Department of Electronic and Information Engineering

Bachelor of Engineering (Honours) Degree Programme in

Electronic and Information Engineering

Full-time Credit-based

Code: 42070

Programme Booklet

2006/2007

BEng(Hons) in Electronic and Information Engineering (Full-Time/Sandwich/ Cooperative Education Scheme/Double Degree/Double Degree Sandwich)

Contents

1. GENERAL INFORMATION

1.1 Cohort of Intakes and readership

This programme booklet is the definitive programme document for the 2006/07 cohort of intakes, and particulary for those students who enter this programme by following a local Advanced-level education system. For those non-local students from Chinese Mainland or countries which have an education system different from the current Hong Kong system, they are required to study a one-year Foundation Curriculum on top of the normal requirements for a 3-year undergraduate degree programme as specified in this programme booklet. These non-local students are required to complete a total of 120 credits, within 4 years nominal, to obtain an undergraduate degree. In addition to this programme booklet, these students should refer to the Foundation-Year Curriculum, which is specially designed and approved by the University Senate. At the time of publication, every effort has been made in assuring the accuracy and currency of the contents. Just in case any updated information is made available after the publication, students are requested to refer to the URL http://www.eie.polyu.edu.hk/prog/beng.html for the most updated information. Should any discrepancy between the contents of the booklet and University regulations arise, University regulations will always prevail.

1.2 Programme Information

Title of Programme	**Bachelor of Engineering (Honours) Degree in Electronic and Information Engineering**
Host Department	Department of Electronic and Information Engineering (EIE)
Programme Structure	Credit-based
Final Award	
Full-time, Sandwich, and CES modes:	BEng(Hons) in Electronic and Information Engineering 電子及資訊工程學(榮譽)工學士
Double Degree mode:	Beng(Hons) in Electronic and Information Engineering 電子及資訊工程學(榮譽)工學士 and 及 Bachelor of Science (Honours) in Engineering Physics 工程物理學(榮譽)理學士學位
Professional Recognition	This programme satisfies the academic requirements for Corporate Membership of the Hong Kong Institution of Engineers (HKIE).

Modes of attendance and total credits for graduation

For students who enter this programme by following a local Advanced-level education system:

Mode of Attendance and Duration	Full-time mode:	3 years nominal, 6 years maximum
	Sandwich mode:	4 years nominal, 7 years maximum
	CES (Cooperative Education Scheme) mode:	3½ years nominal, 7 years maximum
	Double Degree mode:	4 years nominal, 8 years maximum
	Double Degree with Sandwich mode:	5 years nominal, 9 years maximum
Total Credits for Graduation	Academic credits:	90 (for Full-time, Sandwich and CES modes) 131 (for Double Degree mode)
	Training credits:	13 (all modes)
	Work-Integrated Education Credits:	At least 1 (all modes)

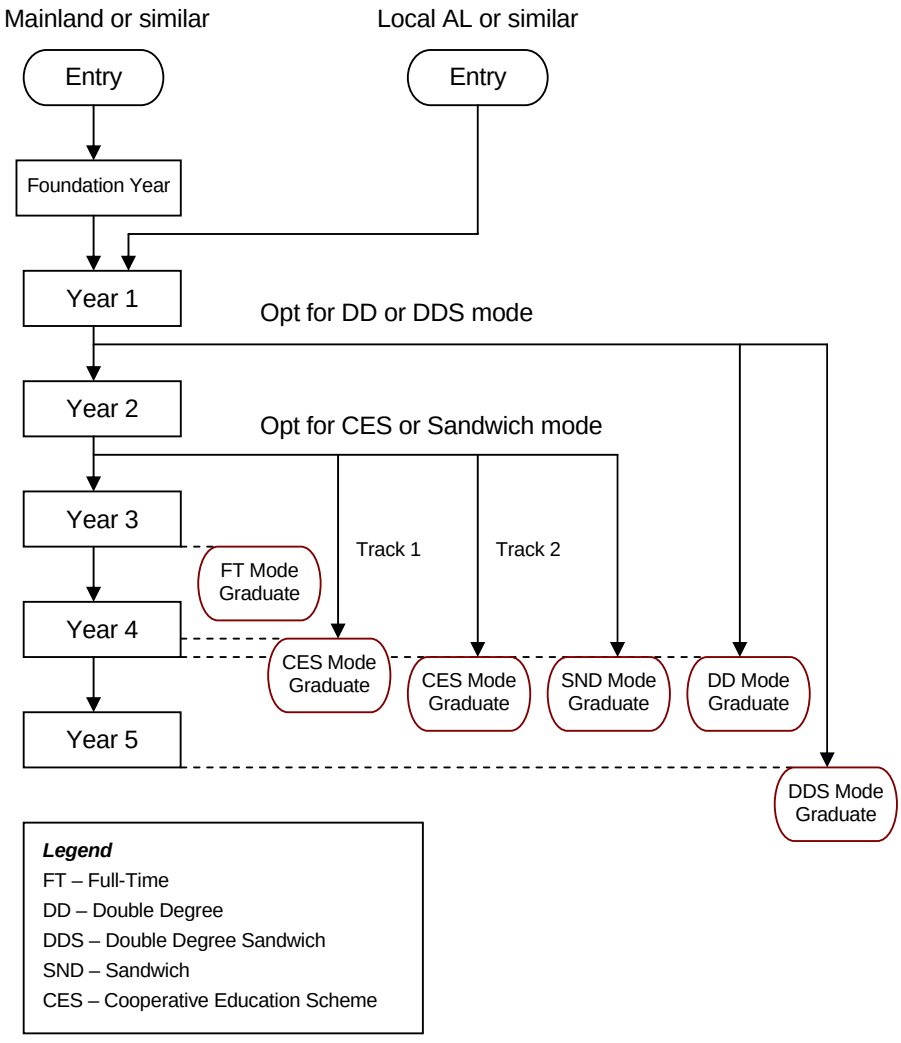
For students who have to study the Foundation-Year Curriculum:

Mode of Attendance and Duration	Full-time mode:	4 years nominal, 8 years maximum
	Sandwich mode:	5 years nominal, 9 years maximum
	CES (Cooperative Education Scheme) mode:	4½ years nominal, 9 years maximum
	Double Degree mode:	5 years nominal, 10 years maximum
	Double Degree with Sandwich mode:	6 years nominal, 11 years maximum
Total Credits for Graduation	Academic credits:	120 (for Full-time, Sandwich and CES modes) 161 (for Double Degree mode)
	Training credits:	13 (all modes)
	Work-Integrated Education Credits:	At least 1 (all modes)

1.3 Modes of Attendance

The following information about the various modes of study apply to students who enter the programme either after having finished the Foundation Year, or through the local Advanced Level examination system or similar. The different years of the various modes of study are referred to as *Foundation Year, Year 1, Year 2, Year 3, Year 4* and *Year 5*.

All students will pursue identical study in Year 1. After Year 1, they may choose a particular mode of study according to their interest, planning, and places available. A mode of study is characterized by the credits and subjects required and the progression pattern in Year 1 to Year 5. There are five possible modes of study, namely Full-time (FT) mode, Sandwich (SND) mode, Cooperative Education Scheme (CES) mode, Double Degree (DD) mode, and Double Degree Sandwich (DDS) mode, as follows:



Full-time mode

Under the Full-time mode, the students will normally pursue their study by going through Year 1, Year 2, and Year 3 in full time and then graduate at the end of Year 3 after having satisfied all programme requirements.

Sandwich mode

Under the Sandwich mode, the students will pursue Year 1 and Year 2 study in full time, and then engage in industrial training in Year 3. During the industrial training year, the students may choose to study one subject each semester. After the industrial training year, the students will pursue study in Year 4 in full time again. Normally the students will graduate at the end of Year 4 after having satisfied all programme requirements.

Cooperative Education Scheme mode

Under the CES mode, the students will pursue Year 1 and Year 2 of study in full time. From Semester 3 of Year 2 up to Semester 1 of Year 4, the students will engage in industrial training while concurrently pursuing study in the University with day-release (one day leave per week) given by the employer. In the “Track 1” route of the CES mode, the students will also undertake a job-related Honours project during the industrial training period. Normally the students will graduate at the end of the first semester of Year 4 after having satisfied all programme requirements. Should the students prefer to take the Honours project after Year 3, he/she will study in the “Track 2” route and will normally graduate at the end of Year 4.

Double Degree mode

After Year 1, students may choose to embark on the Double Degree mode of study. Due to limited quota, students will be selected into the Double Degree mode according to their suitability. The normal duration of the Double Degree mode is four years. The first three years will be UGC-funded while the fourth year will be self-financed. On successful completion of the Double Degree mode of study, the students will obtain two awards, namely Bachelor of Engineering (Honours) in Electronic and Information Engineering and Bachelor of Science (Honours) in Engineering Physics.

In case the students choose to terminate their study after Year 3, they will normally obtain the Major in Electronic and Information Engineering and Minor in Engineering Physics awards, the details of which are specified in Sections 27 and 28.

Double Degree Sandwich mode

The normal duration of the Double Degree Sandwich mode is five years. The student enter the Double Degree mode of study in Year 2. After Year 2, he/she engages in industrial training for one year and then return to the Programme to study for the remaining two years to obtain the double degrees. During the industrial training year, the students may choose to study one subject each semester.

In case the students choose to terminate their study in Year 4 (i.e. the year after training), they will normally obtain the Major in Electronic and Information Engineering and Minor in Engineering Physics awards, the details of which are specified in Sections 27 and 28.

2. AIMS AND OBJECTIVES OF THE PROGRAMME

2.1. Programme Aims and Objectives

The followings are the aims and objectives of the Programme:

(i) This programme aims at producing graduates with the professional knowledge and skills that are relevant for a professional engineer to contribute to electronic and information engineering profession.

(ii) The curriculum enables the students to develop a deep understanding of sound scientific principles, and to gather experience in practical applications.

(iii) The learning and teaching environment is flexible and relevant to support both professional and all-rounded developments of the students.

(iv) The graduates will be able to develop abilities in effective communication, problem-solving, inquisitiveness, critical and creative thinking, and life-long learning.

(v) The graduates are expected to be equipped with professional competence, all-rounded attributes and transferable skills, and be able to meet challenges from the rapidly changing engineering profession.

2.2. Outcome Statements

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

Category A Professional/academic knowledge and skills

1. Meet the academic requirements for Corporate Membership of the Hong Kong Institution of Engineers (HKIE).
2. Practice as a professional engineer in the field of electronic and information engineering with the necessary professional knowledge, skills, ability and attitudes.
3. Identify and apply fundamental principles in the electronic and information engineering profession.
4. Apply mathematical and scientific foundations in the electronic and information engineering profession and in further study.
5. Design solutions to real-life problems in electronic and information engineering while taking into consideration of practical constraints.
6. Recognize responsibility, ethics, and environment issues when practicing as a professional engineer in the field of electronic and information engineering.
7. Communicate effectively up to the standard required for the electronic and information engineering profession.

Category B Attributes for all roundedness

8. Have a sense of global outlook, and be able to recognize local and international technological development in electronic and information engineering.
9. Think critically and creatively.
10. Recognize social and national responsibility.
11. Pursue life-long learning and continual professional development.
12. Have a sense of entrepreneurship, and be able to recognize market needs and product development requirements in the electronic and information engineering profession.
13. Work in a team collaboratively.
14. Exercise leadership when working in a team.

3. ENTRANCE REQUIREMENTS

For non-local students who enter this programme by following a different education system than that in Hong Kong, they must possess the non-local qualifications for meeting the general entrance requirements for Bachelor Degree Programmes as published by the University.

For students who enter this programme by following a local Advanced-level education system, they must satisfy both the University general minimum entrance requirements AND the programme-specific requirements, as set out below.

3.1 University General Minimum Entrance Requirements

For those applying on the basis of HKALE:

- E in HKALE Chinese Literature, or E in HKALE(AS-Level) Chinese Language & Culture, or (for applicants who have not taken Chinese since Secondary Five) D in a HKCEE language other than Chinese and English; AND
- E in HKALE(AS-Level) Use of English; AND
- E in two other HKALE subjects, or E in one other HKALE subject and two other HKALE(AS-Level) subjects; AND
- E in five HKCEE subjects.

For those applying on the basis of other local qualifications:

- An appropriate Higher Certificate (as specified in the individual programme entries where appropriate) from PolyU or the Hong Kong Institute of Vocational Education; OR
- An appropriate Diploma (as specified in the individual programme entries where appropriate) from PolyU or the Hong Kong Institute of Vocational Education, either with a Credit or Pass at Merit Level in at least three Level III subjects.

It is possible for applicants* with Higher Diploma or Associate Degree qualifications to be considered for admission to the senior year of the programme.

** These applicants should follow the regular application arrangements to submit their applications. The Department will consider the applicants for admission to the senior year and inform them at the time of offer.*

3.2 Programme-specific Entrance Requirements

For those applying on the basis of HKALE:

- HKALE Grade E in Pure Mathematics or Applied Mathematics, and in Physics or Engineering Science; OR

- HKALE Grade E in Pure Mathematics or Applied Mathematics, and HKALE (AS-Level) Grade E in Physics or Electronics; OR
- HKALE Grade E in Physics or Engineering Science, and HKALE (AS-Level) Grade E in Applied Mathematics or Mathematics and Statistics.

For those applying on the basis of other qualifications:

- A Higher Diploma in Electronic (and Information) Engineering, Electrical Engineering, or other related disciplines; OR
- A Higher Certificate in Electronic and Communications Engineering, Electrical Engineering, Computer and Information Engineering, or other related disciplines; OR
- A Diploma (with Credit) in Electronic and Communications Engineering, Computer and Information Engineering, or other related disciplines.

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

- Holders of a Higher Diploma in Electronic (and Information) Engineering or Electrical Engineering may be given credit transfer for all/a majority of Year One subjects.

3.3 Admission of Advanced Standing Students Based On Advanced Academic Qualifications

(i) With approval by the Faculty, students may be admitted to the Programme at a point after the initial stage provided they have demonstrably reached the general level of educational development which would have been reached had they taken the earlier stage(s) of the Programme, and provided that there is a high probability that they will complete the Programme successfully.

(ii) Students admitted to the Programme via the above-stated admission route will be advised that based on advanced academic qualifications, they are required to take fewer subjects (of at least 30 credits less than the normal entry) than students admitted through normal entry route. Such students admitted will be given a different set of credit requirements.

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

(iv) Students who, upon admission, wish to apply to transfer any credits from their previous studies and take fewer credits than that confirmed at the time of admission, will have to adhere to normal policy governing credit transfer.

(v) If students, admitted to credit-based programmes via the above-stated admission routes, wish to study the subject(s) again, they may approach the Department for declining the provision of taking fewer credits granted at the time of admission.

4. PROGRAMME, SUBJECTS, AND CREDITS

4.1 Programme Specified Subjects

For those non-local students from Chinese Mainland or countries which have an education system different from the current Hong Kong system, they have to study the Foundation Year prior to studying the Year 1, Year 2 and Year 3 curricula. For the details of Foundation Year subjects and credits requirements, they shall refer to the *2006/07 Foundation-Year Curriculum* (a separate booklet).

For students who enter the programme via the local Advanced Level Examination system or similar, they will study the subjects in Year 1, Year 2 and Year 3 as described in the following.

For subjects to be studied at Year 1, Year 2 and Year 3, most are of standard-size, each carrying 3 credits which are equivalent to 42 contact hours. The Honours Project carries 6 credits. The Integrated Project, English for Engineering Students, and the two General Education subjects carry two credits each. Table 4.1 lists the subjects, their credit values, and the category they belong to (Compulsory or Elective) under a particular mode of study. All subjects shown as compulsory are non-deferrable and must be taken in accordance to the progression pattern. The five modes of study are outlined in Section 1.3.

For the Full-time mode, Sandwich mode, and CES mode of study, students are required to complete 90 academic credits to satisfy the degree requirements. The subjects contributing to the 90 academic credits are listed in Table 4.1 under the respective mode of study. However, they may choose to take additional subjects beyond the basic requirements. The maximum number of credits that can be taken is 99. Please refer to Section 25 for detailed information on the requirements for graduation.

As for the Double Degree and Double Sandwich modes, the students are required to complete 131 academic credits to satisfy the double degree requirements. According to the University regulation on Double Degree, a student will be eligible for an award as soon as the credit requirements of that award are met. The subjects contributing to the BEng(Hons) in EIE award are listed in Table 4.1 under the "Double Degree, Sandwich" column. A total of 90 credits have to be earned by the student in order to meet the academic credit requirement.

Table 4.1 Subjects Category and Credits

Foundation-Year Curriculum

(Note the following table is reproduced from the *2006/07 Foundation-Year Curriculum* for completeness of this document. For details please refer to the Foundation-Year Curriculum booklet.)

Subject	**Subject Title**	**CR**	**Category**
AF1602	Hong Kong Business Environment	3	COM
AMA103	Foundation Mathematics I for Science and Engineering	3	COM
AMA104	Foundation Mathematics II for Science and Engineering	3	COM
AMA105	Logic : Qualitative and Quantitative	3	COM
AP101	College Physics I	3	COM
AP102	College Physics II	3	COM
APSS184	Understanding the Hong Kong Community	3	COM
APSS186	Understanding Ethics in Daily Life	3	COM
ELC1004	English for University Studies I	3	COM
ELC1005	English for University Studies II	3	COM

Table 4.1 Subjects Category and Credits (cont'd)

Year 1, Year 2 and Year 3 Curricula

Subject	Subject Title	CR	Category under mode			
			FT, SAND, CES	DD, DDS	Major in EIE	Minor in EP
AF2617	Economics for Engineers	3	COM	COM*	COM	N.A.
AMA201	Mathematics I	3	COM	COM*#	COM	N.A.
AMA202	Mathematics II	3	COM	COM*#	COM	N.A.
EIE211	Logic Design	3	COM	COM*	ELE	(3)
ENG224	Information Technology	3	COM	COM*	COM	(3)
ENG232	Engineering Science	3	COM	COM*	COM	N.A.
ENG236	Computer Programming	3	COM	COM*#	COM	N.A.
ENG237	Basic Electricity and Electronics I	3	COM	COM*#	COM	(3)
ENG238	Basic Electricity and Electronics II	3	COM	COM*#	COM	(3)
AMA302	Probability and Engineering Statistics	2	COM	COM*	N.A.	N.A.
EIE304	Electronic Circuits	3	COM	COM*#	ELE	(3)
EIE306	IC Technology and Processes	3	COM	COM*#	ELE	(3)
EIE311	Computer System Fundamentals	3	COM	COM*#	ELE	(3)
EIE312	Linear Systems	3	COM	COM*	COM	(3)
EIE320	Object-Oriented Design and Programming	3	COM	N.A.	ELE	N.A.
EIE322	Interface and Embedded Systems	3	COM	COM*#	COM	(3)
EIE330	Integrated Project	2	COM	COM*	COM	N.A.
EIE331	Communication Fundamentals	3	COM	COM*	ELE	(3)
EIE333	Data and Computer Communications	3	COM	ELE*	ELE	(3)
EIE338	Applied Electromagnetics	3	COM	COM*#	N.A.	(1)
EIE413	Digital Signal Processing	3	COM	ELE*	N.A.	(3)
EIE433	Honours Project	6	COM	COM*#	COM	N.A.
ENG403	Society and The Engineer	2	COM	COM*	N.A.	N.A.
ENG306	Engineering Management	3	COM	COM*#	COM	N.A.
MM2021	Management and Organisation	3	COM	COM*#	COM	N.A.
EIE305	Integrated Analogue and Digital Circuits	3	ELE	COM*	N.A.	(3)
EIE401	VLSI and Computer-Aided Circuit Design	3	ELE	ELE*	ELE	(3)
EIE402	Power Electronics	3	ELE	ELE*	ELE	(3)
EIE403	High Frequency Circuit Design	3	ELE	ELE*	ELE	(3)
EIE414	Computer Architecture and Systems	3	ELE	ELE*	N.A.	(3)
EIE415	Multimedia Technology	3	ELE	ELE*	ELE	(3)
EIE424	Distributed Systems and Network Programming	3	ELE	N.A.	ELE	N.A.
EIE425	Video, Image and Audio Processing	3	ELE	N.A.	ELE	N.A.
EIE443	Telecommunication Networks	3	ELE	N.A.	ELE	N.A.
EIE447	Mobile Communications	3	ELE	N.A.	ELE	N.A.
EIE448	Bioengineering Signals and Systems	3	ELE	N.A.	ELE	N.A.
EIE449	Optical Communication Systems and Networks	3	ELE	N.A.	ELE	N.A.
EIE387	Cooperative Education (for CES mode only)	P	WIE	WIE	N.A.	N.A.
EIE388	Industrial Training (for Sandwich mode only)	P	WIE	WIE	N.A.	N.A.
EIE389	Industrial Attachment	P	WIE	WIE	N.A.	N.A.
ELC3051	English for Engineering Students	2	ELC	ELC	ELC	N.A.
GEC2801	China Studies	2	GEC	GEC	GEC	N.A.
GECXXXX	"Broadening" GEC subject	2	GEC	GEC	GEC	N.A.
IC272	Industrial Centre Training I	9	TRN	TRN	TRN	N.A.
IC367	Industrial Centre Training II	4	TRN	TRN	TRN	N.A.

Table 4.1 Subjects Category and Credits (cont'd)

Year 1, Year 2 and Year 3 Curricula (cont'd)

Subject	Subject Title	CR	Category under mode			
			FT, SAND, CES	DD, DDS	Major in EIE	DD Minor in EP
AP200	Mechanics	3	N.A.	COM#	N.A.	(1)
AP201	Wave and Optics	3	N.A	COM#	N.A.	(2)
AP210	Materials Science	3	N.A	COM*#	N.A.	(2)
AP2211	Physics Laboratory	3	N.A	COM#	N.A.	(2)
AP260	Metals and Ceramics	3	N.A	COM#	N.A.	(2)
AP301	Modern Physics I	3	N.A	COM#	N.A.	(1)
AP3211	Measurement and Experimental Techniques	3	N.A	COM#	N.A.	(2)
AP351	Modern Physics II	3	N.A	COM#	N.A.	(2)
AP352	Thermal and Statistical Physics	3	N.A	COM#	N.A.	(1)
AP3611	Materials Science Laboratory	2	N.A	COM#	N.A.	(2)
AP401	Modern Optics	3	N.A	COM#	N.A.	(2)
AP4111	Electronic Materials	3	N.A	COM#	N.A.	(2)
AP451	Condensed Matter Physics	3	N.A	COM#	N.A.	(2)
AP4611	Reliability and Failure Analysis	3	N.A	COM#	N.A.	(2)
AP310	Polymers and Composites	3	N.A	ELE#	N.A.	(2)
AP3311	Computational Physics	3	N.A	ELE#	N.A.	(2)
AP3551	Applied Acoustics	3	N.A	ELE#	N.A.	(2)
AP4311	Simulations of Stochastic Processes	3	N.A	ELE#	N.A.	(2)
AP4711	Advanced Physics Laboratory	3	N.A	ELE#	N.A.	(2)
AP4811	Simulation Methods in Nonlinear Science	3	N.A	ELE#	N.A.	(2)

*Subjects counted towards BEng(Hons) in EIE award under the Double Degree mode.

#Subjects counted towards BSc(Hons) in EP award under the Double Degree mode.

(1), (2), (3) : Choose at least 6 credits from each group to minor in EP under the Double Degree mode. For details please refer to Sections 1.3 and 26.

4.2 University Language Requirements

4.2.1 Students are expected to possess the general standard of language proficiency through the secondary school education prior to their admission to the University as follows:

(i) English and Written Chinese

Students with overall grade "A" or "B" in HKALE(AS-level) Use of English and Chinese Language & Culture shall be considered as possessing the respective general standards of language proficiency, and thus shall be exempted from taking the respective Language Enhancement Programmes (LEP).

Students with overall grade "C" in HKALE(AS-level) Use of English and Chinese Language & Culture shall generally be considered as possessing the respective general standards of language proficiency. But if they possess component grade(s) lower than "C", they shall be required to complete the respective LEP modules prescribed for them.

(ii) Putonghua

Students shall be assessed through the entrance test on Putonghua provided by CBS upon commencement of their programme of study at the University to determine if they shall be required to take the Putonghua LEP.

Students with grade "A" or "B" in HKCEE Putonghua shall be considered as possessing the general standard of Putonghua proficiency, and thus shall be exempted from taking the required Putonghua LEP.

Students with grade "C" in HKCEE Putonghua shall generally be considered as possessing the general standard of Putonghua proficiency. But they will be assessed again through the entrance test on Putonghua provided by CBS upon commencement of their programme of study to determine if they shall be required to take the Putonghua LEP.

4.2.2 Benchmarking mechanisms will be established for assessing students' general standard of language proficiency upon admission, in order that appropriate enhancement can be provided, where necessary, to help them achieve the desired standard upon graduation.

(i) English and Written Chinese

HKALE(AS-level) Use of English and Chinese Language & Culture subjects shall be adopted as the benchmarking mechanisms.

Native speakers of English shall by default be given exemption. Exemption requests on other grounds shall be considered on a case-by-case basis.

(ii) Putonghua

CBS's entrance test on Putonghua and HKCEE Putonghua subject shall be adopted as the benchmarking mechanisms for assessing students' general levels of Putonghua proficiency upon admission.

Native speakers of Putonghua shall by default be given exemption. Exemption requests on other grounds shall be considered on a case-by-case basis.

4.2.3 To enable students to be equipped with the necessary generic language skills to pursue their studies as well as to attain the level of proficiency up to University's desired standard, appropriate non-credit bearing enhancement programmes will be provided to students in accordance with their proficiency level as identified in the entry assessment as specified in Section 4.2.1 above.

(i) Non-credit Bearing Language Enhancement Programmes

Non-credit bearing Chinese/English Language Enhancement Programmes (LEPs) shall be prescribed and provided by CBS/ELC for individual students in respect of their proficiency levels.

Students are expected to complete the LEPs prescribed by CBS and/or ELC before their graduation. Nevertheless, non-completion of the respective LEP(s) will not affect students' eligibility for graduation.

4.2.4 Undergraduate students will be required to undergo both Chinese and English language proficiency assessment before their graduation. In addition, final year students are strongly recommended to take external tests such as IELTS which can help to strengthen their credentials when seeking employment.

(i) Chinese and English Language Proficiency Assessments

The PolyU-developed Graduating Students' Language Proficiency Assessment (GSLPA) in Chinese and English shall be adopted as the required language proficiency exit tests.

Students on all UGC-funded Bachelor's degree programmes catered for school leavers shall be required to sit for both GSLPAs before graduation. Except for those who are given exemption from attempting the GSLPA, students who have not taken both of the GSLPAs shall not be eligible for graduation.

Students who have been waived of the Chinese language requirement during their admission to the University shall be given exemption from sitting for the Chinese GSLPA (both written Chinese and Putonghua). Nevertheless, they will not be precluded from sitting for the Chinese GSLPA, but this will entirely be on a voluntary basis.

A statement indicating a student having completed the GSLPAs shall be included in his/her academic transcript. As regards the student's scores obtained from the GSLPAs, they shall be reported in separate test result transcripts.

4.2.5 Apart from general language proficiency, different disciplines may have different profession-based language requirements. Credit-bearing profession-specific language subjects to be prescribed by individual faculties/departments will be incorporated into the respective curriculum of individual programmes. It is expected that the development and teaching of the appropriate subjects would be made by the host department in collaboration with the subject offering department/relevant expert departments/units.

5. SPECIFIED PROGRESSION PATTERN

For non-local students from Chinese Mainland or countries which have an education system different from the current Hong Kong system, they will have to study the Foundation Year prior to pursuing study in Year 1, Year 2 and Year 3. The progression pattern of the Foundation Year is reproduced in the following from the *2006/07 Foundation-Year Curriculum* for completeness of this document. For details, please refer to the original booklet.

Foundation Year (30 Credits)	
Semester 1 (15 credits)	
University Mandatory subjects	AMA103 Foundation Mathematics I for Science and Engineering
	APSS184 Understanding the Hong Kong Community
	ELC1004 English for University Studies I
Other subjects required	AF1602 Hong Kong Business Environment
	AP101 College Physics
Semester 2 (15 credits)	
University Mandatory subjects	AMA105 Logic : Qualitative and Quantitative
	ELC1005 English for University Studies II
Other subjects required	AMA104 Foundation Mathematics II for Science and Engineering
	AP102 College Physics II
	APSS186 Understanding Ethics in Daily Life

For students who enter the programme by following a local Advanced-level education system, and those who have already finished the Foundation Year, they will pursue their study in Year 1, Year 2 and Year 3 according to the progression pattern specific to each mode of study, as described in the following.

5.1 Full-time mode

Year 1 (31 Credits)	
Semester 1 (15 credits)	**Semester 2** (16 credits)
AMA201 Mathematics I	AMA202 Mathematics II
ENG237 Basic Electricity and Electronics I	ENG238 Basic Electricity and Electronics II
ENG232 Engineering Science	EIE211 Logic Design
ENG224 Information Technology	EIE312 Linear Systems
ENG236 Computer Programming	ENG236 Computer Programming
ELC3501 English for Engineering Students	ELC3501 English for Engineering Students
	GEC2801 China Studies
Whole Year: IC272 - IC Training I (9 training credits)	
Year 2 (28 Credits)	
Semester 1 (14 credits)	**Semester 2** (14 credits)
EIE304 Electronic Circuits	EIE333 Data and Computer Communications
EIE331 Communication Fundamentals	EIE322 Interface and Embedded Systems
EIE311 Computer System Fundamentals	EIE413 Digital Signal Processing
AMA302 Probability and Engineering Statistics	EIE330 Integrated Project
EIE320 Object-oriented Design and Programming **OR** EIE306 IC Technology and Processes	EIE338 Applied Electromagnetics
Semester 3 IC Training II (4 training credits) or EIE389 Industrial Attachment	
Year 3 (31 Credits)	
Semester 1 (17 credits)	**Semester 2** (14 credits)
EIE433 Honours Project	EIE433 Honours Project (cont'd)
AF2617 Economics for Engineers	ENG306 Engineering Management **OR** MM2021 Management and Organisation
EIE Technical Elective	ENG403 Society and The Engineer
EIE Technical Elective	EIE Technical Elective
EIE Technical Elective	EIE Technical Elective
GEC "Broadening" subject	

5.2 Sandwich mode

Year 1 (31 Credits)	
Semester 1 (15 credits)	**Semester 2** (16 credits)
AMA201 Mathematics I	AMA202 Mathematics II
ENG237 Basic Electricity and Electronics I	ENG238 Basic Electricity and Electronics II
ENG232 Engineering Science	EIE211 Logic Design
ENG224 Information Technology	EIE312 Linear Systems
ENG236 Computer Programming	ENG236 Computer Programming
ELC3501 English for Engineering Students	ELC3501 English for Engineering Students
	GEC2801 China Studies
Whole Year: IC272 - IC Training I (9 training credits)	
Year 2 (28 Credits)	
Semester 1 (14 credits)	**Semester 2** (14 credits)
EIE304 Electronic Circuits	EIE333 Data and Computer Communications
EIE331 Communication Fundamentals	EIE322 Interface and Embedded Systems
EIE311 Computer System Fundamentals	EIE413 Digital Signal Processing
AMA302 Probability and Engineering Statistics	EIE330 Integrated Project
EIE320 Object-oriented Design and Programming **OR** EIE306 IC Technology and Processes	EIE338 Applied Electromagnetics
Semester 3 IC Training II (4 training credits) or EIE389 Industrial Attachment	
Year 3I (0-6 Credits) *	
Semester 1	**Semester 2**
EIE388 Industrial Training	EIE388 Industrial Training
Elective – Students may take 1 elective.	Elective – Students may take 1 elective.
Year 4 (25-31 Credits) *	
Semester 1 (11-17 credits) *	**Semester 2** (8-14 credits) *
EIE433 Honours Project	EIE433 Honours Project (cont'd)
AF2617 Economics for Engineers	ENG306 Engineering Management **OR** MM2021 Management and Organisation
GEC "Broadening" subject	ENG403 Society and The Engineer
Electives – Choose 3 to 5 electives	

* Total credits accumulated in Year 3I and Year 4 must be equal to 31 credits.

5.3 Cooperative Education Scheme mode - Track 1

Year 1 (31 Credits)	
Semester 1 (15 credits)	**Semester 2** (16 credits)
AMA201 Mathematics I	AMA202 Mathematics II
ENG237 Basic Electricity and Electronics I	ENG238 Basic Electricity and Electronics II
ENG232 Engineering Science	EIE211 Logic Design
ENG224 Information Technology	EIE312 Linear Systems
ENG236 Computer Programming	ENG236 Computer Programming
ELC3501 English for Engineering Students	ELC3501 English for Engineering Students
	GEC2801 China Studies
Whole Year: IC272 - IC Training I (9 training credits)	
Year 2 (28 Credits)	
Semester 1 (14 credits)	**Semester 2** (14 credits)
EIE304 Electronic Circuits	EIE333 Data and Computer Communications
EIE331 Communication Fundamentals	EIE322 Interface and Embedded Systems
EIE311 Computer System Fundamentals	EIE413 Digital Signal Processing
AMA302 Probability and Engineering Statistics	EIE330 Integrated Project
EIE320 Object-oriented Design and Programming **OR** EIE306 IC Technology and Processes	EIE338 Applied Electromagnetics
Semester 3	
EIE387 Cooperative Education	
IC Training II (4 training credits) or EIE389 Industrial Attachment	
Choose 2 subjects under the guidance of the Programme Leader.	
Year 3	
Semester 1	**Semester 2**
EIE387 Cooperative Education (continued)	
Choose 2 subjects under the guidance of the Programme Leader.	Choose 2 subjects under the guidance of the Programme Leader.
	EIE433 Honours Project
Semester 3	
EIE387 Cooperative Education (continued)	
Choose 1 subject under the guidance of the Programme Leader.	
Year 4	
Semester 1	
EIE387 Cooperative Education (continued)	
Choose 2 subjects under the guidance of the Programme Leader.	
EIE433 Honours Project (continued)	

5.4 Cooperative Education Scheme mode – Track 2

Year 1 (31 Credits)	
Semester 1 (15 credits)	**Semester 2** (16 credits)
AMA201 Mathematics I	AMA202 Mathematics II
ENG237 Basic Electricity and Electronics I	ENG238 Basic Electricity and Electronics II
ENG232 Engineering Science	EIE211 Logic Design
ENG224 Information Technology	EIE312 Linear Systems
ENG236 Computer Programming	ENG236 Computer Programming
ELC3501 English for Engineering Students	ELC3501 English for Engineering Students
	GEC2801 China Studies
Whole Year: IC272 - IC Training I (9 training credits)	
Year 2 (28 Credits)	
Semester 1 (14 credits)	**Semester 2** (14 credits)
EIE304 Electronic Circuits	EIE333 Data and Computer Communications
EIE331 Communication Fundamentals	EIE322 Interface and Embedded Systems
EIE311 Computer System Fundamentals	EIE413 Digital Signal Processing
AMA302 Probability and Engineering Statistics	EIE330 Integrated Project
EIE320 Object-oriented Design and Programming **OR** EIE306 IC Technology and Processes	EIE338 Applied Electromagnetics
Semester 3	
EIE387 Cooperative Education	
IC Training II (4 training credits) or EIE389 Industrial Attachment	
Choose 2 subjects under the guidance of the Programme Leader.	
Year 3	
Semester 1	**Semester 2**
EIE387 Cooperative Education (continued)	
Choose 2 subjects under the guidance of the Programme Leader.	Choose 2 subjects under the guidance of the Programme Leader.
Semester 3	
EIE387 Cooperative Education (continued)	
Choose 1 subject under the guidance of the Programme Leader.	
Year 4	
Semester 1	**Semester 2**
EIE387 Cooperative Education (continued)	
EIE433 Honours Project	EIE433 Honours Project (continued)
Choose 2 subjects under the guidance of the Programme Leader.	

5.5 Double Degree mode

Year 1 (31 Credits)	
Semester 1 (15 credits)	**Semester 2** (16 credits)
AMA201 Mathematics I	AMA202 Mathematics II
ENG237 Basic Electricity and Electronics I	ENG238 Basic Electricity and Electronics II
ENG232 Engineering Science	EIE211 Logic Design
ENG224 Information Technology	EIE312 Linear Systems
ENG236 Computer Programming	ENG236 Computer Programming
ELC3501 English for Engineering Students	ELC3501 English for Engineering Students
	GEC2801 China Studies
Whole Year: IC272 - IC Training I (9 training credits)	
Year 2 (34 Credits)	
Semester 1 (17 credits)	**Semester 2** (17 credits)
EIE304 Electronic Circuits	EIE322 Interface and Embedded Systems
EIE306 IC Technology and Processes	EIE338 Applied Electromagnetics
EIE311 Computer System Fundamentals	EIE330 Integrated Project
AMA302 Probability and Engineering Statistics	AP351 Modern Physics II
AP200 Mechanics	EIE Technical Elective
AP301 Modern Physics I	AP Elective
Semester 3 IC Training II (4 training credits) or EIE389 Industrial Attachment	
Year 3 (34 Credits)	
Semester 1 (18 credits)	**Semester 2** (16 credits)
EIE433 Honours Project	EIE433 Honours Project (continued)
EIE305 Integrated Analogue and Digital Circuits	ENG403 Society and The Engineer
EIE331 Communication Fundamentals	AP260 Metals and Ceramics
AF2617 Economics for Engineers	AP321 Measurement and Experimental Techniques
AP210 Materials Science	ENG306 Engineering Management **OR** MM2021 Management and Organisation
AP221 Physics Laboratory	GEC "Broadening" subject
Year 4 (32 Credits)	
Semester 1 (17 credits)	**Semester 2** (15 credits)
AP201 Wave and Optics	AP401 Modern Optics
AP352 Thermal and Statistical Physics	AP451 Condensed Matter Physics
AP361 Materials Science Laboratory	AP461 Reliability and Failure Analysis
AP411 Electronic Materials	EIE Technical Elective
EIE Technical Elective	
1 AP Elective and 1 EIE Technical Elective	

5.6 Double Degree Sandwich mode

Year 1 (31 Credits)	
Semester 1 (15 credits)	**Semester 2** (16 credits)
AMA201 Mathematics I	AMA202 Mathematics II
ENG237 Basic Electricity and Electronics I	ENG238 Basic Electricity and Electronics II
ENG232 Engineering Science	EIE211 Logic Design
ENG224 Information Technology	EIE312 Linear Systems
ENG236 Computer Programming	ENG236 Computer Programming
ELC3501 English for Engineering Students	ELC3501 English for Engineering Students
	GEC2801 China Studies
Whole Year: IC272 - IC Training I (9 training credits)	
Year 2 (32 Credits)	
Semester 1 (17 credits)	**Semester 2** (15 credits)
EIE304 Electronic Circuits	EIE322 Interface and Embedded Systems
EIE306 IC Technology and Processes	EIE338 Applied Electromagnetics
EIE311 Computer System Fundamentals	AP351 Modern Physics II
AMA302 Probability and Engineering Statistics	EIE Technical Elective
AP200 Mechanics	AP Elective
AP301 Modern Physics I	
Semester 3 IC Training II (4 training credits) or EIE389 Industrial Attachment	
Year 3I (0-6 Credits) *	
Semester 1	**Semester 2**
EIE388 Industrial Training	EIE388 Industrial Training
Elective – Students may take 1 elective.	Elective – Students may take 1 elective.
Year 4 (25-31 Credits) *	
Semester 1 (11-17 credits) *	**Semester 2** (8-14 credits) *
EIE433 Honours Project	EIE433 Honours Project (continued)
EIE305 Integrated Analogue and Digital Circuits	ENG403 Society and The Engineer
EIE EIE331 Communication Fundamentals	AP260 Metals and Ceramics
AP210 Materials Science	AP321 Measurement and Experimental Techniques
AP221 Physics Laboratory	EIE Technical Elective
	GEC "Broadening" subject
Year 5 (29-35 Credits) *	
Semester 1 (11-17 credits) *	**Semester 2** (12-18 credits) *
AP201 Wave and Optics	AP401 Modern Optics
AP352 Thermal and Statistical Physics	AP451 Condensed Matter Physics
AP361 Materials Science Laboratory	AP461 Reliability and Failure Analysis
AP411 Electronic Materials	ENG306 Engineering Management **OR** MM2021 Management and Organisation
AF2617 Economics for Engineers	
1 AP Elective and 1 EIE Technical Elective	

* Total credits accumulated in Year 3I, Year 4 and Year 5 must be equal to 66 credits.

6. HONOURS PROJECT

The objective of the Honours Project is learning by doing. The project is intended to be a challenge to the students' intellectual and innovative abilities and to give them the opportunities to integrate and apply the knowledge and analytical skills gained in class lectures. It should also provide students with some appreciation of the entire process of problem solving. The progress from concept to final implementation and testing, through problem definition and the selection of alternative solutions will be emphasized. Students who opt for Industrial Training may start working on their Honours Project during their sandwich year.

6.1 Project Management

To facilitate the assessment of the student's work and to promote the ability to work independently, each student will be assigned one project under the supervision of an academic staff member, although several students may work on different aspects of a larger project. The project assignment is based on the interest of the students. Projects in collaboration with an external company are only offered to students with good GPA.

The assignment of projects is expected to be completed by the month of June preceding the beginning of the final year of study. Guidelines on the operation of the project are given in Section 6.3. The Project Management Team will review all progress and mid-sessional project reports, in particular, to sound the warning on serious slippage in schedule and on any lack of clarity in project objective. The project supervisor will be alerted so that timely advice is given to the students.

6.2 Project Assessment

At the completion of the project, the student will be required to give an oral presentation/demonstration of his/her project to an audience of fellow students, staff and industrialists. Two hardcopies and one softcopy of the final report, and the daily log-book are to be submitted at the end of the second semester. The reports go to a panel consisting of the project supervisor and one other member of staff of the Department.

Assessment of the project will be split into 3 areas :

(i) oral presentation and assessment by a panel;
(ii) work done over the project period including daily log-book; and

(iii) final report.

In order to ensure that uniform standards are being used to assess different projects by different assessors, a form for project assessment to guide the Project Panel is used. The Project Panel, which is composed of the Programme Leader, staff members from teaching sections and Project Management Team will read all reports and the respective assessment forms and thereby oversee the overall standard of the projects to ensure a reasonable degree of uniformity of assessment.

6.3 Guidelines on the Operation of the Honours Project

(i) Project Plan

Each student is required to submit a lucid, comprehensive Project Plan to his/her supervisor. This Plan may be marked, at the discretion of the supervisor, and returned to the student, who will use it as the basis of his/her project development.

The Plan should be comprehensive and brief. The following points should be considered:

- Statement of problem and objectives
- Result of literature survey conducted (if any)
- Approach to tackle the problem
- Outline design of hardware and software
- Preliminary project schedule

(ii) Daily Log-Book

Students are required to submit a daily log-book in June. The log-book should record anything that is important to your project. Typical contents include monthly summaries, notes of meetings, planning and actions, design details, experimental data and analysis, observations and remarks. The daily log-book will be reviewed, signed and dated by the supervisor(s) at least once a month.

(iii) Mid-sessional Progress Report

Students are required to prepare a mid-sessional progress report in mid December. One copy of the progress report should be submitted to the supervisor, and another one to the General Office of the Department. This forms the basis for their supervisors to review the progress against the declared objectives, and to obviate any discrepancies if necessary.

(iv) Group and Industrial Projects

In addition to submitting reports and giving presentation at the end of the semesters, students taking group or industrial projects are required to submit progress reports in October and March.

(v) Oral Presentation

A project presentation week will be held after the final year examinations and students are required to present their projects to their classmates and staff.

(vi) Submission of Project Report

Supervisors will ensure that their project students would finish their project development such that sufficient time should be available for the students to prepare their written final reports. Two hardcopies and one softcopy of final report are required for each project.

(vii) Demonstration

Immediately after the final year examination each student has to set up a poster and/or their final products in laboratories to demonstrate their projects to students, staff and industrialists.

7. INDUSTRIAL CENTRE TRAINING

It is of utmost importance for students to have a chance to develop hands-on experience in various engineering domains in order to prepare for pursuing a career in the engineering profession. Industrial Centre (IC) Training is a practical training element in this curriculum to serve this purpose.

During Semester 1, Semester 2 and Summer Term of Year 1, students will undergo Industrial Centre Training I (IC272) in the Industrial Centre (IC). In the Summer Term of Year 2, they will undergo Industrial Centre Training II (IC367) in the Industrial Centre. Industrial Centre Training I carries 9 training credits and Industrial Centre Training II carries 4 training credits. They are graded in the normal manner from A+ to F and will be counted in the evaluation of the Grade Point Average (GPA). However, they will not be counted towards the credit requirement of the award or the evaluation of the Weighted GPA. Students must pass the Industrial Centre Training I and Industrial Centre Training II in order to be considered for the BEng award. The IC training

will be graded at the end of the Summer Terms of Year 1 and Year 2. If the assessment of an Industrial Centre Training, which is completed in a particular academic year, cannot be done in time for the grade to be reported in the particular year, the grade will be reported during Semester One of the following academic year.

7.1 Contents of Industrial Centre Training

Industrial Centre (IC) Training is comprised of IC Training I (IC272) and IC Training II (IC367). The detailed syllabus of which can be found in the syllabus section in this booklet. IC Training I is consisted of Technology Training (7 weeks), Engineering Drawing and Computer Graphics (46 hours), and Industrial Safety (15 hours), which provide a comprehensive set of training in disciplines relevant for the development of a professional engineer in Electronic and Information Engineering.

Industrial Centre Training II (IC367) basically takes the form of a manufacturing project, with six students in a team working under the guidance of staff members from both the Industrial Centre and from the parent department. Typically, the team is charged with planning for the manufacture of an electronic product. Students will gain experience in project control by the Critical Path Method, store management, time-study, preparation of detailed drawings and the specification of mechanical and electronic components, preparation of sequence of operation required for manufacture, electronic wiring and assembly, plant layout, and assembly line balancing.

7.2 Assessment of Industrial Centre Training

Each basic training module taken by the student is assessed on completion of the exercise. This is normally at weekly intervals except in the case of the group project. Full details of the assessment procedures are contained in the paper, Assessment Scheme (Workshop Practice), prepared by the Industrial Centre. The salient points of the document concerning the type of activity to be assessed are:

(i) In the overall context:

(a) technical attitude as exemplified by attendance and attitude towards work assignments, rules, and safety codes;

(b) technical diary and overall report which together comprise a log book. This summarizes the work undertaken by the student in individual modules and includes an overall appraisal of the training scheme; and

(c) manufacturing project where assessment is made of the final written report, group oral presentation, technical competence, and the contribution of each individual.

(ii) In the context of an 'appreciation' of a process or skill:

(a) the measure of technical knowledge and understanding gained during the training modules; and

(b) in some cases the acquisition of a skill where this is necessary for better understanding.

If a student fails in a module, he/she will be required to repeat that module, normally during the summer they were originally taken.

8. WORK-INTEGRATED EDUCATION (WIE)

8.1 In the Programme, there can be several routes or options for the students to pursue Work-Integrated Education (WIE). These options include the Cooperative Education Scheme (CES), Sandwich mode of study, Industrial Attachment, Preferred Graduate Development Programme (PGDP), Industrial Projects, and other workplace training opportunities secured by the Department or the students themselves. WIE is a mandatory component of the programme.

8.2 Credits Requirement

By following the Faculty of Engineering's guideline, this programme will award one WIE training credit to the student for every two weeks' full-time training. WIE training credits will not be counted towards the Grade Point Average (GPA) nor the Weighted GPA (WGPA). After assessing the student's training performance, a Pass or a Fail grade will be awarded to the student on his/her WIE component. Depending on the actual job and duration, the number of training credits obtained by the students will vary. In order to graduate from this programme, a minimum of <u>one</u> WIE training credit must be obtained by the student within their period of study. Meanwhile, the maximum WIE credits will depend on the particular mode of workplace training (CES, Sandwich, Industrial Attachment, PDGP, Industrial Project, or other workplace training) undertaken by the student. For instance, in the case of CES mode of study, the student will earn a maximum of 39 WIE credits over a period of 79 weeks of full-time employment. In the case of Sandwich training, the number of WIE credits earned over a period of 1 year full-time employment will be 26. For the case of Industrial Attachment or Industrial Project, normally 2 WIE credits will be earned by the student over a period of 4 weeks

of workplace training. For the case of PGDP, the nominal working period is 2 months, resulting in 4 WIE credits. On the whole, under this Programme, the students might earn WIE credits in a range of 1 to 39 credits.

The WIE credits will be reflected in the Co-curricular Activities Transcript of the student, but will not be counted towards the non-credit bearing co-curricular activities as stated in Section 9.

8.3 Intended Learning Outcomes of WIE

Since WIE can be taken in different forms and applied to different kinds of jobs, the learning outcomes to be achieved will vary depending on the job nature and its duration engaged by the student. However, based on the experience gained from operating the CES and Sandwich modes of the Programme, WIE can bring a lot of advantages to students' learning both in the profession-specific areas and in their all-rounded development. The intended learning outcomes of the WIE component are elaborated in the following paragraph.

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

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

8.4 Structure of the WIE Component(s)

WIE component under the Programme can be in many forms, namely Cooperative Education Scheme, Sandwich Training, Industrial Attachment, Industrial Project, Preferred Graduate Development Programme, and Other Job Opportunities.

8.4.1 Cooperative Education Scheme (CES)

Under this Scheme, the students engage into WIE after the second year of study in the Programme. From Semester 3 of Year 2 up to Semester 1 of Year 4, students will take up a full-time job to work with similar environment. Concurrently, they will pursue their study of the remaining curriculum through a "day-release" (the student is released from the job one day per week by the employer) arrangement. The advantage of the CES mode of WIE is that the students can engage into larger scale of projects and are assumed to bear more responsibility as a result of a fairly the long period of employment (1.5 years). Furthermore, it is possible for the student to stay with the job "non-stop" after graduation.

8.4.2 Sandwich Training (including Double Degree Sandwich)

The Sandwich mode of WIE is quite similar to the CES, except that its workplace training duration is not as long as CES. After the second year of study, the students will engage into a full-time job for one year. On completion of the WIE component in the Sandwich mode, the student will return to the University to continue the study of the remaining curriculum.

8.4.3 Industrial Attachment

In the Industrial Attachment mode, students will complete 4-weeks' workplace training during the summer after their second year of study.

8.4.4 Industrial Project

Industrial projects are Honours Projects arising from the industry. Students working on an industrial project will pursue the project in the company for a certain period of time. With the arrangement, the students will work with a real-life project and in the real working environment.

8.4.5 Preferred Graduate Development Programme (PGDP)

Under the PGDP, students will engage in a real working environment by working in a company which is a partner of the PGDP programme operated by the SAO. The duration is usually several weeks in the summer vacation period. Such kind of training opportunity is also recognized as WIE component.

8.4.6 Other Job Opportunities

It is possible that the students themselves secure a job to work with during the summer vacation. This kind of job opportunity will be judged by the Department whether it is helpful to the students in achieving the intended learning outcomes of WIE. The students and the WIE Coordinator will work collaboratively with regard to the job selection and the subsequent training contents. Once a job is deemed appropriate as a WIE component, the students can engage into it. The Department will constantly monitor the progress. At the end of the training, an assessment will be made on the learning outcomes.

8.5 Strategies for Supporting Learning in the Workplace

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

8.5.1 Preparation

The Department will actively align with the industry to get placement opportunities openings for WIE. Moreover, it is also important for the students to be fully aware of the benefits being brought about by WIE. In this regard, frequent industrial visit and employment seminars are important. The students will be asked to attend employment seminars as early as possible. Through this type of arrangement, the students in all years will be better prepared for job hunting and employment in advance. They will also realize that it is for their own benefit to be engaged in WIE and thus the students have to take an active role in completing the training.

Under the Programme requirement that a student must obtain at least one WIE training credit, each student is expected to take up job placement actively and to undergo WIE training with their best effort.

8.5.2 Operation

There will be WIE Coordinators overseeing all matters related to WIE activities under the Programme. To guide and monitor students in obtaining the WIE component, each student will be assigned an academic supervisor (who is also the student's Personal Tutor) from the Department. The student and his/her Personal Tutor will jointly plan the WIE details, such as job selection, training plan, logging of activities, reporting, and assessment. It is important to ensure that the students are fully aware of the benefits brought by WIE.

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

8.5.3 Monitoring and assessment

Each student will be guided by his/her academic supervisor when conducting WIE training. The student's work will also be monitored continuously and an assessment will be given when the WIE component is completed.

8.5.4 Assessment of the WIE Component(s)

The objective of assessment is to determine to what extent the student has learned through WIE. Since the actual type of work and duration will vary from student to student, an assessment framework is set out as a general guideline.

(i) Continuous Assessment

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

(ii) Brief Report

After the training is completed, the student is required to submit a brief report as a reflective writing to the Personal Tutor.

Through the brief report, the student may reflect on the training he/she has received and the objectives that have been achieved. He/She may also conduct a self-appraisal on his/her own performance.

(iii) Employer Evaluation

At the end of the training period, the employer has to provide an evaluation of the student. This will enable the employer to assess the student's on-the-job performance and all-rounded development.

(iv) Overall Assessment

Finally, an overall assessment of the student's performance can be made with the assessment components as stated in Sections 8.5.4 (i) to (iii). If the student meets the threshold standard, a pass grade will be given to the WIE component, otherwise a failure grade will be given and remedial action will be planned for the student.

9. CO-CURRICULAR ACTIVITIES

9.1 Students are required to participate in at least one non-credit bearing co-curricular activity in order to satisfy the overall requirement of general education before graduation.

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

9.3 Summer attachments, internships, mentorship programmes, community service and Work-Integrated Education activities forming part of the formal programme curricular will NOT be counted as co-curricular activities.

9.4 Activities like Complementary Studies Programme, Leadership and Competence for Success Programme, Physical Education Programmes, Personal Development Programmes, hall education programmes, pre-placement training/career training organized by SAO, seminars and lunch talks by prominent speakers/study tour/exchange activity offered/organized by the Faculty/the Department/ supporting units, cultural appreciation programme, and any other activities in a variety of forms that the Department considers essential as part of the overall requirement of general education will be counted as co-curricular activities.

9.5 Students will be considered as having fulfilled the requirement of co-curricular activities if they have participated in any one of the activities listed in Section 9.4. Students' participation in such activities will be recorded in the Co-curricular Achievement Transcript (CAT) administered by SAO.

10. DEPARTMENTAL PROGRAMME COMMITTEE OF UNDERGRADUATE PROGRAMMES

10.1 Membership Composition (Tentative)

(i) Programme Leaders of all degree and higher diploma programmes hosted by the Department;
(ii) Head of Department;
(iii) Representative from the Departmental Learning and Teaching Committee;
(iv) Teaching staff representatives;
(v) Representatives from major serving departments (AP, AMA, COMP, ELC IC and SD); and
(vi) Student representatives from each programme.

10.2 Function

(i) To act as a formal body to monitor and assess the operation of the programmes;
(ii) To ensure that the programme schemes are implemented;
(iii) To ensure co-ordination between different academic units which contribute to the teaching of the programmes;
(iv) To consider recommendations from the members on teaching methodology and possible modifications to the programme contents.

10.3 Programme Leader and WIE Coordinators

The Programme Leader is a member of the Department responsible for the overall operation of the programme. The Programme Leader is accountable in day-to-day operation of the programme. The Programme Leader will provide the academic and organisational leadership for the programme.

The WIE Coordinators are the academic staff members of the Department responsible for the organization and operation of WIE activities as well as Industrial Centre Training I and II.

10.4 Programme Review and Development

The Programme Committee will collect and consider, on a regular basis, the views of the students, the graduates, the departmental academic advisor, the staff, the programme team and the Advisory Committee. This will be at intervals not less than once every year. Of particular concern are comments on the relevance and currency of

the syllabi, the standards of the examinations, the level of staff research and consultancy activity, the development of the programme, the adequacy of resources and the local and world wide trends related to electronic and information engineering. Another source of student feedback information for the teaching staff is the University's Student Feedback Questionnaire (SFQ) Exercise. Detailed information about the SFQ exercise is available at the EDC website http://edc.polyu.edu.hk/sfq-student.htm.

11. "REGULAR" STUDENT, "SELF-PACED" STUDENT, AND STUDENT STATUS

11.1 Students' eligibility for the range of services provided by the University will be governed by the students' status.

11.2 Students are normally expected to follow the specified progression pattern. These are referred to as "regular" students. Those students who have been given special approval by the Programme Leader and the Head of Department not to follow the specified pattern are referred to as "self-paced" students.

11.3 Students who register on programmes without any specified progression pattern are also known as self-paced students.

11.4 Self-paced students, either accelerated or decelerated, are required to seek counselling and approval from the Programme Leader and the Head of Department.

Student status:

11.5 Students who enroll on full-time / sandwich programmes paying a fixed annual tuition fee and on mixed-mode programmes with a study load of 9 credits or more in a semester are classified as full-time students.

11.6 Students who enrol on full-time programmes but have been given permission to take less than 9 credits (12 credits for students admitted before 2005/06) in a semester will be given the option to pay credit fees. The credit fee paying students would be classified as part-time students for that semester.

11.7 Students of full-time programmes who do not follow the specified progression pattern strictly, but who will pay the full-time flat fee, will still be recognized as full-time students.

11.8 Students who wish to change from full-time to part-time or from part-time to full-time will have to seek prior approval from Programme Leader and Head of Department before

the end of the add/drop period of that semester. In all cases of change of status, approval of the Department, followed by confirmation by the AS on whether the change of student status is in order, are required.

12. SUBJECT REGISTRATION (INCLUDING ADD / DROP / WITHDRAWAL OF SUBJECTS)

12.1 In addition to programme registration, students need to register for the subjects at specified periods prior to the commencement of the semester. An add/drop period will also be scheduled for each semester/term. Students are not allowed to drop subjects after the add/drop period. Requests for dropping of subjects after the add/drop period will only be considered under extenuating circumstances and, if approved, will be regarded as subject withdrawal. Requests submitted after the commencement of the examination period will not be considered. 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.

12.2 Students may register subjects for the following semester with reference to the subject results decided by the Subject Assessment Review Panel.

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

12.4 Subject to the maximum study load of 21 credits (as from 2005/06 cohort of intakes) per semester and the availability of study places, students are allowed to take additional subjects on top of the prescribed credit requirement for award before graduation. For students of full-time programmes, they can take additional subjects from within or outside their programme curriculum.

13. ZERO SUBJECT ENROLMENT

No students will be allowed to take zero subject in any semester unless they have obtained prior approval from the Programme Leader and the Head of Department and in any case not later than the end of the add/drop period; otherwise they will be classified as having unofficially

withdrawn from their programme. Students who have been approved for zero subject enrolment (i.e. taking zero subject in a semester) are allowed to retain their student status and continue using campus facilities and library facilities. Any semester in which the students are allowed to take zero subject will nevertheless be counted towards the maximum period of registration.

14. SUBJECT EXEMPTION

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

15. CREDIT TRANSFER

15.1 Students may be given credits for recognised previous study (including mandatory language or general education subjects) and the credits will be counted towards meeting the requirements of the award. Transferred credits may be counted towards more than one award. Credit transfer may be done with the grade carried or without the grade carried; the former should normally be used when the credits were gained from PolyU. Credit transfer with the grade carried may be granted for subjects taken from outside the University, if deemed appropriate, and with due consideration to the academic equivalence of the subjects concerned and the comparability of the grading systems adopted by the University and the other approved institutions. Subject credit transfer is normally decided by the subject offering department (for "Broadening" GE subjects, the decision will be made by the programme hosting department). However, for applications which are submitted by students who have completed an approved

student exchange programme, the decision will be made by the host department in consultation with the subject offering departments. In case of disagreement between the host department and the subject offering department, the two Faculty Deans/School Board Chairman concerned will make a final decision jointly on the application.

15.2 If a particular stage of study of a student is waived on the basis of advanced qualifications held at the time of admission, the student concerned will be required to complete fewer credits for award.

15.3 Normally, not more than 50% of the normal credit requirement for the academic award may be transferable from approved institutions outside the University. For transfer of credits from programmes offered by PolyU, normally not more than 67% of the normal credit requirement for the award can be transferred. For students required to complete fewer credits for award, the exempted credits will be counted as part of the transferred credits of the normal credit requirement for award.

15.4 In the cases where both types of credits are transferred (i.e. from programmes offered by PolyU and from approved institutions outside the University), not more than 50% of the normal credit requirement for the academic award may be transferred.

15.5 The granting of credit transfer is a matter of academic judgement. In assessing the transferability of subjects previously taken, the syllabus of that subject should be carefully scrutinized to ascertain that it is comparable to the PolyU curriculum. Whether the previous study is from institutions on credit-based or non-credit-based system should not be a concern. Subject size needs not be a perfect match. To ascertain the academic standing of the institution offering the previous study, the Department might need to request the institutions concerned to provide more relevant information.

15.6 Subject offering departments (or the programme hosting department for “Broadening” GE subjects or the programme hosting department in consultation with the subject offering departments for applications which are submitted by students who have completed an approved student exchange programme) should be responsible for assessing the transferability of credits. As the application for credit transfer may involve subjects offered by more than one department, the host department should coordinate and check whether the maximum limit for credit transfer for a student has been exceeded and whether the student has fulfilled the residential requirement.

15.7 Credit transfer can be applicable to credits earned by students through study at an overseas institution and under an approved exchange programme. Students should, before they go abroad for the exchange programme, seek prior approval from the host

department (who will consult the subject offering departments as appropriate) on their study plan and credit transferability. As with all other credit transfer applications, the departments concerned should scrutinise the syllabuses of the subjects which the students are going to take at the overseas institution, and determine their credit transferability based on academic equivalence with the corresponding subjects on offer at the PolyU, and the comparability of the grading systems adopted by PolyU and the overseas institution. The transferability of credits and the suitability for allowing grades to be carried must be determined and communicated to students before they go abroad for the exchange programme. Credits thus approved for transfer will count towards the PolyU award requirement. In order to overcome the problems associated with subject-to-subject mappings and the preparation of student transcripts, this can be done on the basis of a block credit transfer rather than on a subject-by-subject basis. If the transferred credits are part of a PolyU programme which is accredited by a professional body, the department concerned should ensure that the transferred credits will also meet the requirement of the relevant professional body. Students may be given credit transfer above the existing University upper limit, subject to their satisfying the residential requirement for completing at least 1/3 of the normal credit requirement for the award under the current enrolment at PolyU.

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

16. DEFERMENT OF STUDY

Deferment of study is applicable to those who have a genuine need to extend the maximum period of registration. Approval from the Programme Leader and the Head of Department is required. The deferment period will not be counted as part of the maximum period of registration.

17. PRINCIPLES OF ASSESSMENT

17.1 The prime purpose of assessment is to enable students to demonstrate that they have met the aims and objectives of the academic 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. The assessment methods will also allow discrimination between the performance of students in each subject.

17.2 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.

17.3 The ultimate authority in the University for the confirmation of academic decisions is the Senate, but for practical reasons, the Senate has delegated to the Faculty/School Boards the authority to confirm the decisions of Boards of Examiners provided these are made within the framework of the general assessment regulations within the University. Recommendations from Board of Examiners which fall outside these regulations shall be ratified by VP(AD) and reported to the Senate.

18. ASSESSMENT METHODS

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

18.2 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 shall be determined and assessed separately.

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

18.4 At the beginning of each semester, the subject teacher should inform students of the details of the methods of assessments to be used within the assessment framework as specified in the definitive programme document.

19. SUBJECT ASSESSMENT REVIEW PANEL (SARP)

SARP consists of the Head of the Department (as Chairman), the Programme Leader and the relevant subject examiners. SARP is responsible for monitoring the academic standard and quality of subjects and ratifying of subject grades. The Panel will review the distribution of grades within a subject and finalize the grades at the end of each semester/term before submission to the Board of Examiners. The Board of Examiners will not attempt to change any grades.

20. BOARD OF EXAMINERS (BoE)

20.1 The BoE will meet 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) and is responsible to the Senate for making:

(i) a decision on the classification of awards to be granted to each student on completion of the programme;

(ii) a decision on deregistration cases; and

(iii) a decision on cases with extenuating circumstance.

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

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

20.4 Any decisions by the BoE outside the general assessment regulations of the University, supported by the Faculty Board, shall be referred to VP(AD) for ratification. All such cases shall be reported to the Senate. Decisions by BoE outside the programme regulations but within the general assessment regulations of the University fall within the authority of the Faculty Board.

20.5 Students shall be formally notified of decisions affecting them after the BoE meeting except for those cases which require ratification of the Faculty Board. These latter students shall be formally notified of decisions after the Faculty Board's ratification or, if a decision is outside the general assessment regulations, after VP(AD) ratifies that decision. Any prior communication of results to these students shall be subject to formal ratification.

21. PROGRESSION / ACADEMIC PROBATION / DEREGISTRATION

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

21.2 When a student has a Grade Point Average (GPA) (see Section 24.3 below) lower than 2.0, he/she will be put on academic probation in the following semester. Once when a student is able to pull his 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 transcript of studies.

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

(i) the student has exceeded the maximum period of registration for that programme as specified in the definitive programme document; or

(ii) the student's GPA is lower than 2.0 for two consecutive semesters and his Semester GPA in the second semester is also lower than 2.0; or

(iii) the student's GPA is lower than 2.0 for three consecutive semesters.

21.4 The progression of students to the following academic year will not be affected by the GPA obtained in Summer Term, unless the programme enrolled falls into the category described in Section 21.5 below and otherwise specified in the definitive programme document.

21.5 Exceptions to Section 21.4 above could only be made if the Summer Term study is mandatory for all students of the programme and that the study constitutes a substantial requirement for graduation.

21.6 Notwithstanding Sections 21.3(ii) and 21.3(iii) above, a student may be deregistered from the programme enrolled before the time specified in Sections 21.3(ii) and 21.3(iii) above if his academic performance is poor to the extent that the Board of Examiners deems that his chance of attaining a GPA of 2.0 at the end of the programme is slim or impossible.

22. RETAKING OF SUBJECTS

22.1 Normally, students may retake only those subjects for which they have failed, i.e. obtained an F grade.

22.2 Students are not allowed to retake subjects for which they have passed with grade C or above. Retaking of a subject which has been passed at grade D or D+ will require the approval of the Programme Leader.

22.3 The number of retakes of a failed subject is not restricted. Only the grade obtained in the final attempt of retaking will be included in the calculation of the Grade Point Average (GPA). (The grades obtained in previous attempts will only be reflected in transcript of studies.)

22.4 Section 22.3 above applies to the retake of the same subject only, and in cases where a student takes another subject to replace a failed subject, the fail grade will be retained and taken into account in the calculation of the GPA, despite the passing of another subject.

23. EXCEPTIONAL CIRCUMSTANCES

Absence from an assessment component

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

Aegrotat award

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

Board will determine whether the student will be granted an aegrotat award. Aegrotat award will be granted under very exceptional circumstances.

23.3 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.

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

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

Other particular circumstances

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

24. GRADING

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

Subject grade	***Short description***	***Elaboration on subject grading description***
A+	Excellent	The student's work is outstanding. It exceeds the subject learning outcomes in all regards.
A		The student's work is excellent. It exceeds the subject learning outcomes in nearly all regards.
B+	Good	The student's work is very good. It exceeds the subject learning outcomes in the majority of regards.
B		The student's work is good. It exceeds the subject learning outcomes in some regards.
C+	Satisfactory	The student's work is wholly satisfactory. It fully meets all the subject learning outcomes.
C		The student's work is satisfactory. It largely meets all the subject learning outcomes.
D+	Marginal	The student's work is barely adequate. It fails marginally to meet all the subject learning outcomes.
D		The student's work is weak. It fails to meet the subject learning outcomes in some regards.
F	Failure	The student's work is inadequate. It fails to meet most of the subject learning outcomes.

'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.

24.2 A numeral grade point is assigned to each subject grade, as follows:

Grade	***Grade Point***
A+	4.5
A	4
B+	3.5
B	3
C+	2.5
C	2
D+	1.5
D	1
F	0

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

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

where n = number of all subjects as listed in Table 4.1 under the respective mode of study (inclusive of failed subjects) taken by the student up to and including the latest semester/term, but for subjects which have been retaken, only the grade obtained in the final attempt will be included in the GPA calculation.

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

(i) Exempted subjects
(ii) Ungraded subjects
(iii) Incomplete subjects
(iv) Subjects for which credit transfer has been approved without any grade assigned
(v) Subjects from which a student has been allowed to withdraw (i.e. those with the grade 'W')

Subject which has been given an "S" subject code, i.e. absent from examination, will be included in the GPA calculation and will be counted as "zero" grade point. GPA is thus the unweighted cumulative average calculated for a student, for all relevant subjects taken from the start of the programme to a particular reference point of time. GPA is an indicator of overall performance and is capped at 4.0.

25. REQUIREMENTS FOR BENG(HONS) IN EIE AWARD AND BSC(HONS) IN EP AWARD

For students entering the programme via the local Advanced Level examination system, they will pursue a 3-year study in Year 1, Year 2 and Year 3. For these students, the requirements for BEng(Hons) in EIE and BSc(Hons) in EP awards are specified in the following Sections 25.1 to 25.8. For students entering the programme form Chinese Mainland or countries which have an education system different from the current Hong Kong system, they will have to pursue a 4-year curriculum in this programme. They will have to satisfy the 30 credits requirement as specified in the Foundation-Year curriculum in addition to the requirements as stated in Sections 25.1 to 25.8 below in order to be eligible for the BEng(Hons) in EIE and BSc(Hons) in EP awards.

25.1 Under the Full-time, CES, and Sandwich mode, a student would be eligible for the BEng(Hons) in EIE award if he/she satisfies all the conditions listed below:

(i) Obtains a total of 90 academic credits composed of the following:
  (a) 69 credits from the subjects in the COM Category in Table 4.1.
  (b) 15 credits from the subjects in the ELE Category in Table 4.1.
  (c) 4 credits from the subjects in the GEC Category in Table 4.1.
  (d) 2 credits from the subjects in the ELC Category in Table 4.1.

(ii) Obtains a total 13 credits in the TRN Category in Table 4.1.

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

(iv) Obtains at least 1 WIE credit as set out in Section 8.2. If the student studies under the CES mode, he/she must pass the subject EIE387. If the student studies under the Sandwich mode, he/she must pass the subject EIE388.

(v) Fulfills the requirement of co-curricular activities as set out in Section 9.

(vi) Achieves a GPA of 2.0 or above.

(vii) Fulfills the University language requirements as set out in Section 4.2.

25.2 Under the Double Degree and Double Degree Sandwich mode, a student would be eligible for the BEng(Hons) in EIE award if he/she satisfies all the conditions listed below:

(i) Obtains a total of 90 academic credits composed of the following:
  (a) 69 credits from the subjects in the COM* Category in Table 4.1.
  (b) 15 credits from the subjects in the ELE* Category in Table 4.1.
  (c) 4 credits from the subjects in the GEC Category in Table 4.1.
  (d) 2 credits from the subjects in the ELC Category in Table 4.1.

(ii) Obtains a total of 13 credits in the TRN Category in Table 4.1.

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

(iv) Obtains at least 1 WIE credit as set out in Section 8.2. If the student studies under the Double Degree Sandwich mode, he/she must pass the subject EIE388.

(v) Fulfills the requirement of co-curricular activities as set out in Section 9.

(vi) Achieves a GPA of 2.0 or above.

(vii) Fulfills the University language requirements as set out in Section 4.2.

25.3 Under the Double Degree and Double Degree Sandwich mode, a student would be eligible for the BSc(Hons) in EP award if he/she satisfies all the conditions listed below:

(i) Obtains a total of 90 academic credits composed of the following:
  (a) 78 credits from the subjects in the COM# Category in Table 4.1.
  (b) 6 credits from the subjects in the ELE# Category in Table 4.1.
  (c) 4 credits from the subjects in the GEC Category in Table 4.1.
  (d) 2 credits from the subjects in the ELC Category in Table 4.1.

(ii) Obtains a total of 9 credits in the TRN Category in Table 4.1.

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

(iv) Obtains at least 1 WIE credit as set out in Section 8.2. If the student studies under the Double Degree Sandwich mode, he/she must pass the subject EIE388.

(v) Fulfills the requirement of co-curricular activities as set out in Section 9.

(vi) Achieves a GPA of 2.0 or above.

(vii) Fulfills the University language requirements as set out in Section 4.2.

25.4 Under the Full-time, CES, and Sandwich mode, a student is required to graduate as soon as he/she satisfies all the conditions for award as set out in Section 25.1 above.

25.5 Under the Double Degree and Double Degree Sandwich mode, a student is required to graduate as soon as he/she satisfies all the conditions for the two award as set out in Sections 25.2 and 25.3 above.

25.6 Under the Double Degree and Double Degree Sandwich mode, a student will be eligible for the BEng(Hons) in EIE award or the BSc(Hons) in EP award as soon as he/she satisfies all the conditions for award as set out in Section 25.2 or 25.3 above, even though the requirements for the other award have not yet been met.

25.7 Subject to the maximum study load of 21 credits per semester, a student may take more credits than he/she needs to graduate up to a maximum of 9 credits on top of the prescribed credit requirements for his/her award in or before the semester within which he/she becomes eligible for award.

25.8 Students graduating under the Double Degree or Double Degree Sandwich mode will receive two award parchments which will be issued upon completion of the second degree. Students should claim for the degree completed if they decide not to continue with the second degree.

26. GUIDELINES FOR AWARD CLASSIFICATION

26.1 The guidelines for award classification of BEng(Hons) in EIE and BSc(Hons) in EP are stated in the following. In using these guidelines, the respective 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.

26.2 This programme uses Weighted GPA as a guide for helping to determine award classifications. Subjects studied in Foundation Year will not be counted towards the Weighted GPA. Only subjects contained in the Year 1, Year 2, and Year 3 curricula will be counted towards the Weighted GPA.

(i) BEng(Hons) in EIE award under the Full-time, Sandwich, CES, Double Degree and Double Degree Sandwich modes.

Weighted GPA will be computed as follows:

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

where W_i = 0.2 for all level 2 subjects, and
W_i = 0.4 for all Level 3 and Level 4 subjects.
n = number of all subjects counted towards the award as listed in Table 4.1 under the respective mode of study according to the Specified Progression Pattern (Section 5) (inclusive of failed subjects) taken by the student up to and including the latest semester/term, but for subjects which have been retaken, only the grade obtained in the final attempt will be included in the GPA calculation except those exclusions specified in Section 26.3.

Same as GPA, Weighted GPA is capped at 4.0.

(ii) BSc(Hons) in EP award under the Double Degree and Double Degree sandwich mode.

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

where W_i = 0.18 for all level 2 subjects, and
W_i = 0.27 for all Level 3 subjects, and
W_i = 0.55 for all Level 4 subjects.
n = number of all subjects counted towards the award as listed in Table 4.1 under the respective mode of study according to the Specified Progression Pattern (Section 5) (inclusive of failed subjects) taken by the student up to and including the latest semester/term, but for subjects which have been retaken, only the grade obtained in the final attempt will be included in the GPA calculation except those exclusions specified in Section 26.3.

Same as GPA, Weighted GPA is capped at 4.0.

26.3 Any subjects passed after the graduation requirement has been met or subjects taken on top of the prescribed credit requirements for award shall not be taken into account in the grade point calculation for award classification. However, if a student attempts more elective subjects (or optional subjects) than the requirement for graduation in or before the semester within which he/she becomes eligible for award, the elective subjects (or optional 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 calculation for award classification (i.e. the subjects attempted with lower contribution will be excluded from the grade point calculation for award classification), irrespective of when the excessive elective subjects (or optional subjects) are enrolled.

26.4 The followings are guidelines for Board for Examiners' reference in determining award classifications:

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

26.5 A Pass-without-Honours degree award will be recommended only under exceptional circumstances, when the student has demonstrated a level of final attainment which is below the 'essential minimum' required for graduation with Honours from the programme in question, but when he has nonetheless covered the prescribed work of the programme in an adequate fashion, while failing to show sufficient evidence of the intellectual calibre expected of Honours degree graduates. For example, if a student in an Honours degree programme has a Grade Point Average (GPA) of 2.0 or more, but his Weighted GPA is less than 2.0, he may be considered for a Pass-without-Honours classification.

26.6 The following is a set of indicators, for Board of Examiners' reference, which can be used in helping to determine award classification:

Award Classification	***Weighted GPA***
1st	3.7^{+} - 4
2nd (Division I)	3.2^{+} - 3.7^{-}
2nd (Division II)	2.3^{+} - 3.2^{-}
3rd	2.0 - 2.3^{-}

26.7 There is no requirement for the Board of Examiners to produce an award list which conforms to the guidelines in Section 26.6 above.

26.8 The honours classification of the two degrees for any student enrolled on double degree programmes need not be identical.

27. Major in Electronic and Information Engineering

27.1 Eligibility

Students will be invited in their first year of registration to indicate an irrevocable option of whether to follow a major/minor route or to continue with the single-discipline degree.

27.2 Professional Recognition

Students taking major/minor programmes may not satisfy the academic requirements for Corporate Membership of the Hong Kong Institution of Engineers (HKIE).

27.3 Major in Electronic and Information Engineering

Programme requirement

To major in EIE and minor in another discipline, a student must obtain the following:

- 41 credits from the subjects in the COM under Major Category in Table 4.1.
- 24 credits from the subjects in the ELE under Major Category in Table 4.1.
- 4 credits from the subjects in the GEC under Major Category in Table 4.1.
- 2 credits from the subjects in the ELC under Major Category in Table 4.1.

- 13 credits in the TRN under Major Category in Table 4.1.
- at least 1 WIE credit as set out in Section 8.2.

and

- fulfills the requirement of co-curricular activities as set out in Section 9.
- achieves a GPA of 2.0 or above.
- Fulfills the University Language requirement as set out in Section 4.2.

27.4 Progression Pattern

If the students choose to follow the major/minor route of study, the students will basically follow the progression pattern of either the Full-time mode or the Double Degree mode when selecting the subjects to study in Year 1, Year 2 and Year 3. In this regard, the students must consult the Programme Leader in choosing the subjects to study in a particular stage.

27.5 Eligibility for Award

Students taking the major/minor route will be considered for an award when they have satisfied the requirements for the major and minor studies and have also submitted an application for graduation. If the 18 credits (21 credits for students admitted before 2005/06) taken for the minor study meet the requirements for a specific minor, the major students may apply to graduate with a specific minor, in addition to their major. If the 18 credits (21 credits for students admitted before 2005/06) taken are a free collection of electives in any combination of disciplines in conjunction with a major programme, these students will graduate with a major only. For the minor credits, at least 9 credits must be level 3 or above.

27.6 Guidelines for Award Classification (Major / Minor Programme)

(i) For students who have completed a major and a minor programme or a major programme combined with free electives, their award classification will be based on both their “Major GPA” and “Minor GPA”.

(ii) "Major GPA" is derived based on the subjects as set out in the COM#, ELE#, GEC, and ELC Categories in Table 4.1.

(iii) The "Major GPA" will be Weighted GPA to be derived by a mechanism same as that for the Weighted GPA for award classifications of students on the single-discipline degree (see Sections 26.1 to 26.3 above).

(iv) "Minor GPA" is derived based on the 18 credits (21 credits for students admitted before 2005/06) of minor study (either a specific minor or free combination of electives). "Minor GPA" will be unweighted.

(v) The "Major GPA" and the "Minor GPA" will be presented separately to the Board of Examiners for consideration. The guidelines for determining award classification as stipulated in Sections 26.4 to 26.7 are applicable to programmes with major/minor studies.

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

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

28. Minor in Engineering Physics

To minor in EP under the Double Degree or Double Degree Sandwich mode of study, a student must obtain at least 18 credits from the subjects listed in Table 4.1 under Minor in EP Category according to the following composition:

(i) at least 6 credits from the group label with (1).
(ii) at least 6 credits from the group label with (2).
(iii) at least 6 credits from the group label with (3).

29. APPEAL AGAINST ASSESSMENT RESULTS

A student may appeal against a decision of a Subject Assessment Review Panel or the Board of Examiners within 5 working days upon the public announcement of the examination results. The procedures for appeals against examination results are detailed in the Student Handbook.

30. SYLLABI

(Please see pages 55 to 157)

Remarks: For details about subject syllabi under the Engineering Physics programme, please refer to the corresponding programme booklet published by the Department of Applied Physics, or the URL: http://ap.polyu.edu.hk/main/APProgrammes.htm

SUBJECT DESCRIPTION FORM

Subject Title:	Hong Kong Business Environment	**Subject Code:**	AF1602
Number of Credits:	3	**Hours Assigned:**	Lecture 28 hours Tutorial 14 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

Building on the foundation study in the working of Hong Kong being a modern city economy, this subject aims to introduce the essentials of the economy of Hong Kong which are basic to the study of the system and the territory' s business environment.

Learning Outcomes:

On successful completion of this subject, students are expected to be able to:

1. Gain an awareness of the social and economic structures of Hong Kong.
2. Appraise the business environment in Hong Kong on economic, financial and government issues.
3. Acquire the basic knowledge to evaluate the major policies implemented by the Hong Kong Government.

Keyword Syllabus:

1. Economic Setting
   Growth and industrialization, economic structure, economic system.
2. Social Structure
   Community, prosperity and stability, income and inequality.
3. Market Environment
   Competition and competition policy, monopolies, conglomerates, public firms.
4. Trade and Financial Sector
   External trade, international financial centre, money and banking system.
5. Labour and Employment
   Employment, labour resources and Hong Kong' s competitiveness, labour relations.
6. Government and Politics
   Government and administration, executive council, legislative council.
7. Hong Kong – China Mainland Integration
   Economic integration and synergy effects, trade and investment, factor mobility.

Teaching and Learning Approach:

Concepts and basic issues are introduced through lectures. During seminars, students are required to review various business issues through class presentations and discussion. Other coursework assessment tools include in-class exercises and mid-term tests to develop students' analytical, teamwork and communication skills.

Method of Assessment:

Continuous Assessment: 50% Examination: 50%

Essential Reading:

1. S.K. Ng and D. Lethbridge (eds.), *The Business Environment in Hong Kong*, Oxford University Press, 2000.

Reference List:

1. Li, Kui-wai. *The Hong Kong Economy: From Recovery to Restructure*. McGraw-Hill, 2006.

SUBJECT DESCRIPTION FORM

Subject Title:	Foundation Mathematics I for Science and Engineering	**Subject Code:**	AMA103
Number of Credits:	3	**Hours Assigned:**	Lecture 28 hours Tutorial and Student Presentation 14 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

This is a subject to provide students with a solid foundation in Differential and Integral Calculus. It is essential for all undergraduate students of Engineering or Science. The emphasis will be on application of mathematical methods to solving basic engineering science problems.

Learning Outcomes:

On successful completion of this subject, students are expected to be able to:

1. understand the concept of functions and inverse functions;
2. use mathematical induction in various contexts;
3. understand the algebra and geometry of complex numbers and apply complex numbers to solve science and engineering problems;
4. apply mathematical reasoning to analyse essential features of different mathematical problems such as differentiation and integration;
5. apply appropriate mathematical techniques to model and solve problems in science and engineering;
6. extend their knowledge of mathematical techniques and adapt known solutions in different situations;
7. undertake continuous learning.

Keyword Syllabus:

1. Basic Concepts
   Mathematical induction; Functions and inverse functions; Elementary functions, trigonometric functions; Complex numbers; De Moivre' s Theorem; Roots of a complex number.
2. Differential Calculus
   Limits and continuity; Derivatives; Techniques of differentiation; Mean value Theorem; Higher derivatives; Maxima and minima; Curve sketching.
3. Integral Calculus
   Definite and indefinite integrals; Fundamental Theorem of Calculus; Techniques of integration; Taylor' s Theorem; Applications in geometry, physics and engineering.

Teaching and Learning Approach:

The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. To develop students' ability for logical thinking and effective communication, tutorial and presentation sessions will be held.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

To ensure that students learn and reflect continuously, Continuous Assessment is an important element. The continuous assessment comprises of assignments, in-class quizzes and tests. The assignments are used to assist the students to reflect and review on their progress. The end-of-semester examination is used to assess the knowledge acquired by the students and their ability to apply and extend such knowledge.

Reference List:

1. D. Varberg, E.J. Purcell and S.E. Rigdon, *Calculus*, 8th edition. Prentice-Hall, 2000.
2. Dept. of Applied Math., *Foundation Mathematics*, HK PolyU, 2004
3. F.R. Giordano, M.D. Weir and R.L. Finney, *Calculus for Engineers and Scientists*, Addison-Wesley, 1988.

SUBJECT DESCRIPTION FORM

Subject Title:	Foundation Mathematics II for Science and Engineering	**Subject Code:**	AMA104
Number of Credits:	3	**Hours Assigned:**	Lecture 28 hours Tutorial and Student Presentation 14 hours

Pre-requisite:	Foundation Mathematics I for Science and Engineering (AMA103)	**Co-requisite:**	nil	**Exclusion:**	nil

Objectives:

This is a subject to provide students with a solid foundation in Mathematics and Statistics. It aims to prepare the students for studying an undergraduate programme in Engineering or Science. The emphasis will be on application of mathematical methods to solving basic engineering science problems.

Learning Outcomes:

On successful completion of this subject, students are expected to be able to:

1. understand the concepts of convergence and divergence of series and to apply Taylor's expansions in solving numerical problems;
2. use the methods in matrices and linear equations in problem solving;
3. apply the techniques of statistics to model and solve problems in science and engineering;
4. undertake continuous learning.

Keyword Syllabus:

1. Infinite Series
   Convergence of series, including tests for convergence; power series; Taylor expansions of functions; applications.
2. Linear Algebra
   Matrices and determinants; Systems of linear equations.
3. Probability and Statistics:
   Descriptive statistics; Frequency distribution; Mean, median and mode; Variance and standard deviation; Probability; Discrete and continuous random variables; Normal distribution; Sampling; Hypotheses testing and estimations.

Teaching and Learning Approach:

The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. To develop students' ability for logical thinking and effective communication, tutorial and presentation sessions will be held.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

To ensure that students learn and reflect continuously, Continuous Assessment is an important element. The continuous assessment comprises of assignments, in-class quizzes and tests. The assignments are used to assist the students to reflect and review on their progress. The end-of-semester examination is used to assess the knowledge acquired by the students and their ability to apply and extend such knowledge.

Reference List:

1. R.E. Walpole & R.H. Myers, S.L. Myers & K.Y. Ye, *Probability and Statistics for Engineers and Scientists*. 7th ed., Prentice-Hall, 2002.
2. Dept. of Applied Math., *Foundation Mathematics*, 2nd ed., HK PolyU, 2004.
3. F.R. Giordano, M.D. Weir and R.L. Finney, *Calculus for Engineers and Scientists*, Addison-Wesley, 1988.

SUBJECT DESCRIPTION FORM

Subject Title:	Logic : Qualitative and Quantitative	**Subject Code:**	AMA105
Number of Credits:	3	**Hours Assigned:**	Lecture 28 hours Tutorial 14 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

This subject aims to develop students' ability in logical and analytical thinking through the qualitative and quantitative aspects of logic. The first part will emphasize qualitative logic and will be taught by the General Education Centre. The second part will emphasize quantitative logic. Some topics from discrete mathematics will be presented as illustrations of the general theory. This part will be taught by the Department of Applied Mathematics.

Learning Outcomes:

On successful completion of this subject, students are expected to be able to demonstrate some ability to:

1. demonstrate basic logical reasoning.
2. see the relationship between formal logic and natural language.
3. apply logical reasoning in both everyday and academic situations.
4. recognize and refute common logical fallacies.
5. appreciate the axiomatic approach in mathematics.
6. understand why proofs of mathematical statements work
7. apply logical reasoning in problem solving.

Keyword Syllabus:

1. Qualitative Logic
   Introduction_What is Logic? Logic Puzzles. Some Basic Concepts and Logical Relations. Propositional Logic. Syllogistic Logic. Inductive Reasoning. Some Common Informal Fallacies.
2. Quantitative Logic
   Sets and propositions; Permutations and combinations; Relations and Functions; Graphs and Trees; Natural Numbers.

Teaching and Learning Approach:

Introduction to the key concepts and relationships of formal logic will be done primarily through lectures. Examples and case studies will be presented in small group tutorials. Finally, self-study will be encouraged through student accessible computer-based exercises. Assessment will be in the form of both in-class mid-term tests as well as group projects associated with tutorials.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

The continuous assessment comprises of assignments, in-class quizzes and tests. The assignments are used to assist the students to reflect and review on their progress. The end-of-semester examination is used to assess the knowledge acquired by the students and their ability to apply and extend such knowledge.

Reference List:

1. Harry Gensler, *Introduction to Logic*, Routledge, New York, 2002.
2. Alec Fisher, *Critical Thinking*, OUP, Cambridge, 2001.
3. I.M. Copi and C. Cohen, *Introduction to Logic*, 10th ed., Macmillan, New York, 1998.
4. D.L. Johnson, *Elements of Logic via Numbers and Sets*, Springer, 1998.
5. Patrick J. Hurley, *A Concise Introduction to Logic*, Wadsworth Publishing Co., Belmont, 1988.
6. Samuel Guttenplan, *The Languages of Logic: An introduction to formal logic*, Basil Blackwell, Oxford, 1986.
7. W.C. Salmon, *Logic*, 3rd ed., Prentice-Hall, Englewood Cliffs, 1984.
8. Wilfred Hodges, *Logic*, Harmondsworth, 1977.
9. C.L. Liu, *Elements of Discrete Mathematics*, McGraw-Hill, 1985.
10. A. Cupillari, *The Nuts and Bolts of Proofs*, Academic Press, 2001.

SUBJECT DESCRIPTION FORM

Subject Title: College Physics I

Subject Code: AP101

Number of Credits: 3

Hours Assigned:

Classroom teaching and laboratory experiments

Lecture	28 hours
Tutorial	6 hours
Laboratory	8 hours

Multimedia teaching/learning and other activities

Virtual Laboratory	12 hours
Self-study	60 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

This is the first bridging course in physics of the Foundation Programme for students admitted from mainland. It provides a broad foundation in mechanics and thermal physics, preparing students to study science, engineering, or related programmes.

Learning Outcomes:

On successful completion of this subject, students are expected to be able to:

1. solve simple problems in mechanics using vector method;
2. solve problems on rotation of rigid body about fixed axis;
3. define simple harmonic motion and solve simple problems;
4. apply Archimedes' principle to solve problems in hydrodynamics;
5. apply Bernoulli' s equation to simple problems in fluid flow;
6. explain ideal gas laws in terms of kinetic theory;
7. apply the first law of thermodynamics to simple processes; and
8. solve simple problems related to the Carnot cycle.

Keyword Syllabus:

1. Preparation in Mathematics
   Review of algebra, geometry and trigonometry; Function and graph; Derivative; Integration; Vectors and coordinate system.

2. Mechanics
   Measurement of space, time and mass; Kinematics; Dynamics and Newton' s laws; Force and motion; Impulse and momentum; Work and energy; Conservation of energy; Gravitation field and gravitation acceleration; Systems of particles; Collisions; Rigid body; Rotation; Angular momentum; scillations and simple harmonic motion; Pendulum; Statics and elasticity; Hydrostatics and Archimedes' principle; Bernoulli' s equation.

3. Thermal Physics
   Conduction, convection and radiation; Black body radiation and energy quantization; Ideal gas and kinetic theory; Work, heat and internal energy; First law of thermodynamics; Entropy and the second law of thermodynamics; Carnot cycle; Heat engine and refrigerators.

Teaching and Learning Approach:

1. Lectures are given to deliver the subject outline and key physics concepts to the students. The students will also get the guidance on further reading.
2. Tutorials are provided to help the students gain analytical abilities through problem-solving strategy and also help them strengthen the concepts taught.
3. Laboratories are designed to help the students gain hands-on experience in the operation of equipment and apply their knowledge in the experiments.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

Essential Reading and CD-ROM:

1. Giancoli, *Physics for Scientists and Engineers,* 3rd ed., Prentice-Hall, 2000.
2. *Physics CAI* in CD-ROM, USTC, 2000.
3. *Computer Simulation System for College Physics Experiment*, Version 2.0 for Windows, USTC, 2000.

Reference List:

1. Halliday, Resnick and Walker, *Fundamentals of Physics,* 7th ed., Wiley. 2005.
2. Young and Freedman, *University Physics,* 11th ed., Pearson, 2004.
3. Knight, *Physics for Scientists and Engineers with Modern Physics*, Pearson, 2004.
4. Giambattista, Richardson and Richardson, *College Physics,* 2nd ed., MaGraw-Hill, 2007.
5. Jewett and Serway, Serway' s , *Principles of Physics*, 4th ed., Thomson, 2006.

SUBJECT DESCRIPTION FORM

Subject Title: College Physics II

Subject Code: AP102

Number of Credits: 3

Hours Assigned:

Classroom teaching and laboratory experiments

Lecture	28 hours
Tutorial	6 hours
Laboratory	8 hours

Multimedia teaching/learning and other activities

Virtual Laboratory	12 hours
Self-study	60 hours

Pre-requisite: College Physics I (AP101) **Co-requisite:** nil **Exclusion:** nil

Objectives:

This is the second bridging course in physics of the Foundation Programme for students admitted from mainland. It is built on College Physics I and continues on topics in wave motion, electromagnetism and modern physics, in preparing students to study science, engineering, or related programmes.

Learning Outcomes:

On successful completion of this subject, students are expected to be able to:

1. use Doppler' s effect to explain changes in frequency received;
2. apply simple laws in optics to explain image formation;
3. explain phenomena related to the wave character of light;
4. define electrostatic field and potential;
5. use Gauss' law in solving problems in electrostatics;
6. solve problems on interaction between current and magnetic field;
7. apply electromagnetic induction to various phenomena;
8. solve simples problems in AC circuits; and
9. describe simple models of the atom and the nucleus.

Keyword Syllabus:

1. Wave Motion
   Longitudinal and transverse waves; traveling wave; Doppler effect; Acoustics; Huygen's principle; Reflection and refraction; Image formation by lenses and mirrors; Compound lens; Microscope and telescope; Superposition of waves; Polarization; Interference and diffraction; Interferometers and diffraction grating; Wave-particle duality.

2. Electromagnetism
   Charge and Field; Coulomb's law and Gauss' law; Electrostatic field and potential difference; Capacitors and dielectrics; Current and resistance; Ohm' s law; Electromotive force, potential difference and RC circuits; Magnetic force on moving charge and current; Hall effect; Faraday' s law and Lenz' s law; Self inductance and mutual inductance; Biot-Savart law and Ampere's law; Types of magnetic materials; AC circuits; Transformers.

3. Modern Physics
   Photons and photoelectric effects; The Bohr model and the hydrogen spectrum; Compton effect; Heisenberg uncertainty principle; Electron spin and Pauli;s exclusion principle; Law of radioactive decay; Equivalence of mass and energy; Nuclear fission and fusion.

Teaching and Learning Approach:

1. Lectures are given to deliver the subject outline and key physics concepts to the students. The students will also get the guidance on further reading.
2. Tutorials are provided to help the students gain analytical abilities through problem-solving strategy and also help them strengthen the concepts taught.
3. Laboratories are designed to help the students gain hands-on experience in the operation of equipment and apply their knowledge in the experiments.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

Essential Reading and CD-ROM:

1. Giancoli, *Physics for Scientists and Engineers,* 3rd ed., Prentice-Hall, 2000.
2. *Physics CAI* in CD-ROM, USTC, 2000.
3. *Computer Simulation System for College Physics Experiment*, Version 2.0 for Windows, USTC, 2000.

Reference List:

1. Halliday, Resnick and Walker, *Fundamentals of Physics,* 7th ed., Wiley. 2005.
2. Young and Freedman, *University Physics,* 11th ed., Pearson, 2004.
3. Knight, *Physics for Scientists and Engineers with Modern Physics*, Pearson, 2004.
4. Giambattista, Richardson and Richardson, *College Physics,* 2nd ed., MaGraw-Hill, 2007.
5. Jewett and Serway, Serway' s , *Principles of Physics*, 4th ed., Thomson, 2006.

SUBJECT DESCRIPTION FORM

Subject Title:	Understanding the Hong Kong Community	**Subject Code:**	APSS184
Number of Credits:	3	**Hours Assigned:**	Lecture 28 hours Seminar 14 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

The subject aims to provide the students with an integrated knowledge required for the understanding and application of sociological concepts to understand the social and cultural development of Hong Kong.

Learning Outcomes:

On successful completion of this subject, students are expected to be able to:

1. describe the historical development of the pre-1841 Hong Kong;
2. understand the social life of the pre-1841 Hong Kong;
3. depict the historical trajectory of the colonial Hong Kong;
4. analyze the social, cultural and political aspect of the colonial Hong Kong;
5. understand the social life of the post-1997 Hong Kong.

Keyword Syllabus:

1. Pre-1841 Hong Kong: Wall Communities and the Form of Living.
2. Visit: Markets at Yuen Long, Fanling and Sheung Shui.
3. Domestic Villages and the Survival Strategies.
4. Visit: Tai O- a fishing Village.
5. 1841: The Coming of the Colonial Hong Kong.
6. Visit: Central and Sheung Wan.
7. The Chinese Communities.
8. Visit: Wan Chai.
9. Post-1950's Hong Kong: the Minimally Integrated Social and Political System.
10. Visit: Hong Kong Museum of History.
11. The Development and the Future of Social Service in Hong Kong.
12. Hands-on Participation in Community Service Project.
13. Modern City Life of Hong Kong: Shopping Malls.
14. Residence Patterns of Hong Kong People: Public Housing and Home Ownership.
15. Landscape of Hong Kong: Disney World, Tourism and Economic Development.
16. Hong Kong's Tomorrow.

Teaching and Learning Approach:

Apart from the lectures, students would participate in outings by which they are introduced to, on the one hand, the historic sites that could exhibit the traditional social lives of Hong Kong people, and on the other the modern landscapes of Hong Kong. In addition, students are arranged to participate in community service projects to reinforce their hands-on understanding in the community. Students are required to attend seven tutorials and present their views on various aspects of the traditional and modern social lives in Hong Kong. Students are encouraged to focus on the cultural and social aspects of Hong Kong society.

Method of Assessment:

Continuous Assessment: 100%

1. mid-term paper on fieldtrips reflection (20%)
2. end-of term paper on social life of HK (35%)
3. participation (seminars/fieldtrips/service) (15%)

4. presentation on service reflection (30%)

Essential Reading:

謝均才（編），*《我們的地方，我們的時間: 香港社會新編》*，香港，牛津大學出版社, 2002.

Reference List:

1. Jeffrey W. Cody and James R. Richardson, *Urbanizing Forest and Village Trees in Hong Kong's Shatin Valley, 1976-1997*, Traditional Dwellings and Settlements Review, 9: 21-33, 1997.
2. Agnes Ku, *Narratives, Politics, and the Public Sphere: Struggles over Political Reform in the Final Transitional Years in Hong Kong (1992-1994)*, Aldershot, Brookfield USA, Ashgate, Chapter 2, pp. 18-48, 1999.
3. Benjamin K.P. Leung, *Perspectives on Hong Kong Society*, Hong Kong: Oxford University Press, 1996.
4. S.K. Lau, et al., *Indicators of Social Development: Hong Kong*, Hong Kong: Hong Kong Chinese University Press, various years.
5. Benjamin K.P. Leung, *Social Issues in Hong Kong*, Hong Kong: Oxford University Press, 1990.
6. *The Other Hong Kong Report*, Hong Kong: Hong Kong Chinese University Press, Various Years.
7. 蔡榮芳,*《香港人之香港史：1841-1945》*，香港，牛津大學出版社, 2001.
8. 王宏志,*《歷史的沉重：從香港看中國大陸的香港史論述》*，香港，牛津大學出版社, 2000.
9. 呂大樂,*《唔該，埋單！》*, "I.故事": 17-46, 1997.
10. 陳冠中,*《香港未完成的實驗》*: 23-30, 2001.
11. 陳填慶編,*《諸神嘉年華: 香港宗教研究》*，香港: 牛津大學出版社, 2002.
12. 潘毅、余麗文（編）,*《書寫城市: 香港的身份與文化》*，香港，牛津大學出版社, 2003.

SUBJECT DESCRIPTION FORM

Subject Title:	Understanding Ethics in Daily Life	**Subject Code:**	APSS186
Number of Credits:	3	**Hours Assigned:**	Lecture 30 hours Seminar 12 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

This subject attempts to help students have an elementary understanding of the significance of moral discussions in their daily lives and in their future professional practices. It also enables the students to apply moral concepts and theories to moral problems that they face in the fast changing modern society.

Learning Outcomes:

On successful completion of this subject, students are expected to be able to:

1. have an elementary understanding of the nature of good life and morality;
2. acquire the basic understanding of the concepts and frameworks pertaining to moral discussions;
3. be aware of the current moral issues in the rapidly changing modern society;
4. understand the basic skills of applying the moral concepts and frameworks to the current moral issues.

Keyword Syllabus:

1. Introduction: the Nature of Good Life
   - What are good life and morality?
   - Can moral discussions provide answers?
   - How to justify moral goods?
2. Concepts, Theories, and Frameworks
   - Are consequences all that matter?
   - Are there absolute moral rules?
   - The ethics of virtue and the ethics of right action
   - The Chinese perspectives
3. Moral Goods and Issues
   - Why should we act morally?
   - Can the end justify the means?
   - Taking life: abortion, euthanasia, and killing
   - Personal values and accountability in work place
   - Economic development and man' s responsibility for nature
   - Should we oppose human cloning?
   - Cyber theft: phishing, hacking, and pirating

Teaching and Learning Approach:

The approach will be comprised of lectures and seminars. Audio and video materials will be used to engage students' interest in the subject. Seminars are conducted in groups of about 20 students. Students are expected to pay their effort to organize presentations and small group discussions in seminars on assigned topics.

Method of Assessment:

Continuous Assessment: 100%

(including (i) group seminar presentation; (ii) individual participation in seminar activities and discussion; (iii) term paper on a selected topic or quiz.)

Essential Reading:

1. James Rachels, *The Elements of Moral Philosophy*, 4th ed., Boston, Mass.: McGraw-Hill College, 2002.

Reference List:

1. B. Almond and D. Hill, eds., *Applied Philosophy: Moral and Metaphysics in Contemporary Debate*, London: Routledge, 1991.
2. Simon Blackburn, *Ethics: A Very Short Introduction*, Oxford: Oxford University Press, 2003.
3. A. Cohen and C. Wellman, eds., *Contemporary Debates in Applied Ethics*, London: Blackwell, 2005.
4. C. McGinn, *Moral Literacy or How to Do the Right Thing*, Indianapolis: Hackett Publishing Company, 1992.
5. P. Singer, eds., *Applied Ethics*, Oxford: Oxford University Press, 1990.
6. P. Singer, eds., *A Companion to Ethics*, Oxford: Blackwell, 1993.
7. J. Teichman, *Social Ethics: A Student's Guide*, Oxford: Blackwell.
8. Jacques P. Thiroux, *Ethics: Theory and Practice*, 8th ed. Upper Saddle River, N.J.: Pearson/ Prentice-Hall, 2004.
9. **謝仲明**, ***《儒家與現代世界》*台北：學生書局**, 1991.
10. **杜維明**, ***《儒家思想》*台北：東大**, 1997.

SUBJECT DESCRIPTION FORM

Subject Title:	English for University Studies I	**Subject Code:**	ELC1004
Number of Credits:	3	**Hours Assigned:**	Seminar 42 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

This subject aims to help students study effectively in an English-medium learning environment and to enhance their proficiency in English. The subject is designed to enable students to use English effectively in the academic contexts they will encounter in their studies. The main emphasis is on improving students' confidence and competence in grammar, vocabulary and pronunciation in these contexts.

Learning Outcomes:

On successful completion of this subject, students are expected to be able to use the language and study skills needed to:

1. deliver effective oral presentations.
2. summarise and paraphrase materials from written and spoken sources.
3. plan, write and revise expository academic essays.

Keyword Syllabus:

This syllabus is indicative. The balance of the components, and the weighting accorded to each, will be based on the specific needs of the students.

1. Spoken Communication
   Developing and practising the research and specific oral skills required to prepare and deliver oral presentations; developing awareness of interpersonal communication strategies in different social contexts.

2. Written Communication
   Analysing and practising functions common in academic writing; understanding common patterns of organisation in academic writing; taking notes from written and spoken sources; introducing paraphrasing, summarising and referencing skills; improving coherence and cohesion in writing; introducing appropriate tone and style in academic writing; developing revision and proofreading skills.

3. Reading and Listening
   Understanding the content and structure of information delivered both orally and in print form; reading and listening for different purposes.

4. Language Development
   Developing relevant grammar, vocabulary and pronunciation skills.

Teaching and Learning Approach:

The study method is primarily seminar-based. Seminar activities will include discussions, role-plays and individual and group activities. Use will be made of information technology where appropriate.

Method of Assessment:

Continuous Assessment: 100%

Reference List:

1. J. Boyle & L. Boyle, *Common Spoken English Errors in Hong Kong*, Hong Kong: Longman, 1998.
2. B. Brannan, *A Writer's Workshop: Crafting Paragraphs, Building Essays*, Boston, Mass.: McGraw-Hill, 2003.
3. *Collins COBUILD English Dictionary for Advanced Learners*, Glasgow: Collins, 2001.
4. J. Eastwood, *Oxford practice grammar*, Oxford: Oxford University Press, 1999.
5. M. Hancock, *English Pronunciation in Use*, Cambridge: Cambridge University Press, 2003.
6. A. Jay and R. Jay, *Effective Presentation,* London: Prentice-Hall, 2000.
7. R. Jordan, *Academic Writing Course*, Harlow: Longman, 1999.
8. M. McCarthy and F. O'Dell, *English Vocabulary in Use: Upper-intermediate*, Cambridge: Cambridge University Press, 2001.
9. A. Oshima and A. Hogue, *Writing Academic English*, New York: Longman, 1991.
10. S. Redman, *English Vocabulary in Use: Pre-intermediate and Intermediate*, Cambridge: Cambridge University Press, 2003.

SUBJECT DESCRIPTION FORM

Subject Title:	English for University Studies II	**Subject Code:**	ELC1005
Number of Credits:	3	**Hours Assigned:**	Seminar 42 hours

Pre-requisite:	English for University Studies I (ELC1004)	**Co-requisite:**	nil	**Exclusion:**	nil

Objectives:

This subject aims to further develop those English language skills required of students to communicate effectively in academic contexts. The subject is designed to enhance the written and spoken communication skills that students will need to function effectively in their university studies. These skills will also be beneficial to their future employment in any organisation where internal and/or external oral communication is conducted in English.

Learning Outcomes:

On successful completion of this subject, students are expected to be able to use the language and study skills needed to:

1. participate effectively in formal and informal discussions.
2. refer to sources in academic essays.
3. plan, write and revise argumentative essays.

Keyword Syllabus:

This syllabus is indicative. The balance of the components, and the weighting accorded to each, will be based on the specific needs of the students.

1. Spoken Communication
   Enhancing and practising the specific oral and aural skills required to participate effectively in formal interactions involving such activities as seminar discussions and debates, as well as in a variety of informal contexts.

2. Written Communication
   Describing and interpreting data; understanding common organisational patterns of academic essays; enhancing referencing skills; improving coherence and cohesion in writing; reinforcing revision and proofreading skills; achieving appropriate tone and style in academic writing.

3. Reading and Listening
   Understanding the content and structure of information delivered both orally and in print form; reading and listening for different purposes.

4. Language Development
   Developing relevant grammar, vocabulary and pronunciation skills.

Teaching and Learning Approach:

The study method is primarily seminar-based. Seminar activities will include discussions, role-plays and individual and group activities. Use will be made of information technology where appropriate.

Method of Assessment:

Continuous Assessment: 100%

Reference List:

1. R. Carter, R. Hughes and M. McCarthy, *Exploring grammar in context: upper-intermediate and advanced*, Cambridge: Cambridge University Press, 2000
2. *Collins COBUILD English dictionary for advanced learners*, Glasgow: Collins, 2001.
3. C.G. Madden and T.N. Rohlck, *Discussion and interaction in the academic community*, Ann Arbor, MI: University of Michigan Press, 1997.
4. M. McCarthy and F. O'Dell, *English vocabulary in use: upper-intermediate*, Cambridge: Cambridge University Press, 2001.
5. M. McCarthy and F. O'Dell, *English vocabulary in use: advanced*, Cambridge: Cambridge University Press, 2002.
6. A. Oshima and A. Hogue, *Writing academic English*, New York: Longman, 1991.
7. A. Oshima and A. Hogue, *Introduction to academic writing*, New York: Longman, 1997.

SUBJECT DESCRIPTION FORM

Subject Title:	Economics for Engineers	**Subject Code:**	AF2617
Number of Credits:	3	**Hours Assigned:**	Lectures 28 hours Tutorials 14 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** Economics for Engineers (AF3901)

Role and Purpose:

This subject aims to provide students with fundamental concepts of economics / finance / costing and to develop students' ability to analyze the economic situations by application of these concepts. It also aims to explain how these concepts can be applied to affect the functioning of an engineering company and contribute to decision making in engineering operations. It provides a foundation for related higher level subjects in economics/finance.

Learning Outcomes:

On successfully completing this subject, students will be able to:

1. Understand the fundamental concepts of microeconomics / finance and costing.
2. Understand the concepts of costs and revenues in global business operation.
3. Develop the ability to understand economic and financial issues in reality.
4. Develop the problem-solving skills to deal with economic and financial problems in reality.
5. Assess the strategies and behaviors of firms operating under various market structures in the global economy.
6. Understand the ethical dimension of business decisions and the social consequences of any business decisions made.

Indicative Contents:

1. Introduction to Microeconomics
   Scarcity, Choice and Opportunity Cost; Demand, Supply and Price; Profit-maximizing Objective of a Firm; Cost and Output of a Firm; Depreciation and Cost.

2. Engineering Economic Decisions
   Engineering Projects: Strategic Engineering Economic Decisions; Short-term Operational Economic Decisions.

3. Time Value of Money and Project Evaluation
   Economic Equivalence and Interest Formulas; Evaluation of Engineering Projects using Methods of Present Value, Annual Worth, and Internal Rate of Return.

4. Capital Budgeting Decision
   Methods of Financing Cost of Capital, and Evaluation of Investment Alternatives.

Teaching/Learning Approach:

There will be a lecture of two hours per week that will be structured to help students to understand engineering economics concepts. Besides, there will be an one-hour tutorial per week, for which students are required to present answers from tutorial questions and discuss relevant cases and examples relating to the subject.

Method of Assessment:

Coursework: 50% Final Examination: 50%

Minimum Pass Grade:	Coursework	(D)
	Examination	(D)

Indicative Reading:

Textbook:

1. Park Chan, *Contemporary Engineering Economics*, 4th ed., Prentice-Hall.
2. Michael Parkin, *Economics*, 7th ed., Addison-Wesley.

Reference Books:

1. William, Sullivan, Wicks Elin and Luxhoj James, *Engineering Economy*, 13rd ed., Prentice-Hall.
2. Mankiw, Gregory, *Principles of Economics*, 2nd ed., Harcourt.
3. Stiglitz, Joseph and Carl Walsh, *Principles of Microeconomics*, 4th ed., W.W. Norton and Company Inc.
4. Landsburg, Steven, *Armchair Economist: Economics And Everyday Experience*, Free Press.

Other Readings:

1. The Economist.
2. Far Eastern Economic Review.
3. Hong Kong Economic Journal.
4. Hong Kong Economic Times.
5. Various newspaper articles.

SUBJECT DESCRIPTION FORM

Subject Title:	Mathematics I	**Subject Code:**	AMA201
Number of Credits:	3	**Hours Assigned:**	Lecture 28 hours Tutorial and Student Presentation 14 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Aims:

The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. To develop students' ability for logical thinking and effective communication, tutorial and presentation sessions will be held.

Learning Outcomes:

The subject aims to introduce the students to some fundamental knowledge of engineering mathematics. The emphasis will be on the application of mathematical methods to solving practical engineering problems.

Upon satisfactory completion of the subject, students are expected to be able to:

1. apply mathematical reasoning to analyse essential features of different engineering problems;
2. extend their knowledge of mathematical and numerical techniques and adapt known solutions to different situations;
3. apply appropriate mathematical techniques to model and solve problems in engineering;
4. develop and extrapolate mathematical concepts in synthesizing and solving new problems;
5. search for useful information in solving problems;
6. undertake continuous learning.

Syllabus:

1. Algebra of Complex Number
   Complex numbers; Geometric representation; n-th roots of complex numbers.
2. Linear Algebra
   Matrices and determinants; Vector space; Elementary algebra of matrices; Eigenvalues and eigenvectors; Normalization and orthogonality.
3. Ordinary Differential Equations
   First and second order linear ordinary differential equations; Laplace transforms; Convolution theorem; Fourier transforms.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

To ensure that students learn and reflect continuously, Continuous Assessment is an important element and students are required to obtain Grade D or above in both the Continuous Assessment and the Examination components. The continuous assessment comprises of assignments, in-class quizzes and tests. The assignments are used to assist the students to reflect and review on their progress. The end-of-semester examination is used to assess the knowledge acquired by the students and their ability to apply and extend such knowledge.

Textbooks and Reference Books:

1. C.K. Chan, C.W. Chan and H.F. Hung, *Basic Engineering Mathematics*, McGraw-Hill, 2005.
2. H. Anton, *Elementary Linear Algebra*, 8th ed., John Wiley & Sons, 2000
3. G.B. Thomas, R.L. Finney, J.R. Hass and F.R. Giordano, *Thomas' Calculus*, 11th ed., Addison-Wesley, 2004.
4. G. James, *Modern Engineering Mathematics*, 3rd ed., Pearson Education, 2002
5. M.E. Van Valkenburg, *Network Analysis*, 3rd ed, Prentice-Hall, 1974.

SUBJECT DESCRIPTION FORM

Subject Title:	Mathematics II	**Subject Code:**	AMA202
Number of Credits:	3	**Hours Assigned:**	Lecture 28 hours Tutorial and Student Presentation 14 hours

Pre-requisite: Mathematics I (AMA201) **Co-requisite:** nil **Exclusion:** nil

Aims:

The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. To develop students' ability for logical thinking and effective communication, tutorial and presentation sessions will be held.

Learning Outcomes:

The subject aims to introduce the students to some fundamental knowledge of engineering mathematics. The emphasis will be on the application of mathematical methods to solving practical engineering problems.

Upon satisfactory completion of the subject, students are expected to be able to:

1. apply mathematical reasoning to analyse essential features of different engineering problems;
2. extend their knowledge of mathematical and numerical techniques and adapt known solutions to different situations;
3. apply appropriate mathematical techniques to model and solve problems in engineering;
4. develop and extrapolate mathematical concepts in synthesizing and solving new engineering problems;
5. search for useful information in solving problems;
6. undertake continuous learning.

Syllabus:

1. Calculus and Functions of Several Variables
   Infinite series; Power series; Taylor series; Fourier series; Partial differentiation; Maxima and minima; Lagrange multiplier.
2. Partial Differential Equations
   Formulation of partial differential equations; Method of separation of variables; Initial and boundary value problems.
3. Vector Calculus
   Vectors; Scalar and vector products; Gradient, divergence and curl operators; Multiple integrals; Line, surface and volume integrals; Green's theorem, divergence theorem and Stokes' theorem.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

To ensure that students learn and reflect continuously, Continuous Assessment is an important element and students are required to obtain Grade D or above in both the Continuous Assessment and the Examination components. The continuous assessment comprises of assignments, in-class quizzes and tests. The assignments are used to assist the students to reflect and review on their progress. The end-of-semester examination is used to assess the knowledge acquired by the students and their ability to apply and extend such knowledge.

Textbooks and Reference Books:

1. C.K. Chan, C.W. Chan and H.F. Hung, *Basic Engineering Mathematics*, McGraw-Hill, 2005.
2. G. James, *Modern Engineering Mathematics*, 3rd ed., Pearson Education. 2002.
3. R. Haberman, *Applied Partial Differential Equations*, 4th ed., Prentice-Hall, 2003.
4. H. Rogers, *Multivariable Calculus with Vectors*, Prentice-Hall, 1998.

SUBJECT DESCRIPTION FORM

Subject Title: Logic Design

Subject Code: EIE211

Number of Credits: 3

Hours Assigned: Lecture/tutorial 36 hours
Laboratory 6 hours
(Equivalent to 18 laboratory hours)

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

To provide students with a broad view in both hardware and software aspects of digital systems in general and microprocessor systems in particular, and enable them to gain understanding and skills that will be used in later computer related courses. Emphasis will be placed on topics such as

1. Common binary logic components found in a microcomputer system
2. Use and applications of programmable logic devices
3. Structure and organization of microprocessors
4. Basic assembly language programming techniques.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand the fundamentals of digital systems and associated technologies.
2. Solve problems and design simple system related to digital logic.
3. Apply theory to practice by using logic design techniques to develop simple digital systems.
4. Appreciate the importance of creativity and critical thinking, and to realize that there is no perfect digital system for any particular situation and that engineers have to find "good" solutions, or make good designs.

Category B: Attributes for all-roundedness

5. Present ideas and findings effectively.
6. Think critically.
7. Learn independently.
8. Work in a team and collaborate effectively with others.

Syllabus:

1. Logic Circuit and ICs
   - 1.1 Decoders and encoders
   - 1.2 Multiplexers and demultiplexers
   - 1.3 Binary adders, binary adder-subtrators
   - 1.4 Binary multipliers
   - 1.5 HDL representation - Verilog HDL
   - 1.6 Sequential circuit analysis and design
   - 1.7 Registers and counters.

2. Memory and Programmable Logic Devices
   - 2.1 RAM: Write and read operations, timing waveforms, RAM integrated circuits, three-state buffers, DRAM ICs
   - 2.2 Programmable logic technologies
   - 2.3 ROM, PLA and PAL
   - 2.4 VLSI programmable logic devices: Xilinx FPGA.

3. Microprocessor
   - 3.1 Register transfer operations
   - 3.2 Microoperations
   - 3.3 Bus-based transfer
   - 3.4 ALU
   - 3.5 Shifter

3.6 Datapath representation
3.7 Control word
3.8 Control unit
3.9 Algorithmic state machine
3.10 Hardwired control and microprogrammed control.

4. Basic Assembly Language Programming
   4.1 Concepts of assembly/machine languages
   4.2 Operand addressing
   4.3 Addressing modes
   4.4 Instruction set: Data transfer, data manipulation, program control

Laboratory Experiment:

1. Basic logic gates and their applications
2. Hardware description language
3. Programmable logic devices, Assembly language programming

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

The continuous assessment will consist of a number of assignment, short quizzes, and two tests.

Textbook:

1. M.M. Mano and C.R. Kime, *Logic and Computer Design Fundamentals*, 3rd ed., Upper Saddle River, NJ: Prentice-Hall, 2004.

Reference Books:

1. N.P. Cook, *Digital Electronics with PLD Integration*, Upper Saddle River, NJ: Prentice-Hall, 2001.
2. T.L. Flody, *Digital Fundamentals with VHDL*, Upper Saddle River, NJ: Prentice-Hall, 2003.
3. B.B. Brey, *The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4*, Upper Saddle River, NJ: Prentice-Hall, 2003.

SUBJECT DESCRIPTION FORM

Subject Title: Information Technology

Subject Code: ENG224

Number of Credits: 3

Hours Assigned: Lecture/Tutorial 33 hours
Laboratory 6 hours
(Equivalent to 18 laboratory hours)

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

1. To provide the foundation knowledge in computer engineering, computer networking and data processing that is essential to modern information system design;
2. To provide training in using information technologies to solve practical problems in engineering.

Student Learning Outcomes:

Category A: Professional/academic knowledge and skills

1. Be able to identify different components of a computer system and understand their features.
2. Understand the basic structure and functions of a computer operating system and be able to use the services it provided for manipulating computer resources.
3. Be able to set up and configure a simple computer system.
4. Understand the basic structure and limitations of the Internet.
5. Have the ability to understand a Web document and be able to develop the client-side and the server-side programs required for a Web application.
6. Understand the basic structure of a database system and be able to set up and configure a simple database system.
7. Be able to design and develop a web-based system with database connectivity at the server side
8. Learn to make reasonable judgment in choosing suitable technologies for the implementation of an information system.
9. Be able to identify different components and technologies used in a digital network and understand their features.
10. Be able to set up and configure a simple computer network.

Category B: Attributes for all-roundedness

11. Solving problems using systematic approaches.
12. Learn independently and be able to search for the information required in solving problems.

Syllabus:

1. Introduction to computers and computing
   Evolution and applications of computers. Microprocessors – internal structure, fetch and execute cycles, instruction set, basic assembly language programming. Other major computer hardware components: Memory and I/O. Software components – applications, utilities and operating systems. Case study: Linux – background, architecture, user interfaces, file management and storage, process management. Internet and Internet services. Multi-tier Internet model. Internet programming case studies – XHTML, PHP/ASP. (13 hours)

2. Introduction to data processing and information systems
   Database systems – architecture, relational database concept, structural query language (SQL), database management systems, Web and database linking, database application development. Case study: Database management using Microsoft Access/MySQL. Introduction to Information systems. System development life cycle. Structured tool for system analysis and design. Workflow management. (11 hours)

3. Networking Essentials
   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 – cabling, topology, access methods; TCP/IP – application layer message passing, message assembling, port multiplexing, IP addressing, subnetting, routing and address resolution. Networking devices – modem, hub, bridge, switch, and router. (9 hours)

Laboratory Experiments and other Practical Work (18 hours):

1. Installation and use of Linux
2. Setting up a Web site with Apache/IIS and XHTML
3. Server-side programming with PHP/ASP
4. Database management using Microsoft Access / MySQL
5. Structured network cabling
6. Network Address Translation and IP Routing

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

The continuous assessment consists of assignments, laboratory reports and tests. The assessment criteria will be made known to the students prior to conducting the assessment.

Reference Books:

1. P. Norton, *Introduction to Computers*, 3rd ed., McGraw-Hill, 1999.
2. S.M. Sarwar, *Linux, the Textbook,* 1st 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,* 5th ed., Addison-Wesley, 2000.
6. K.C. Laudon and J.P. Laudon, *Management Information Systems,* 6th ed., Prentice-Hall, 2000.

SUBJECT DESCRIPTION FORM

Subject Title:	Engineering Science	**Subject Code:**	ENG232
Number of Credits:	3	**Hours Assigned:**	42 hours

Pre-requisite: nil Co-requisite: nil Exclusion: nil

Objectives:

This subject aims:

1. To enable students to establish a broad knowledge base on the atomic structure and properties of materials and a few important engineering problems.
2. To enable students to understand the properties of pure substances, states, phase change, and behaviour of ideal gas.
3. To enable students to understand the forms of energy and their conversion.
4. To enable students to understand and apply the Law of Conservation of mass and Law of Conservation of energy and their applications to various kind of heat engines and heat pumps.
5. To provide a basic understanding of the manufacturing system, the relationship between material properties and manufacturing processes so that they (students) are able to select those that are appropriate taking into consideration green design and environmental issues.

Student Learning Outcomes:

1. Identify different subsystems, indicate where there is work, heat transfer and the importance of temperature, pressure and density [1, 3].
2. Given a set of properties, find the correct phase and remaining properties for a substance [2].
3. Given a physical set up, find process and compute associated heat and work transfer that is the most reasonable approximation [2, 3].
4. Given a closed thermal system, compute the heat, work transfer and change of internal energy by 1st Law of Thermodynamics[2, 3, 4].
5. Given a physical setup, formulate the ideal approximation to the behavior and compute the corresponding work and heat transfer [4, 6].
6. Given an open thermal system, compute the heat, work transfer and change of enthalpy by 1st Law of Thermodynamics[2, 3, 4].
7. Apply by 1st Law of Thermodynamics to heat engines and refrigerators[2, 3, 4].
8. To design a basic manufacturing system, to recognise the basic inputs and outputs of the system, and their importance when designing products for the consumer market [5].
9. To be able to recognise the basic processes in manufacturing, and to select those that are appropriate recognising time, quality, and cost considerations [5].
10. To be able to select appropriate materials for particular manufacturing applications, and to understand the relationship between processing and material properties taking into consideration relevant issues, particularly green design and environmental issues [5].

Syllabus:

1. Materials Science
   Atomic structure, wave-particle duality, bonding and crystal structures and energy levels; optical properties of materials; conductors, insulators, semi-conductors and P/N junction; stress-strain behavior, elastic properties of materials, tensile properties, and compressive, shear, and torsional deformation. (15 hours)

2. Thermodynamics
   Basic concepts and definitions, state, thermal properties, temperature closed and open systems, work and heat, processes and cycles. Equation of state of perfect gas and gas constant, phase (p-v-T) diagram of a pure substance, phase changes and latent heat, vapour and liquid, table of properties of pure substances. The First Law of Thermodynamics, energy and mass conservation in systems, internal energy and enthalpy, applications to closed or steady flow processes. Applications of the First Law of thermodynamics. (15 hours)

3. Manufacturing Technology
   Manufacturing as a system. Product design activity. The product and the marketplace. Evolution of engineering materials. The role of materials in manufacturing. The relationship between

manufacturing processes and material properties. Process capability. Cost consideration in materials selection. Procedures for selecting materials and processes. Green manufacturing and environmentally conscious design. (12 hours)

Laboratory Experiment:

Tensile strength of metallic and plastic materials.

Case study:

Selection of manufacturing process and material using the Cambridge Engineering Selector.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

Continuous Assessment may include assignments and short tests

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Textbooks and references:

1. W. Bolton, *Engineering Science*, 4th ed., Newnes, Oxford, 2001.
2. Sonntag, Borgnakke & Wylen, *Fundamentals of Thermodynamics*, Wiley & Son s, 2003.
3. T.D. Eastop and A. McConkey, *Applied Thermodynamics for Engineering Technologists*, 5th ed., Longman Group UK, 1993.
4. William D. Callister Jr., *Materials Science and Engineering – An Introduction*, 6th ed., John Wiley & Sons, Inc., 2003.
5. *Manufacturing with Materials*, by Open University, Butterworths, 1st ed., 1990.
6. Sherif D. El Wakil, *Processes and Design for Manufacture*, PWS Publishing Company, 1998.
7. The materials selector on CD-ROM [interactive multimedia], Edited by Norman A. Waterman and Michael F. Ashby, Chapman & Hall, 1999.

SUBJECT DESCRIPTION FORM

Subject Title:	Computer Programming	**Subject Code:**	ENG236
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial/ Laboratory 42 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

1. To introduce the fundamental concepts of computer programming.
2. To equip students with sound skills in C/C++ programming language.
3. To equip students with techniques for developing structured computer programs.
4. To demonstrate the techniques for implementing engineering applications using computer programs.

Student Learning Outcomes:

Category A: Professional/academic knowledge and skills

After taking this subject, the students should be able to develop a good computer program using C/C++ programming language. To be specific, the students should be able to achieve the following:

1. Familiarize themselves with at least one C/C++ programming environment.
2. Be proficient in using the basic constructs of C/C++, such as variables and expressions, looping, arrays and pointers, to develop a computer program.
3. Be able to develop a structured and documented computer program.
4. Understand the fundamentals of object-oriented programming and be able to apply it in computer program development.
5. Be able to apply the computer programming techniques to solve practical engineering problems.

Category B: Attributes for all-roundedness

6. Solve problems by using systematic approaches.
7. Write technical reports and present the findings.
8. Learn team working skills.

Syllabus:

1. Introduction to programming
   Software components of a computer – Operating system, directories, files. Evolution of programming languages. Programming environment – Compiler, linker and loader. Building the first program – Hello World. (3 hours)
2. Bolts and Nuts of C/C++
   Preprocessor, program codes, functions, comments. Variables and constants. Expressions and statements. Operators. (3 hours)
3. Program Flow Control
   If, else, switch, case. Looping – for, while, do. Functions, parameters passing, return values. Local and global variables. Scope of variables. (4.5 hours)
4. Program Design and Debugging
   Structured program design. Improving program readability. Flow chart. Modular programming – static library. Programming bugs, errors, mistakes and code rot. Exceptions and debugging. Case study: Using Visual C++ debugger. (4.5 hours)
5. Basic Object Oriented Programming
   Objects and classes. Encapsulation. Private versus public. Implementing class methods. Constructors and destructors. (4.5 hours)
6. Pointer and Array
   The stack and free store. Create and delete objects in free store. Pointer arithmetic. Passing function arguments by pointer. Returning values by pointer. Array of Objects. Multidimensional array. Array and pointer. Array of pointers. Pointer of array. Character array – Strings. Command line processing. (9 hours)

7. Stream I/O
   Input and Output. Input using cin. Output using cout. File I/O using streams. (6 hours)
8. Using C/C++ in Engineering Applications
   Solving numerical problems using C/C++. Developing graphical user interfaces for Engineering applications. Control I/O devices using C/C++. (7.5 hours)

Method of Assessment:

Continuous Assessment: 100%

Textbook:

1. H.M. Deitel and P.J. Deitel, *C++ How To Program*, 5th ed., Prentice-Hall, 2005.

Reference Book:

1. K. Gregory, *Microsoft® Visual C++®.NET 2003 Kick Start*, Sams Publishing, 2003.

SUBJECT DESCRIPTION FORM

Subject Title:	Basic Electricity and Electronics I	**Subject Code:**	ENG237
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 42 hours Laboratory 15 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

1. Introduce the fundamental concepts of electrical and electronics principles and components applicable to all engineering students.
2. Develop an ability for solving problems involving electrical and electronics circuits.
3. Provide experimentation on electrical and electronic circuits.
4. Impart the skills and knowledge required for independent learning.

Student Learning Outcomes:

Upon satisfactory completion of the subject, the students are expected to:

1. Have acquired a good understanding of the electrical and electronics principles.
2. Be able to solve problems in electrical and electronic circuits;
3. Use suitable instrumentation to carry out experimental investigations to validate the theoretical investigations;
4. Learn to search for useful information in solving problems;
5. Be able to carry out independent investigation in an improvised environment.

Syllabus:

1. DC Circuits
   Circuit components, Kirchhoffs laws, Loop & nodal analysis, Thevenin and Norton theorems, Capacitance and inductance, Independent and dependent sources, Source transformation, Instantaneous power, Source loading and maximum power transfer. (6 hours)
2. AC Circuits
   Average and rms values, Phasors, Steady-state analysis, Impedance, Admittance, Network theorems, Real and reactive power, power factor. (6 hours)
3. Basic Electromechanics
   Electric and magnetic fields, Faraday's Law, Self and mutual inductance, Transformer, Basic ac generator, Three-phase voltage generation, Three-phase power, Introduction to electric motors. (6 hours)
4. Time-Domain in Analysis
   Transient analysis, RC , RL and RLC circuits, Initial and final conditions, Laplace transform, Time domain solution by Laplace transform, Impulse and step responses of first-and second-order systems. (9 hours)
5. Basic Diode Circuits
   I-V characteristics of ideal diodes, Practical diode circuits such as rectifier circuits, clipping and clamping circuits. (3 hours)
6. Basic Amplifier Circuits
   Ideal amplifier characteristics, ideal operational amplifier, Op-amp applications: inverting, non-inverting, summing and difference circuits. (3 hours)
7. Digital Logic Circuits
   Binary number system: addition, subtraction, multiplication and division in binary number systems, Conversion between binary and decimal numbers, Two' s complement, Boolean algebra, Basic logic gates, Flip-flops, Karnaugh maps, Don't care condition, Combinational Logic circuit designs and modules. (9 hours)

Laboratory Experiments: (15 hours, 3 hours each)

1. Introduction to Laboratory instrumentation
2. Thevénin and Norton theorems
3. Time dependent circuit analysis
4. Simple op-amp circuits
5. Simple digital circuits

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

Textbook:

1. G. Rizzoni, *Principles and Applications of Electrical Engineering*, McGraw-Hill Higher Education, 5th ed., 2006.

Reference Books:

1. R.A. DeCarlo and P.M. Lin, *Linear Circuit Analysis*, Oxford University Press, 2nd ed., 2001.
2. A.H. Robbins and W.C. Miller, *Circuit Analysis: Theory and Practice*, Thomson Learning, 2nd ed., 2000.
3. M.B. Histand and D.G. Alciatore, *Introduction to Mechatronics and Measurement Systems*, McGraw-Hill, 1999.
4. E. Hughes, *Electrical Technology*, Addison-Wesley Longman Limited, 1997.
5. Donald A. Neamen, *Electronic Circuit Analysis and Design*, Boston, McGraw-Hill, 2nd ed., 2002.

SUBJECT DESCRIPTION FORM

Subject Title:	Basic Electricity and Electronics II	**Subject Code:**	ENG238
Number of Credits:	3	**Hours Assigned:**	Lecture/tutorial 42 hours Laboratory 12 hours

Pre-requisite: Basic Electricity and Electronics I (ENG237) **Co-requisite:** nil Exclusion: nil

Objectives:

To introduce students to the operating principles of electrical machines and electronic circuits. Several classes of electronic circuits will be covered in this subject – diode circuits, BJT transistor circuits, FET transistor circuits, and operational amplifier circuits. The fundamentals of power electronics and simple electric machines will also be introduced.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

1. Understand basic pn junction characteristics, load line concept and the design of basic diode circuits;
2. Understand fundamentals of DC biasing of BJT and FET circuits;
3. Understand the basic operation principles of BJT and FET transistor circuits and design;
4. Understand the basic operation principles of operational amplifiers;
5. Understand the basic frequency response of amplifiers;
6. Understand the basic principles of power electronics and operating principles of dc, stepping and servo motors.
7. Develop their application skills by doing laboratory experiments.

Syllabus:

1. Operational Amplifiers
   Integrator and differentiator circuits; analog computers; instrumentation amplifiers; current-to-voltage and voltage-to-current converters; non-ideal op-amp characteristics.
2. Diode Fundamentals
   p-n junction basics; various I-V characteristics of diodes; circuit models for non-ideal semiconductor diodes; load line concept.
3. Transistor Fundamentals
   The bipolar junction transistors (BJT); DC biasing and analysis of BJT circuits; MOS field-effect transistors (MOSFET); junction field effect transistors (JFET); load line and graphical large-signal analysis; transistor amplification concept.
4. Amplifier Circuit Design
   Analog signals and linear transistor amplifiers; basic BJT and MOSFET amplifier configurations; small-signal parameters; voltage and current gains evaluation; input and output impedances, transconductance.
5. Frequency Domain Analysis
   Exponential excitations; s-domain; applications to circuits; RC/RL filters.
6. Frequency Response of Amplifiers
   Equivalent circuits; cut-off frequency; unity-gain bandwidth; system transfer functions, Bode plots; short-circuit and open-circuit time constants; frequency response of amplifiers with coupling; by pass capacitors.
7. Introduction to Electrical Machines
   Star and Delta connections; measuring three-phase power; two-wattmeter method, DC motors; stepping and servo motors; selection criteria of stepping motor and servo motor; basic power electronics.

Laboratory Experiments:

1. Op-amps as analog computers and as current-to-voltage converters.
2. DC transistor biasing/load line and diode clamping circuits.
3. Transistor amplifier circuits.
4. Three phase system.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

The continuous assessment will consist of a number of assignments and tests.

Reference Books:

1. Donald A. Neamen, *Electronic Circuit Analysis and Design*, Boston, McGraw-Hill, 2nd ed., 2002.
2. Giorgio Rizzoni, *Principles and Applications of Electrical Engineering*, Boston, McGraw-Hill, 4th ed., 2002.
3. E. Hughes, *Electrical Technology*, Addison-Wesley Longman Limited, 1997.
4. R.W. Goody, *PSPICE for Windows – A Circuit Simulation Primer*, Englewood Cliff: Prentice-Hall, 1995.

SUBJECT DESCRIPTION FORM

Subject Title: China Studies **Subject Code:** GEC2801

Number of Credits: 2 **Hours Assigned:** Lecture 28 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objective:

To help students acquire a broad-based knowledge about China.

Intended Learning Outcomes:

Upon completion of the subject, students shall be able to develop interest in:
1. the understanding of: Chinese culture, legal system, social and political institutions, economy and business, science and technology, etc.;
2. the relationship and linkage of the past and the present day China; and
3. the latest development and trends of the Mainland that shape the future of China.

Structure:

14 themes under the subject will be offered in Semester 1 of 2006/07, each theme lasts for 4 hours (2 hours for each week).

Students who participate in the *Preferred Graduate Development Programme* with their summer placement in Beijing can apply to take an alternate mode of *China Studies* during the summer term. This mode combines classroom lectures with associated guided study visits in Beijing. For details, please refer to the Student Affairs Office (www.polyu.edu.hk/sao/pgdp).

Medium of Instruction:

1. Cantonese will be the predominant medium of instruction. For some theme lectures, Putonghua and English will be used.
2. Non-Chinese speaking students can attend the English class (group 128).

Method of Assessment:

To complete the subject, students are required to:
1. **Attend 7 different theme lectures** out of the 14 themes offered.
2. Submit 7 reflective writings / quizzes and **pass at least 5 themes**; and
3. **Pass an essay** on a theme that has been attended.

Grading: Pass with Merit, Pass, or Fail

Learning Support:

1. WebCT webct.polyu.edu.hk
2. General Education Centre's Project Room (located at A529)
3. List of educational videos (China Studies) www.polyu.edu.hk/~gec/video
4. Online resources database accessible via PolyU campus network
   a. Infobank China 中國資訊行 www.chinainfobank.com
   b. Sinowisdom 中華智庫網 www.sinowisdom.com
5. Other electronic database accessible via the website of PolyU library
   a. China Studies www.lib.polyu.edu.hk/electdb/cdsubjec.htm#CHINA
   b. WiseNews (Newspapers) www.lib.polyu.edu.hk/electdb/newsopt.htm
6. Books reserved for this subject at the Pao Yue-kong library

SUBJECT DESCRIPTION FORM

Subject Title:	Industrial Centre Training I	**Subject Code:**	IC272
Number of Credits:	9 training credits	**Hours Assigned:**	9 weeks (Refer to Training Pattern)

Pre-requisite:	nil	**Co-requisite:**	nil	**Exclusion:**	nil

Objectives:

Industrial Centre Training I is offered by The Hong Kong Polytechnic University Industrial Centre. The objective of the subject is to equip students with practical skills, techniques and technologies which are general and essential in the practice of electronic and information engineering (EIE). The training comprised of three parts; technology training, engineering graphic communication and industrial safety.

1. Technology training provides training in engineering practice in electronic and information engineering. Students should be able to acquire fundamental knowledge in electronic product design and prototype fabrication with an appreciation of electronic product manufacturing process and practise. On completion of the engineering practice, student should be able to handle projects and fabricate prototype for electronic design and development. Furthermore, students also receive training in fundamental practical skills in different types of computer software that is essential in engineering, which include computer operating systems, client-server operation, data networking, basic scientific computing, computer graphics and animations, Web authoring and Internet search, database and spreadsheets.
2. Engineering graphic communication provides an opportunity for student to learn and use technical graphics as a media to express ideas and describe objects. The emphasis is put on practicing the principle and interpretation of technical drawing and to communicate design idea using simple sketch and computer graphics. In addition to computer based technical graphics, students are expected to be familiar with using electronic design automation (EDA) software to capture and design electronic circuit boards and comprehend different types of electrical drawings that are frequently encountered in electronic and electrical engineering.
3. Industrial Safety provides students with an understanding of industrial hazards and their control in practicing engineering in industry.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Acquire practical professional skills and best practice in electronic and information engineering for application on the design, construction, operation and maintenance of electronic and information equipment and system.
2. Acquire fundamentals in using commercial available software to solve problems.
3. Demonstrate technical competence in handing electronic projects and produce prototypes for design and development.
4. Understand the importance of safety, responsibility and regulation in the practice of engineering.
5. Application of fundamental principles in electronic and information engineering and develop practical methods to solve circuit or production development problems.

Category B: Attributes for all-roundedness

6. Communicate effectively and work in harmony with other members in a team and develop leadership capability.
7. Communicate effectively with engineering graphics and computer graphics.
8. Demonstrate critical and creative thinking in electronic project development and handling.
9. Understand the importance of training and the needs for continue professional development in professional engineering career.
10. Practice and demonstrate initiative and learn by practice interactively and produce solutions on open-ended problems.

Syllabus:

I. Technology Training (7 weeks)

1. IC 0705 – Automation and Robotics (1 week)
   - 1.1 Introduction to industrial robots, programming and interface.
   - 1.2 Introduction to electronic motion control systems, programmable logic controller, servo and stepping motors. Data communication for industrial robots.
   - 1.3 Applications of sensors for automation and control. Application of electro-pneumatic components and system for automation and control.
   - 1.4 Introduction to material handling devices and Automatic Storage and Retrieval System (ASRS). Introduction to Computer Integrated Manufacturing system (CIM).

2. IC 1101 – Basic Electronic Practice for Electronics and Information Engineering (1 week)
   - 2.1 Introduction to common electronics parts, use of basic test instruments, best practices and basic troubleshooting techniques, electronics workshop safety.
   - 2.2 Soldering and de-soldering techniques, mounting and installation of electronic circuits, wiring of subassemblies.
   - 2.3 PCB design, hands on practice on PCB circuit design in EDA.
   - 2.4 Circuit artwork, etching process, PCB prototype fabrication.
   - 2.5 Introduction to embedded devices, hands on embedded device programming and testing practice.

3. IC 1102 – Advanced Electronic Practice for Electronics and Information Engineering (1 week)
   - 3.1 Introduction to electronic circuit interconnect technologies: SMT, COB and wave-soldering.
   - 3.2 Introduction to electronic assembly design and manufacturing process, components, tools and machines.
   - 3.3 Hands-on practice on wave-soldering, SMT process, chip level wire bonding, chip-on-board encapsulation, LCD display attachment with heat seal connector.
   - 3.4 Application and use of electronic test instruments: current and voltage measurements, two wire and four wire techniques, power and signal sources, oscilloscope probes, analogue and digital oscilloscopes .
   - 3.5 Introduction to Virtual Instrument, application and hands-on practice on Labview or equivalent software package.

4. IC1610 - Workshop practice for Electronic and Information Engineering (1 week)
   - 4.1 Introduction to materials and design of mechanical small parts, chassis and support for electronic products. Hands-on training will focus on the design and fabrication of parts for electronic prototype assembly using available stock material and fastening solution.
   - 4.2 Design and application of sheet metal on electronic chassis and small parts. Make use of basic sheet metal processing tools in machine shop to fabricate prototype parts such as heat sink, chassis or mechanical structure for electronic products. Typical tools should include manual shear and press brake, drilling, stamping and application of sheet metal fastening solutions with necessary safety measures.
   - 4.3 Application of engineering plastic stock in the design and fabrication of parts, linkages and structures for electronic product prototype. Hands-on training will focus on the application of tools and processes including laser processing, heat forming and vacuum forming with appropriate joining techniques, fastening and assembly solution.
   - 4.4 Appreciation of mass production processes for sheet metal and plastic parts fabrication

5. IC3003 - Basic Scientific Computing (30 hours)
   - 5.1 Approach and techniques in using the MATLAB Development Environment.
   - 5.2 Mathematical Operations, matrices, linear algebra, polynomials and interpolation, data analysis and statistics, function functions, differential equations.
   - 5.3 Programming, M-files programming and application examples, flow control statements, function files
   - 5.4 Graphical user interface, data structures, input/output, and object-oriented capabilities.
   - 5.5 Graphics, data plotting, formatting, basic printing and exporting interfaces with examples in basic scientific applications, pie chart, bar chart, area chart, linear and log plots, 3D-View plot experiment with fitting curves to data.

6. IC3004 - General Computer and Network Skills (30 hours)
   - 6.1 General computer concepts: architecture, interface, peripherals and cabling. Good practice on Internet software application; basic PC troubleshooting; virus scan and cleaning; Installation, patching, configuring, managing and troubleshooting Microsoft Windows.

6.2 Introduction to the application and basic administration of Microsoft Windows Server; managing access to resources, system configuring with data, files and disks management, file transfer on Internet.
6.3 Linux system administration, desktop environment, shells, text editing and printing.
6.4 Network Configuration, TCP/IP addressing, name resolution and IP routing, remote access configuring and mobile computing.

7. IC3009 - Database & Presentation for EIE (30 hours)
   7.1 Design html based web page with Dreamweaver using graphics, fonts, layers and interactive features with multimedia, Java applet and Javascript.
   7.2 Application of Microsoft Access in simple database creation, indexing, input and output into Microsoft Excel, Microsoft Word and Microsoft Powerpoint. Make presentation with chart and graph using Microsoft Excel for basic business and scientific analysis.
   7.3 Application of Adobe Illustrator to create simple graphics in pixel-based and vector-based formats with simple graphic rendering techniques; colour, gradient, and pattern fill.
   7.4 Application of Adobe Photoshop with basic photo-editing techniques; selection, adjustment, transformation and masking.

II. Engineering Drawing and Computer Graphics (46 hours)

IC8031 Drawing for Electronics & Information Engineering (46 hours)

1. Computer Based Technical Graphics (36 hours)
   1.1 Overview and Technical Sketching
      - Engineering graphics as a communication medium, geometrical sketching, problems and visualization.
   1.2 Appreciation of Engineering Drawing
      - Orthographic Projection Systems, Sectioning, Auxiliary Projections.
   1.3 Technical Sketching
      - Axonometric projections and standard practices; dimension and tolerance.
   1.4 Application of CAD in Engineering Drawing
      - CAD command system and drawing aids, computer based documentation; export, import, attachment.
   1.5 Three-dimensional Modelling and Presentation
      - Three-dimensional visualization; wire frame, surface and solid models; constructive solid geometry; primitives, Boolean operations.
   1.6 Orthographic projection from solid models; viewpoints, model space.
      - Appreciation of parametric solid modelling, parametric constraints; NURBS surface modelling.

2. Engineering Drawing in Electronic & Information Engineering (10 hours)
   2.1 Introduction to electronic circuit schematics and logic diagrams; electronic design automation software, placement of components, capturing, annotation, labelling, net list generation.
   2.2 Electronic parts library, symbols, physical packages, discrete components, integrated circuits, logic and analogue circuits, gate and pin definition, swappability.
   2.3 Electrical & electronic device symbols and layout, system block diagrams and representation, architectural wiring diagram, wiring table and diagrams for electronic and electrical installations.

III. Industrial Safety (15 hours)

IC2002 Industrial Safety I for Engineering Discipline (15 hours)

1. Safety Management
   1.1 Overview in safety management.
   1.2 Development of safety in Hong Kong and Government' s current safety policy; safety training.
   1.3 Principles of safety management.
   1.4 Essential elements of safety management; causes of accidents and prevention methods; accident reporting procedures.
   1.5 Job safety analysis and fault tree analysis.

2. Safety Law
   2.1 F&IU Ordinance and Principal Regulations.
   2.2 Construction Sites (Safety) Regulations.

3. Occupational Hygiene
   3.1 Noise hazard and control.
   3.2 Dust hazard and control.

3.3 Personal protective equipment.
3.4 First aid and emergency procedures.

4. Safety Technology
   4.1 Manual and mechanical handling.
   4.2 Fire prevention.
   4.3 Dangerous substances and chemical safety.
   4.4 Machinery hazards and principles of guarding.
   4.5 Electrical safety.
   4.6 Construction safety - Potential hazards and risks associated with construction sites; safety codes of practice at work.

Training Pattern:

(I) Technology Training	:	IC3003 Year 1 term 1; IC3004, IC3009 1-2 weeks, Year 1 term time scheduled by students; balance in Year 1 Summer
(II) Engineering Drawing and Computer Graphics	:	46 hours in Year 1 term time.
(III) Industrial Safety	:	15 hours in Year 1 term time.

Method of Assessment:

The assessment is comprised of 100% continuous assessment with the following weighting:-

Assignment: 50% Report: 30% Test: 20%

Reference Books:

1. Villanucci, Robert S., Avtgis, Alexander W., et all, *Electronic Techniques : Shop Practices and Construction*, 6th ed., Prentice-Hall, 1999.
2. Ronald K. Jurgen., *Digital Consumer Electronics Handbook*, McGraw-Hill, New York, 1997.
3. Tooley, Michael H., *Electronic Circuits: Fundamentals and Applications*, 2nd ed., Newnes, Oxford, Boston, 2002.
4. Stadtmiller, D. Joseph, *Applied Electronic Design*, Prentice-Hall, N.J., 2003.
5. O'Hara, Martin, *EMC at Component and PCB Level*, Newnes, Oxford , 1998
6. Harper, Charles A., *Electronic Packaging and Interconnection Handbook*, 4th ed., McGraw-Hill, 2005.
7. Klein Wassink, R. J., *Soldering in Electronics : A Comprehensive Treatise on Soldering Technology for Surface Mounting and Through-hole Techniques*, 2nded., Electrochemical Publications Limited, Ayr, Scotland, 1989.
8. Martin, Perry L., *Electronic Failure Analysis Handbook : Techniques and Applications for Electronic and Electrical Packages, Components and Assemblies*, McGraw-Hill, New York, 1999.
9. Meeldijk, Victor, *Electronic Components: Selection and Application Guidelines*, Wiley, New York, 1996.
10. Loveday, George., *Electronic Fault Diagnosis*, 4th ed., Pitman, London, 1994.
11. *The ARRL Handbook for Radio Communications*, ARRL, Newington, Conn.
12. Giesecke, Frederick E., et al., *Modern Graphics Communication*, 2nd ed., Prentice-Hall, N.J., 2001.
13. Cheng, Ron, *Maximizing Autodesk Mechanical Desktop 2005*, Delmar Learning, N.Y., 2005.
14. Edward, A. Lacy, *Complete Guide to Understanding Electronics Diagrams*., Prentice-Hall, N.J., 1989.
15. Raskhodoff, Nicholas M., *Electronic Drafting and Design*, 5th ed., Prentice-Hall, N.J., 1987.
16. *Code of Practice for the Electricity (wiring) Regulations*, EMSD, The Government of the HKSAR.
17. Steven Holzner, *Inside JavaScript, Indianapolis, Ind. : New Riders*, 1st ed., ISBN: 0735712859.
18. Hakon Wium Lie and Bert Bos, *Cascading Style Sheets: Designing for the Web*, Addison Wesley, 3rd ed., ISBN: 0321193121.
19. Microsoft Official Curriculum in Windows, Microsoft, Redmond.

SUBJECT DESCRIPTION FORM

Subject Title:	Management and Organisation	**Subject Code:**	MM2021
Number of Credits:	3	**Hours Assigned:**	Lectures 28 hours Seminars 14 hours

Pre-requisite: nil **Co-requisite:** nil

Exclusion: Introduction to Management (MM201)
Organisational Behaviour (MM211)
Organisation and Management (MM202/MM302)
People and Management (MM2191)

Role and Purpose:

This subject introduces the basic theories and concepts concerning firstly, the functions of managing a business, secondly, the study of human behaviour and its implications for the management of organisations, and thirdly, the importance of social responsibility and ethics in managing organisations. The subject will also develop students' critical thinking and communication skills, both oral and written.

Student Learning Outcomes:

On completion of this subject, students will:

Category A: Professional/academic knowledge and skills

1. Be able to identify the nature of managerial work in a variety of forms of organisation, and assess the impact of the external environment on managers' jobs.
2. Be able to explain and analyse the functions of management – planning, organising, leading, and controlling.
3. Understand the essence of human behaviour and be able to assess the implications for the management of organisations and businesses.
4. Be able to evaluate the arguments surrounding social responsibility and ethical behaviour in organisations and businesses, and in so doing have an enhanced awareness of the importance of such issues.

Category B: Attributes for all-roundedness

5. Have further developed their critical thinking, and oral and written communication skills.

Indicative Content

1. Managers and Management
   Define the nature of managerial work taking into account the impacts of the external environment in modern society. Provide an overview of the evolution of management thoughts.
2. Management Functions
   The major elements of the management functions: planning, organising, leading, and controlling, and their importance for the effective management of business organisations.
3. Planning
   Foundations of planning. Decision making and problem solving. Strategic management.
4. Organising an Enterprise
   Review of a variety of organisational structures and the identification of the conditions under which they are appropriate. Managerial communication and information technology. Staffing and human resource management.
5. Leading
   The manager's role as a leader. Foundations of human behaviour. Leading and motivating employees – individuals and groups.
6. Controlling
   Foundations of control. Operations and quality management. Controlling for organisational performance.

7. Social Responsibility and Managerial Ethics
   Arguments for and against social responsibility as a business objective. Factors affecting managerial ethics. Approaches to improving ethical behaviour.

Teaching / Learning Approach:

In the lectures the general principles of the syllabus topic will be presented and developed. In the seminars, students will develop and apply the general principles of the topic in student-centred activities.

Method of Assessment:

Coursework: 50% Final Examination: 50%

Minimum Pass Grade: Coursework (D)
Final Examination (D)

Indicative Reading:

**Individual subject lecturer may prescribe different textbooks for the course.*

Recommended Textbook:

1. S.P. Robbins and M. Coulter, *Management,* 8th ed., Prentice-Hall, 2005.

References:

1. Certo, *Modern Management,* 10th ed., Prentice-Hall, 2006.
2. Jones, *Contemporary Management*, 4th ed., McGraw-Hill, 2006.
3. Kinicki & Williams, *Management: A Practical Introduction,* 2nd ed., McGraw-Hill, 2006.
4. McShane, *Organizational Behavior,* 3rd ed., McGraw-Hill, 2005.
5. Robbins, *Essentials of Organizational Behavior,* 8th ed., Prentice-Hall, 2005.
6. J.R. Schermerhorn, *Management*, 8th ed., John Wiley & Sons, 2005.
7. Sieren, Boos and Boos, *China Management Handbook,* MacMillan, 2002.

Current journal articles, periodicals & newspapers will also be assigned for study.

SUBJECT DESCRIPTION FORM

Subject Title:	Probability and Engineering Statistics	**Subject Code:**	AMA302
Number of Credits:	2	**Hours Assigned:**	Lecture 20 hours Tutorial and Student Presentation 8 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Aims:

The lectures aim to provide the students with an integrated knowledge required for the understanding and application of statistical techniques. To develop students' ability for logical thinking and effective communication, tutorial and presentation sessions will be held.

Learning Outcomes:

The subject aims to introduce the students to some basic probability theory and stochastic processes. The emphasis will be on application of statistical methods to solving practical engineering problems.

Upon satisfactory completion of the subject, students are expected to be able to:

Category A: Professional/academic knowledge and skills

1. Apply mathematical reasoning to analyse essential features of different statistical problems in engineering.
2. Apply appropriate probabilistic techniques to model and solve problems in engineering.
3. Make use of stochastic and Markov processes to solve typical engineering problems.
4. Search for useful information and use statistical tables in solving statistical problems in the context of engineering.

Category B: Attributes for all-roundedness

5. Undertake continuous learning.

Syllabus:

1. Probability Theory
   Probability and random variables; Probability distributions; Sampling distributions; Sampling means; The Central Limit Theorem; Significance and test of hypothesis.
2. Stochastic Process
   Bernoulli process; Poisson process; time averaging and ergodicity; Spectral analysis; Correlation and spectra; Wiener-Khintchine theorem; White noise; Narrow-band noise; thermal noise; Signal-to-noise ratio and probability of error; Effective noise temperature and noise figure.
3. Markov Process
   Recursions and Markov chains; Applications to queuing theory; Birth-death process.

Method of Assessment:

Continuous assessment: 40% Examination: 60%

To ensure that students learn and reflect continuously, Continuous Assessment is an important element and students are required to obtain Grade D or above in both the Continuous Assessment and the Examination components. The continuous assessment comprises of assignments, in-class quizzes and tests. The assignments are used to assist the students to reflect and review on their progress. The end-of-semester examination is used to assess the knowledge acquired by the students and their ability to apply and extend such knowledge.

Textbooks and Reference Books:

1. R.E. Walpole, R.H. Myers, S.L. Myers and K.Y. Ye, *Probability and Statistics for Engineers and Scientists*, 7th ed., Prentice-Hall, 2002.
2. A.V. Balakrishnan, *Introduction to Random Processes in Engineering*, 2nd ed., John Wiley & Sons, 2005.
3. W.A. Gardner, *Introduction to Random Processes: with Applications to Signals and Systems*, 2nd ed., McGraw-Hill, 1990.

SUBJECT DESCRIPTION FORM

Subject Title: Electronic Circuits

Subject Code: EIE304

Number of Credits: 3

Hours Assigned: Lecture/tutorial 39 hours
Laboratory 3 hours
(Equivalent to 9 laboratory hours)

Pre-requisite: Basic Electricity and Electronics I (ENG237)
Basic Electricity and Electronics II (ENG238)

Co-requisite: nil

Exclusion: nil

Objectives:

This is the main foundation subject introducing the working principles and constructions of analog electronic circuits. The specific aim is to familiarize students with the design and operation of analog building blocks (e.g., mirrors, differential stages, output stages), practical operational amplifiers, feedback amplifiers and oscillators.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand the operations of transistor devices, e.g., BJT and MOSFET
2. Analyze the small-signal characteristics of transistor amplifiers
3. Design basic analogue building blocks
4. Understand the operations and limitations of operational amplifiers
5. Analyze and design feedback circuits and oscillators

Category B: Attributes for all-roundedness

6. Communicate effectively
7. Think critically and creatively
8. Assimilate new technological development in related field

Syllabus:

1. Analog Building Blocks
   - 1.1 Simple current mirrors; problem due to Early effect and non-ideality; Wilson and Widlar mirrors; use of mirrors as active loads.
   - 1.2 Differential amplifier (DA) stage; analysis using half-circuit models, common-mode and differential-mode gains; common-mode rejection ratio (CMRR).
   - 1.3 Output stages; class A, class B and class AB output stages; efficiency; harmonic distortions.
2. Operation Amplifier Design
   - 2.1 Typical operational amplifier circuit: input differential stage, CE gain stage, and output stage; details of internal circuit design: active loading, level shift, current sourcing.
   - 2.2 Non-idealities: dc offset, input bias current (causing offset); finite input impedance, etc.
   - 2.3 Slew-rate limitation; gain-bandwidth product; stability design; concept of unity-gain feedback; phase margin; design of low-frequency pole and use of Miller effect for internal compensation.
3. Feedback Circuits and Oscillators
   - 3.1 General feedback configuration; basic amplifier gain, loop gain and closed-loop (overall) gain.
   - 3.2 Effects of feedback on gain, frequency response, distortion, input and output impedances.
   - 3.3 Feedback circuit configurations: shunt-series, shunt-shunt, series-shunt and series-series feedback; stability analysis; phase margins and compensation methods; analysis of feedback circuits via two-port models.
   - 3.4 Oscillation criteria; amplitude limiting and sustained oscillation; Colpitts, Hartley, Wien bridge, phase-shift and crystal oscillators.

Laboratory Experiments:

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

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

Method of Assessment:

Continuous assessment: 40% Examination: 60%

The continuous assessment consists of assignments, lab reports, and a test.

Textbooks:

1. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, *Analysis and Design of Analog Integrated Circuits,* New York: Wiley, 2001.
2. K.R. Laker and W.M.C. Sansen, *Design of Analog Integrated Circuits and Systems*, New York: McGraw-Hill, 1994.

Reference Books:

1. D.A. Jones and K. Martin, *Analog Integrated Circuit Design*, New York: Wiley, 1997.
2. D.A. Neamen, *Electronic Circuit Analysis and Design*, 2nd ed., New York: McGraw-Hill, 2001.
3. R.W. Goody, *PSPICE for Windows - A Circuit Simulation Primer*, Englewood Cliffs: Prentice-Hall 1995.

SUBJECT DESCRIPTION FORM

Subject Title:	Integrated Analogue and Digital Circuits	**Subject Code:**	EIE305
Number of Credits:	3	**Hours Assigned:**	Lecture/tutorial 39 hours Laboratory 3 hours (Equivalent to 9 laboratory hours)

Pre-requisite:	Basic Electricity and Electronics I (ENG237) Basic Electricity and Electronics II (ENG238) Electronic Circuits (EIE304)	**Co-requisite:**	nil	**Exclusion:**	nil

Objectives:

To develop an in-depth understanding of the design principles and applications of integrated analogue and digital circuits.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the fundamental principles and applications of digital logic circuits.
2. Design periodic signal generators from digital logic circuits.
3. Understand filter design principles and circuit technologies.
4. Apply theory and realize analog filter circuits.
5. Understand the Verilog style digital design.
6. Perform logic synthesis using FPGA tools.

Category B: Attributes for all-roundedness
7. Communicate effectively
8. Think critically and creatively
9. Assimilate new technological development in related field

Syllabus:

1. Digital Circuits
   - 1.1 Digital logic circuit families: Transistor-transistor logic (TTL), emitter-coupled logic (ECL), and CMOS logic. Input and output characteristics. Fan-in (in CMOS) and fan-out (in TTL). Noise margin. Time delay. Power loss. Switching speed.
   - 1.2 Multi-vibrators: Mono-stable, bi-stable and astable circuits. Saturating and non-saturating multi-vibrators. Schmitt trigger and 555 timer.
   - 1.3 Memory circuits: RAMs, ROMs and EPROMs.
2. Analog Filter Design
   - 2.1 Basic filter principles. Filter approximations (e.g., Butterworth, Chebychev, elliptic, Cauer, etc.). Transfer functions for low-pass, band-pass, high-pass, and band-stop filters. Frequency responses (magnitude and phase).
   - 2.2 Analogue filters: lossless passive realization and active RC realization. Standard first-order filters and biquads.
   - 2.3 Discrete-time realizations. z-domain functions. Active switched-capacitor realization. Standard first-order filters and biquads.
3. Introduction to Verilog Styles Digital Design and Synthesis
   - 3.1 Basic language structures: data types and modules. Structural and behavioural specifications: basic gates, user-defined primitives, modelling levels, synthesizable operations, continuous assignments. Procedural specifications: blocks, functions and tasks, blocking and non-blocking assignments, control and conditional constructs.
   - 3.2 Basic design methodology: small module design, module validation, finite state machines. Managing large complexity leading to large designs.
   - 3.3 Synthesis to FPGA: timing, area and power considerations.

Laboratory Experiments:

1. Design of electronic circuits using Xilinx FPGA tools.
2. Simulation of filter design using SPICE.

Method of Assessment:

Continuous assessment: 40% Examination: 60%

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

Textbooks:

1. R. Schaumann and M.E. Van Valkenburg, *Design of Analog Filters*, New York: Oxford University Press, 2001.
2. D.R. Smith and P.D. Franzon, *Verilog Styles for Synthesis of Digital Systems*, Englewood Cliffs: Prentice-Hall, 2000.
3. J.P. Hayes, *Introduction to Digital Logic Design*, Reading: Addison-Wesley, 1993.

Reference Books:

1. P.R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, *Analysis and Design of Analog Integrated Circuits,* New York: Wiley, 2001.
2. D. Van den Bout, *The Practical Xilinx Designer Lab Book*, Englewood Cliffs: Prentice-Hall, 1999.

SUBJECT DESCRIPTION FORM

Subject Title: IC Technology and Processes **Subject Code:** EIE306

Number of Credits: 3 **Hours Assigned:** Lecture/Tutorial 39 hours
Laboratory 3 hours
(Equivalent to 9 laboratory hours)

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

To enable students to gain basic knowledge and understanding in the following aspects:
1. Fundamentals of semiconductors
2. The operating principles of pn junctions and MOSFETs
3. CMOS processes and basic CMOS logic gates
4. Fabrication processes of semiconductor devices

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand basic electronic properties of semiconductors.
2. Design structures of pn junctions to meet a given specification.
3. Fabricate basic semiconductor devices.
4. Appreciate the effects of defects and impurities on the properties of semiconductor devices.
5 Optimize the physical structure of a MOSFET .

Category B: Attributes for all-roundedness
6. Present ideas and findings effectively.
7. Think critically.
8. Learn independently.
9. Work in a team and collaborate effectively with others.

Syllabus:

1. Semiconductor Fundamentals
   Energy band, extrinsic semiconductor, carrier concentration, mobility, drift and diffusion currents, Einstein Relationship.
2. P-N Junctions
   Energy band diagram, electrostatics of p-n junctions, capacitance, forward and reverse current characteristics, applications in optoelectronics.
3. Bipolar Junction Transistors
   Energy band diagram at equilibrium and under bias, current components, dependence of current gain on transistor parameters, Ebers-Moll model, Charge control model.
4. MOS Field-Effect Transistors
   MOS structure, capacitance of MOS system, operation of MOSFETs, oxide and interface charge, derivation of the threshold voltage, I-V characteristics, short channel effects.

Laboratory Experiments:

Fabrication of Semiconductor Device
Session 1: Cleaning of wafers and oxidation and windows opening and doping;
Session 2: Thin film deposition, photolithography, mask alignment, pattern definition and etching; and
Session 3: Device characterization

Method of Assessment:

Continuous assessment: 40% Examination: 60%

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

Textbook:

1. Robert F. Pierret, *Semiconductor Device Fundamentals*, Addison Wesley, 1966.

Reference Book:

1. Betty Lise Anderson and Richard L. Anderson, Fundamentals of Semiconductor Devices, McGraw-Hill, 2005

SUBJECT DESCRIPTION FORM

Subject Title: Computer System Fundamentals **Subject Code:** EIE311

Number of Credits: 3 **Hours Assigned:** Lecture/Tutorial 39 hours
Laboratory 3 hours
(Equivalent to 9 laboratory hours)

Pre-requisite: Logic Design (EIE211) **Co-requisite:** nil **Exclusion:** nil

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Objectives:

To provide a broad treatment of the fundamentals of computer systems.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the fundamentals of computer systems and associated technologies.
2. Solve problems and design simple systems related to computer systems.
3. Apply different important computer interfacing techniques in designing a computer system.
4. Develop a simple assembly program with an assembler.

Category B: Attributes for all-roundedness
5. Present ideas and findings effectively.
6. Think critically.
7. Learn independently.
8. Work in a team and collaborate effectively with others.

Syllabus:

1. Microprocessors and Microcomputers
   The following topics will be discussed in detail with references to one or two well-established (contemporary) microprocessor systems.
   1.1 CPU architecture; memory space and I/O space; instruction fetch and execution; pipelining; essential assembly language instruction types; working principle of assembler; assembler directives/pseudocodes; examples of assembly language programs.
   1.2 Memory interface: Memory devices; address decoding; memory interface; banking; bus buffering and driving; wait state, bus cycle, instruction cycle.
   1.3 Basic I/O interface: Memory-mapped I/O; I/O port address decoding; programmable peripheral interface; handshaking.
   1.4 Interrupts: polling, programmed I/O, interrupt I/O; Basic interrupt processing, software interrupt, expanding the interrupt structure, interrupt controller.
   1.5 Serial interface: Asynchronous/synchronous interface, RS232C serial interface and handshaking.
   1.6 Direct memory Access and DMA-controlled I/O: Basic DMA operation, DMA controller, shared-bus operation, disk memory systems, video displays.
   1.7 Cache memory: mapping, associativity; replacement policies; write policies; performance.

2. Disk Operating System
   2.1 Roles of basic input/output system (BIOS) and basic disk operating system(DOS); power-up sequence; bootstrap; command processor; system control, automatic program execution (e.g. batch file); operating system calls via software interrupts; system utilities; file operating commands; device driver.
   2.2 File system: space management e.g. file allocation table; File management; directory entry and file control block.
   2.3 Multitasking and time-sharing: time-slicing; process states and process control block; context-switching mechanism; scheduling schemes and process priorities.

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

Laboratory Experiment:

Six of the following topics or others.

1. Memory manipulation & Data representation
2. Serial communication
3. Parallel communication
4. Interrupt I/O
5. DMA I/O
6. BIOS
7. Device driver
8. Power-up procedures
9. User interface

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

The continuous assessment consists of short quizzes, assignments, laboratory reports and tests.

Textbook:

1. Barry B. Brey, *The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro Processor: Architecture, Programming and Interfacing*, 6th ed., Prentice-Hall, 2003.

Reference Books:

1. C. Hamacher, Z. Vranesic and S. Zaky, *Computer Organization*, 5th ed., McGraw-Hill, 2002.
2. Hans-Peter Messmer, *The Indispensable PC Hardware Book*, 4th ed., Addison-Wesley, 2002.
3. Silberschatz and P.B. Galvin, *Operating System Concepts*, 5th ed., John Wiley & Son, 1999.
4. W. Stallings, *Operating Systems: Internals and Design Principles,* 3rd ed., Prentice-Hall, 1998.

SUBJECT DESCRIPTION FORM

Subject Title: Linear Systems

Subject Code: EIE312

Number of Credits: 3

Hours Assigned: Lecture/Tutorial 36 hours
Laboratory 6 hours
(Equivalent to 18 laboratory hours)

Pre-requisite: Mathematics I (AMA201)

Co-requisite: nil

Exclusion: nil

Objectives:

1. To provide students with basic concepts and techniques for the modelling and analysis of linear continuous-time and discrete-time signals and systems.
2. To provide students with an analytical foundation for further studies in Communication Engineering and Digital Signal Processing.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand the representations and classifications of the signals and systems.
2. Model linear systems using time and frequency domain approaches for both continuous-time and discrete-time models.
3. Analyze signals and systems using both time domain and frequency domain techniques.
4. Understand the generation of a discrete-time signal by sampling a continuous-time signal.
5. Understand the design of analogue filters.
6. Apply software tools, particularly MATLAB, to laboratory exercises for experimenting with theories, and to the analysis and design of signals and systems.
7. Appreciate the advantages and disadvantages of using the different representations and modeling approaches.

Category B: Attributes for all-roundedness

8. Present ideas and findings effectively.
9. Think critically.
10. Learn independently.
11. Work in a team and collaborate effectively with others.

Syllabus:

1. Signal Representation
   Signal Classification, Continuous and Discrete-Time Signals, Random Signals. Time-Domain and Frequency-Domain Representations.
2. Continuous-Time and Discrete-Time Systems
   Impulse Representation and Convolution, Linear Time-Invariant Systems. Properties of Systems: Causality, Time Invariance, Linearity, Systems with Memory, Inverse of a System, Stability. LTI Systems: Differential and Difference Equation Representation, Block Diagram Representations.
3. Fourier Representations for Signals
   Reviews on Periodic and Nonperiodic Signals, Continuous and Discrete Signal, Fourier Series and Transform, Frequency Spectra. Properties of Fourier Representations, Time Functions, Applications on System Frequency Response and Signal Frequency Spectrum. Frequency Response of LTI Systems, Sampling. Discrete-Time Fourier Transform, Discrete Fourier Transform, Circular Convolution.
4. Laplace Transform
   Definition and Properties of Laplace Transform, Inversion of Laplace Transform, Bilateral Laplace Transform. Transform Analysis of LTI Systems, Poles and Zeros. Relationship of Laplace Transform and Fourier Transform.

5. *z*-Transform
   Definition and properties of *z*-Transform. Inverse *z*-Transform: Power Series Expansion, Partial-Fraction Expansion. *z*-Transfer Analysis of LTI Systems, Frequency Response. Mapping between *z*-Plane and *s*-Plane.

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

Laboratory Experiments:

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

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

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

Reference Books:

1. Ed. Kamen and Bonnie Heck, *Fundamentals of Signals and Systems Using the Web and Matlab*, 2/e, Prentice-Hall, 2000.
2. Simon Haykin and Barry Van Veen, *Signals and Systems*, Wiley, 2003.
3. M.J. Roberts, *Signals and Systems: Analysis Using Transform Methods and MATLAB*, McGraw-Hill, 2003.
4. Charles L. Phillips, et al., *Signals, Systems, and Transforms,* 3/e, Prentice-Hall, 2003.

SUBJECT DESCRIPTION FORM

Subject Title:	Object-Oriented Design and Programming	**Subject Code:**	EIE320
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 36 hours Laboratory 6 hours (Equivalent to 18 laboratory hours)

Pre-requisite: Computer Programming (ENG236) **Co-requisite:** nil **Exclusion:** nil

Objectives:

This subject will provide students with the principles of object orientation from the perspective of Java implementation and UML. Students are expected to learn the concepts of and practical approaches to object-oriented analysis, design and programming using UML and Java.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the principles of object oriented design.
2. Apply the programming language Java in object oriented software development.
3. Apply the tool UML in object oriented software modeling.
4. Develop a simple software application using the object oriented approach.

Category B: Attributes for all-roundedness
5. Learn independently and be able to search for the information required in solving problems.
6. Present ideas and findings effectively.
7. Think critically.
8. Work in a team and collaborate effectively with others.

Syllabus:

1. Introduction to Software Engineering
   Software products; the software process; process models; process visibility.
2. Java Programming Basic
   Java technologies; Java platform; Java language basic: variables, operators, expressions, statements, blocks, control flow, methods, arrays
3. Object-Oriented Programming with Java
   Objects and classes; class definition; fields, constructors and methods; object interaction; grouping objects; array and collections; designing classes; inheritance and polymorphism; managing inheritance: creating subclasses and super-classes, hiding member variables, overriding methods. Interfaces and packages.
4. Web Programming with Java
   Java applets: creating custom applet subclasses, HTML applet tag syntax, passing information from Web pages to applets. Java Servlets: architecture of servlets, client interaction, life cycle of servlets, saving client states; servlet communications, session tracking, and using server resources.
5. Unified Modelling Language (UML)
   Purposes of modeling. Structural Modeling: classes, relationships, class Diagrams, interfaces, packages, and object diagrams. Behavioral modeling interactions, use cases, use case diagrams, interaction diagrams, activity diagrams, events, signals, processes and threads. Architectural modeling: components, deployment, collaborations, patterns, frameworks, component diagrams, and deployment diagrams. Mapping UML diagrams to Java Code.

Laboratory Experiment:

1. Laboratory Work
   Students will implement an on-line shopping system using Java Servlets and Tomcat Web server. Students will use a UML software tool to write requirement specifications and design documents for the on-line shopping system.
2. Practical Work
   Students will be requested to write and debug Java programs during tutorial and lab sessions.

Method of Assessment:

Coursework: 40% Examination: 60%

The continuous assessment consists of a number of short quizzes, programming assignments, a mini-project, laboratory reports and a mid-term test.

Textbooks:

1. G. Booch, I. Jacobson and J. Rumbaugh, *The Unified Modeling Language User Guide*, Addison-Wesley, 1999.
2. D.J. Barnes and M. Kolling, *Objects First with Java: A Practical Introduction using BlueJ*, Prentice-Hall, 2003.

Reference Books:

1. H.M. Deitel and P.J. Deitel, *Java: How To Program*, 5th ed., Prentice-Hall, 2002.
2. R.C. Lee and W.M. Tepfenhart, *Practical Object-Oriented Development with UML and Java*, Prentice-Hall, 2003.
3. J. Rumbaugh, I. Jacobson and G. Booch, *The Unified Modeling Language Reference Manual*, Addison-Wesley, 1999.
4. http://java.sun.com.

SUBJECT DESCRIPTION FORM

Subject Title: Interface and Embedded Systems **Subject Code:** EIE322

Number of Credits: 3 **Hours Assigned:** Lecture/Tutorial 37 hours
Laboratory 5 hours
(Equivalent to 15 laboratory hours)

Pre-requisite: Computer System Fundamentals (EIE311) **Co-requisite:** nil **Exclusion:** nil

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Objectives:

To provide students with the concepts and techniques in designing embedded software and hardware interfaces.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Identify and model real-time requirements of products.
2. Apply embedded software techniques to satisfy functional and response-time requirements.
3. Apply circuit and computer knowledge onto product design.
4. Practice self-learning through reading of manuals and component specifications.
5. Demonstrate practical skills in the construction of prototypes.
6. Design under tradeoffs among various constraints such as manpower, program size and hardware complexity.

Category B: Attributes for all-roundedness
7. Pursue life-long learning through searching and reading technical materials.
8. Design and solve problems in general.
9. Present ideas and findings effectively.
10. Think critically.
11. Work in a team and collaborate effectively with others.

Syllabus:

1. Embedded System Hardware
   Microcontroller-based, microprocessor-based and PC-based approaches; Details of a typical microcontroller architecture e.g. the 8051 or AVR family.
2. I/O Interfacing
   Output-pin driving limitations; Current driving; inductive load driving; Pulse generation and measurement; Keyboard multiplexing, display multiplexing; LCD controllers; analog signals sensing, processing and generation.
3. Embedded Software Development and Testing
   Embedded software issues; tasks and events; Interrupt system: nesting, priority and latencies; inter-task communication, the shared-variables problem and solutions; Multitask embedded software architectures and scheduling schemes; task latencies, CPU utilization, RMS theorem; program simulator, debugger, emulator and logic/state analysis tools; hardware/software co-design issues.
4. Real-time Operating System
   Kernel services; semaphores; task priority and scheduling; priority inversion.
5. Industrial I/O Standards
   Signalling, transaction protocols, timing specifications and arbitration. e.g. RS485, PS2, I^2C, CAN.and USB. Case studies on USB.
6. Bus Interfacing
   Synchronous and asynchronous transfers; bus events and states, electrical buffering; storage buffering; dynamic bus sizing; data ordering and alignment; pipelined and burst transfers; ac loading effects; switching-current effects; Memory device interfaces: dynamic memory, flash memory and application-specific memories.

Laboratory Experiments:

1. Serial I/O and timer-based baud rate generation
2. Timer-based pulse width measurement
3. Timer-triggered multitasking
4. Pulse-Width-Modulated output generation.
5. USB development tool and programming.

Method of Assessment:

Continuous Assessment: 50% Examination: 50%

The continuous assessment will consist of assignments, tests and laboratory work.

Reference Books:

1. M. J. Pont, *Embedded C*, Addison-Wesley, 2002.
2. D.E. Simon, *An Embedded Software Primer*, Addison-Wesley, 1999.
3. K. Arnold, *Embedded Controller Hardware Design*, Newnes, 2001.
4. S. R. Ball, *Embedded Microprocessor Systems: Real World Design*, 3rd ed., Newnes, 2002.
5. Rai Kamal, *Embedded Systems: Architecture, Programming and Design*, McGraw-Hill, 2004.
6. S. R. Ball, *Analog Interfacing to Embedded Microprocessors: Real World Design*, 2nd ed., 2004.
7. Betty Prince, *High Performance Memories*, John Wiley & Sons, 1996.
8. W. Buchana, *PC Interfacing,Comm and Windows Programming*, Addison-Wesley, 1999.

SUBJECT DESCRIPTION FORM

Subject Title:	Integrated Project	**Subject Code:**	EIE330
Number of Credits:	2	**Hours Assigned:**	Lecture 12 hours Laboratory 9 hours Mini-project Work 69 hours Total 90 hours

Pre-requisite: Computer Systems Fundamentals (EIE311)
Basic Electricity and Electronics II (ENG238)

Co-requisite: nil

Exclusion: nil

Objectives:

At a mid-stage of the programme, this subject plays the role of applying knowledge acquired in other subjects in an integrated manner. While the emphasis will mainly be placed on the technical challenges that may encompass component evaluation, circuit design, software development and troubleshooting, students will also be given opportunities to face various non-technical difficulties behind the implementation/fabrication of electronic/information products.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Integrate and apply knowledge acquired in previous subjects.
2. Design under cost constraints and with component limitations/tolerances in mind.
3. Critically evaluate the cost-performance benefits of available components.
4. Locate and resolve problems, in both circuits and software.

Category B: Attributes for all-roundedness

5. Search, self-learn and try untaught solutions.
6. Exercise discipline and time-planning to meet deadlines.
7. Present ideas and findings effectively.
8. Think critically.
9. Learn independently.
10. Work in a team, collaborate effectively with others, and exercise leadership.
11. Exercise entrepreneurship while designing the project by addressing cost effectiveness, market position, entry barrier, user acceptance…etc.

(Note: The above outcome number will be referred to within square brackets later)

Syllabus / Operation:

The project(s) shall be of engineering development in nature [1,2,3,4,5,6,9,11] with objectively defined milestones (or **Subtasks**). The scope to be covered shall include embedded software development and circuit design, but does not exclude the possibilities of extending into areas such as DSP or RF. The project(s) shall not be close-ended in nature [2,3,5,8] and shall provide ample headroom for the more enthusiastic students to excel. Students shall work in groups of two or three [10]. Each **Subtask** will be given a certain period of time to complete. Each student will take turn in serving as the Team Leader [11] to lead the group to complete a subtask assigned. Progress will be measured by functional **Demonstrations**, and one or two written **Progress Reports** [7]. Upon the completion of the project, each group should give a demonstration/presentation [7] of the completed product and submit a **Final Report** [7]. Students are required to individually keep a **Logbook** [7] on the work performed during the entire period. The logbooks are to be evaluated and signed by the supervisor /assessor on a monthly or more frequent basis. At the end of the project, the logbook will be collected and graded.

Lectures:

Lectures are to be conducted during the first half of the semester. During these lectures, the instructor shall give clear explanation on the functional and technical requirements [2,3], with a schedule for submitting deliverables [6]. Concepts specific to the project(s), which are not yet learnt by the students, are to be covered in these lectures. Concepts behind critical use of tools and equipment shall also be strengthened [4]. Copies of supplementary/reference material shall be distributed, or, links to on-line material shall be provided for self-paced learning [5].

Guided Laboratory Experiments:

The project will normally require the students to learn to use specific tools and/or equipment [4]. Laboratory demonstrations and exercises will be arranged in the early weeks. Below are some examples:

1. Troubleshooting and measurement techniques using typical equipment.
2. Use of project-specific development tools, software and hardware.
3. Use of specialized equipment for project-specific measurements.

Self-Paced Work:

The class could well be composed of a good mix of students with different timetables. Multiple sessions of laboratory, inevitably some evening slots, will be scheduled to cater for self-paced work in the laboratory, particularly during the second half of the semester.

Method of Assessment:
Continuous assessment: 100%

Throughout the project, the subject lecturer will conduct periodic interview discussions with the student groups. On these occasions, assessment on individual student's ability and contribution will be conducted, according to the attributes detailed below.

INSIGHT	as evidenced by how well issues are understood and resolved [1,2,3,4]
DRIVE	as evidenced by initiative, diligence and tenacity [5,6,9,10]
CREATIVITY	as evidenced by ingenuity and imagination [5,8,9,10]
COMMUNICATION	as evidenced by an ability to express ideas clearly and succinctly [7]

At the completion of each subtask, one member of a team will be asked to give a demonstration to the assessor. Based on the presentation and response to questions addressed to the members, the assessor shall rate the contribution, achievement, and performance of each member. [2,4,6,7,8]
Below is a recommended assessment scheme:

Assessment type	***Weighting***	***Number of times***
Attendance	10 %	= 5
Quiz/Test	10 %	= 2
Progress Demonstrations	20 %	= 2
Logbook & Presentation	20 %	= 2
Progress& Final Reports	20 %	= 2
Final Demonstration	20 %	1

Reference Books:

To be specified by the subject lecturer for each project.

SUBJECT DESCRIPTION FORM

Subject Title:	Communication Fundamentals	**Subject Code:**	EIE331
Number of Credits:	3	**Hours Assigned:**	Lecture/tutorial 36 hours Laboratory 6 hours (Equivalent to 18 laboratory hours)

Pre-requisite:	Mathematics I (AMA201) Mathematics II (AMA202)	**Co-requisite:**	nil	**Exclusion:**	nil

Objectives:

Telecommunication occupies an important role in every society. The major objectives of this subject are to establish the foundations for the students so that they understand the telecommunication industry, its historical development, and the future trend; the fundamental principles governing the operation of telecommunication systems.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Identify various elements in a typical communication system.
2. Perform quantitative measurement for information.
3. Describe the operational details of various modulation and demodulation schemes.
4. Relate the performance of a communication to features such as signal to noise ratio and bandwidth.
5. Design a simple communication system consisting the basic building blocks.

Category B: Attributes for all-roundedness
6. Communicate effectively.
7. Think critically and creatively.
8. Work in a team collaboratively.
9. Assimilate new technological development in related field.

Syllabus:

1. Introduction
   - 1.1 Introduction to communication systems. Elements of a basic communication system. Examples of wired and wireless systems.
2. Information Theory
   - 2.1 Measure of information. Entropy.
   - 2.2 Conditional, joint and mutual information. Channel capacity.
3. Analogue Communications
   - 3.1 Amplitude modulation: double sideband, single sideband and vestigial sideband modulation, frequency spectrum and power relationship of the amplitude modulation signal, envelope detector, coherent detector, superheterodyne receiver.
   - 3.2 Angular modulation: phase and frequency modulation, frequency spectrum of the angular modulation signals, discriminator, PLL detector. Stereo FM.
   - 3.3 Noise in analogue modulation: Output S/N ratios in various analogue modulation systems. S/N ratio improvement through pre-emphasis/de-emphasis.
4. Pulse Modulation
   - 4.1 Pulse amplitude modulation, quantizing and coding, quantization noise, uniform and non-uniform quantization, pulse code modulation, delta modulation. Comparison of pulse code modulation and delta modulation systems.
   - 4.2 Time division multiplexing: concept of framing and synchronization, TDM-PCM telephone system, comparison of TDM and FDM.

Laboratory Experiment:

Experiments

1. Amplitude Modulation
2. Frequency Modulation
3. Pulse Modulation

Mini Project

1. Superheterodyne receiver

Method of Assessment:

Continuous assessment: 40% Examination: 60%

Textbook:

1. F.G. Stremler, *Introduction to Communication Systems*, Addison-Wesley, 1990.

Reference Books:

1. A.B. Carlson, P.B. Crilly and J.C. Ruthledge, *Communication Systems*, 4th ed., McGraw-Hill, 2002.
2. S. Haykin, *Communication Systems*, 4th ed., John Wiley & Sons, 2001.

SUBJECT DESCRIPTION FORM

Subject Title:	Data and Computer Communications	**Subject Code:**	EIE333
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 36 hours Laboratory 6 hours (Equivalent to 18 laboratory hours)

Pre-requisite: Communication Fundamentals (EIE331) **Co-requisite:** nil

Exclusion: Data and Computer Communications (EIE442)

Objectives:

This subject is designed to:

1. provide a solid foundation to the students about architectural concepts of data communications and computer networking
2. enable the students to master the knowledge about data communications and computer networking in the context of real-life applications
3. prepare the students for understanding, evaluating critically, and assimilating new knowledge and emerging technology about data communications
4. enable the students to understand the impact of new computer and communication technology on human society

Student Learning Outcomes:

On completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Describe the services, functions, and inter-relationship of different components within an architectural model such as Open System Interconnection (OSI) seven layer model and TCP/IP model.
2. Describe how components and subsystems in the physical layer, data link layer, and network layer inter-operate; and analyze their performance.
3. Evaluate critically the performance of some common data communications systems.
4. Design solutions to solve engineering problems that require the application of data communications technology.

Category B: Attributes for all-roundedness

5. Take up new knowledge by reading related magazines, journal papers, and trade brochure, and by analyzing new situations while taking into account various constraints.
6. Describe how rapid progress of computer and communication technology can impact on the society in various aspects, such as culture and economics.

Syllabus:

1. Communication Networks, Services, and Layered Architectures
   Evolution of networking and switching technologies. Protocols and services. Layered network architectures: OSI 7-layer model, TCP/IP architecture
2. Digital Transmission
   Baseband data transmission and line coding. Digital modulation and its applications in modems. Transmission media. Transmission impairment, data rate limit, error detection and correction.
3. Protocols in Data Link Layer
   Automatic Repeat Request (ARQ) protocol and reliable data transfer service. Sliding-Window flow control. Framing and point-to-point protocol.

4. Local Area Networks
   Media Access Control (MAC) protocols: the IEEE802.3 and IEEE802.11 standard. Interconnection of LANs: bridge, switch, and virtual LAN
5. Packet Switching Technology
   Connectionless (datagram) packet switching and virtual-circuit switching. Routing in packet networks.
6. TCP/IP Protocols
   IP packet format, addressing, subnetting, and IP routing. TCP protocol: connection management and congestion control. Dynamic Host Configuration, Network Address Translation, and mobile IP.
7. Case Studies (conducted in tutorial sessions)
   Recent development in data Communications and computer Networking.
   Selected topics: Voice over IP, Virtual Private Network, Internet2, High Speed Router design … etc.

Laboratory Experiments:

1. FSK Modem
2. Microcontroller communication over EIA323 interface
3. Protocol Analysis
4. Network Address Translation
5. Routing simulation study
6. Terminal Server over the Ethernet

Method of Assessment:

Continuous assessment: 50% Examination: 50%

The continuous assessment will consist of a number of assignments, laboratory reports, case study reports (administered in tutorial sessions), and two tests.

Textbook:

1. Leon-Garcia, Alberto, *Communication Networks: Fundamental Concepts and Key Architectures*, 2nd ed., New York : McGraw-Hill Higher Education, 2004. (PolyU Call No.: TK5101 .L46 2004)

Reference Books:

1. Stallings, William, *Data and Computer Communications*, 7th ed., Pearson/Prentice-Hall, 2004. (PolyU Call No.: TK5105 .S73 2004)
2. Tanenbaum, Andrew S., *Computer Networks*, 4th ed., Prentice-Hall, 2003. (PolyU Call No.: TK5105.5 .T36 2003)
3. Comer, Douglas, *Computer Networks and Internets: with Internet Applications*, 4th ed., Pearson/Prentice-Hall, 2004. (PolyU Call No.: TK5105.5 .C5897 2004)
4. Bertsekas, Dimitri P., *Data Networks*, 2nd ed., Prentice-Hall, 1992. (This reference is selected as a classics) (PolyU Call No.: TK5105 .B478 1992)

SUBJECT DESCRIPTION FORM

Subject Title: Applied Electromagnetics **Subject Code:** EIE338

Number of Credits: 3 **Hours Assigned:** Lecture/tutorial 39 hours
Laboratory 3 hours
(Equivalent to 9 laboratory hours)

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

1. To introduce to students the physical laws that govern the electromagnetic phenomena commonly encountered in electrical engineering systems.
2. To familiarise students with the techniques for solving problems in electromagnetics.
3. To provide students the foundation of electromagnetic field theory required for pursuing the EE programme.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional / academic knowledge and skills:

1. Apply mathematical techniques to formulate the fundamental field equations and to analyse electromagnetic phenomena related to electrical engineering systems.
2. Select the most appropriate laws/theorems/solution techniques for electromagnetic field analysis.
3. Appreciate the effect of material media and boundary conditions on the behaviour of field quantities.
4. Apply electromagnetic theory to the design of practical electromagnetic devices and components.
5. Appreciate recent developments in computational electromagnetics.
6. Have had hands-on experience in electromagnetic measurements and be able to compare/apprecipate different kinds of field plotting mechanisms, e.g., to verify Laplace's equation with a resistance network.

Category B: Attributes for all-roundedness:

7. Appreciate the engineering applications of electromagnetic theory.
8. Appreciate the importance of electromagnetics from a historical perspective.
9. Interpret the physical meaning and phenomena behind mathematical equations and computed results.
10. Describe a physical problem mathematically and to apply mathematical tools to analyse and solve physical problems.

Syllabus:

1. Static fields: Electrostatics
   Electric fields, Coulomb's law, Gauss's law, potential, capacitance and energy storage. Magnetostatics: Biot-Savart law, magnetic fields, Ampere's circuital law, force on a current-carrying conductor, Lorentz force and energy storage.
2. Time-varying Fields
   Faraday's Law and Lenz's Law; self-inductance, mutual inductance and stored energy.
3. Mathematical Preleminaries
   Vectors, vector and scalar product. The operators, grad, div and curl. Concept of line, surface and volume integrals. Stokes's and divergence theorems.
4. Maxwell's Equations and EM Waves
   Maxwell's equations in integral form as a restatement of fundamentals. Differential form. The continuity equation. The displacement current. The wave equation, plane polarized wave, velocity of propagation and energy flows.
5. Material Media
   Dipole, polarisation, permittivity, dielectrics and capacitors. MMF, ferromagnetism, permeability, reluctance and permeance, magnetisation curve and hysteresis. Magnetic circuits.

6. Solution of Static Field Problems
   Hand-mapping, method of images, numerical and computer-based methods. Field analogues. Estimation of conductance, inductance, capacitance and field quantities from field plots.
7. Electromagnetic Design
   Magnetic circuit design for inductors, actuators and rotating machines. Design of cable insulation and capacitors. Concepts of electromagnetic interference and screening.

Laboratory Experiments:

1. Field plotting using resistance and impedance networks.
2. Field plotting using the Electrolytic tank.
3. Field plotting using the resistive paper.

Method of Assessment:

Continuous Assessment: 30% Examination: 70%

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

Reference Book:

1. W. H. Hayt, Jr. and J. A. Buck, *Engineering Electromagnetics*. 6th ed., Boston: McGraw Hill, 2001.

SUBJECT DESCRIPTION

Subject Title:	English for Engineering Students	**Subject Code:**	ELC3501
Number of Credits:	2	**Hours Assigned:**	Seminar 2 hours / bi-weekly for 14 sessions 28 hours
Group Size: 20 (maximum)			

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

To develop those English language skills required of engineering students to communicate effectively in their future professional careers. Attention will be given to helping students develop the core competences identified by the University as vital to the development of effective life-long learning strategies and skills.

Student Learning Outcomes:

By the end of the subject, students should be able to use appropriate language and text structure to:

Category A: Professional/academic knowledge and skills
1. Write reports related to technical studies.
2. Write workplace correspondence related to engineering professions.
3. Present information and ideas professionally.

Category B: Attributes for all-roundedness
4. Communicate effectively in speech and in writing.
5. Work individually on their own initiative, and as team members.
6. Engage in lifelong learning for career development and personal growth.

Syllabus:

1. Written Communication
   Identifying and writing functions common in technical subject discourse; understanding and applying principles of technical text structure; developing paraphrasing, summarising and referencing skills; improving editing and proofreading skills; achieving appropriate tone and style in technical and report writing; selecting and using relevant content, appropriate style, acceptable format, structure and layout in letters, memoranda and reports.
2. Spoken Communication
   Recognising the purposes of and differences between spoken and written communication in English in professional contexts; identifying and practising interactional and linguistic skills for oral presentations; preparing and delivering presentations.
3. Language Appropriacy
   Introducing notions of context-sensitive language use in both spoken and written English.
4. Language Development
   Improving and extending relevant features of students' grammar, vocabulary and pronunciation.

Teaching and Learning Approach and Teaching Schedule:

The subject is designed to introduce students to the communication skills, both oral and written, that they may be expected to need to function effectively in their future professions. These skills will be necessary for successful employment in any organisation where internal and/or external communication is conducted in English.

The study method is primarily based on seminars which will include discussions, role-play, individual and group activities. In addition to learning materials specially prepared by English Language Centre staff, use will be made of information technology and the ELC's Centre for Independent Language Learning. Teachers will also recommend additional reference materials as required. A considerable amount of individual self-access learning is expected of students.

Method of Assessment: Continuous Assessment: 100%

Reference Books:

Written Communication

1. Bilbow, G.T, *Business Writing for Hong Kong*, Hong Kong: Longman, 2000.
2. Guffey, M.E., *Essentials of Business Communication*, 6th ed., Ohio:South-Western College Pub, 2004.
3. Houp, K.W. (et al.), *Reporting Technical Information*, New York: Oxford University Press, 2002.
4. White, F.D., *Communicating Technology: Dynamic Processes and Models for Writers*, New York: Harper Collins College Publishers, 1996.

Spoken Communication

1. Conradi, M. and Hall, R., *That Presentation Sensation*, London: Pearson Education Ltd, 2001.
2. Sampson, E., *Creative Business Presentation: Inventive Ideas for Making an Instant Impact*, London: Kogan Page, 2003.
3. Walther, G. R., *Power Talking Skills: How to Say What You Mean and Get What you Want*, A video seminar. Newcastle, WA: Speaking From Experience, Inc, 1996.
4. *Longman Dictionary of Contemporary English*, Harlow: Longman, 2003.

SUBJECT DESCRIPTION FORM

Subject Title:	Engineering Management	**Subject Code:**	ENG306
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 42 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

This subject will provide students with:

1. Skills for analysing and applying the basic principles and techniques involved in management of people and engineering activities in the production of goods and services. Techniques learned will enable students to carry out operations in an organization for the purposes of organizing, planning and control of project and process activities.
2. Skills in the use and understanding of different quality management tools and techniques in an organisation, hence enable students to interpret the quality work content of typical jobs.
3. The ability to apply ethical and business behaviours in engineering organizations in the changing environment in which they operate.
4. The ability to apply the change management techniques and enable students to evaluate the changing factors that affect the change process before implementation of any changes.

Student Learning Outcomes:

Category A: Professional/academic knowledge and skills
Category B: Attributes for all-roundedness

1. To analyse the organisation structure, and identify the planning and strategic management factors affecting the success of organizations in both manufacturing, and service sectors. (Objective 1 and Syllabus Item 1). Category A
2. To apply appropriate management techniques to improve organization structure and procedures, and quality management. (Objective 2 and Syllabus Item 2). Category A
3. To describe and differentiate between the project management objectives and requirements, and select an appropriate project management technique and apply it to analyze project activities. (Objective 1 and Syllabus Item 3). Category A
4. To be able to analyse factors affecting the changes in the work environment, and be able to control and manage the change activities. *(Objective 4 and Syllabus Item 4). Categories A & B*
5. To discuss the environmental factors that affect on operations of engineering organizations in Hong Kong, and to recognise ethics and business behaviours in conducting business. (Objective 3 and Syllabus Item 5). Categories A & B

Syllabus:

1. Introduction.
   General management concepts in organizations; functions & types of industrial organizations, structure, corporate objectives, strategy and policy
2. Industrial Management
   Roles of managers. Process of management, planning, organising, motivating, leading and controlling of social and engineering activities. Quality management and tools
3. Industrial Engineering Planning
   Project management, project specifications, scope and objectives, work breakdown structure and organizational breakdown structure. Tools that support engineering operations; scheduling, business process re-engineering, etc
4. The Management of Change
   Changes due to technical innovation, political-legal, economic and social issues. Factors that affect the execution of changes

5. Effects of Environmental Factors
   The effects of environmental factors on the operations of engineering organizations in Hong Kong, e.g. legal aspects of employment; professional codes of conduct for engineers; contracting; product liability; sources, effect and control of environmental pollutants.

Teaching and Learning Approach:

A mixture of lectures, tutorial exercises, and case studies will be used to deliver the various topics in this subject. Some of which will be covered in a problem-based format where this enhances the learning objectives. Others will be covered through directed study in order to enhance the students' ability of "learning to learn". Some case studies, largely based on real experience will be used to integrate these topics and thus demonstrate to students how the various techniques are inter-related and how they apply in real life situations.

Method of Assessment:

Coursework: 40% Examination: 60%

Coursework comprises assignments with individual and group components; and team work is an essential element in the Coursework assessment. All assessment components will require students to apply what they have learnt to realistic work applications.

Reference Books:

1. D.L. Babcock and L.C. Morse, *Managing Engineering and Technology: An Introduction to Management for Engineers*, 3rd ed., Prentice-Hall, 2002.
2. H. Kerzner, *Project Management: A Systems Approach to Planning, Scheduling and Controlling*, 9th ed., Wiley, 2005.
3. F.F. Mazda, *Engineering Management*, Addison-Wesley, 1998.
4. S.P. Robbins and M. Coulter, *Management*, 8th ed., Prentice-Hall International, 2005.
5. J.R. Jr. Schermerhorn, *Management*, 8th ed., Wiley, 2005.
6. J.A.F. Stoner, R.E. Freeman and D. Gilbert, *Management*, 6th ed., Prentice-Hall, 1995.

SUBJECT DESCRIPTION FORM

Subject Title:	Industrial Centre Training II	**Subject Code:**	IC367
Number of Credits:	4	**Hours Assigned:**	4 weeks (Year 2 Summer)

Pre-requisite:	Industrial Centre Training I (IC272)	**Co-requisite:**	nil	**Exclusion:**	nil

Objectives:

In succession to IC272, Industrial Centre Training II provided by The Hong Kong Polytechnic University Industrial Centre focus on the training for undergraduate professional engineer in the area of electronic and information engineering. The objectives of this course are:-

1. To apply and consolidate the practical skills and best practices acquired in previous training and coalesce with academic knowledge to work on engineering projects in an industrial environment.
2. To develop the technical and managerial skills of undergraduate engineer to tackle open-ended problem with preparation to participate in engineering project in their future career.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand the process and develop the skills of planning, market survey, and delivery of an engineering project in addition to the technical aspects.
2. Consolidate, gain confidence and demonstrate technical competence in handling engineering projects and producing prototypes for design and development in the area of electronic and information engineering.
3. Understand the importance of safety, responsibility and regulation in the practice of engineering.
4. Apply fundamental principles and knowledge in electronic and information engineering and to develop practical solutions to solve problems in the development phase of an engineering project.
5. Deploy available resource to fabricate working prototype with relevant engineering documentation under a multidisciplinary industrial environment.

Category B: Attributes for all-roundedness

6. Communicate effectively and work in harmony with other members in a team and develop leadership capability.
7. ommunicate effectively using Internet.
8. emonstrate critical and creative thinking in electronic project development and handling.
9. ractise creativity and demonstrate initiative with a learn-by-practice approach to produce solutions for open-ended problems in an engineering context.
10. Understand the importance of training and the needs for continual professional development in professional engineering career.

Syllabus:

1. IC 1103 – Integrated Training in Electronic & Information Engineering (4 weeks)
   1.1 Industrial Centre Training II takes the form of technical projects with typically 4 to 6 students in a team working in the Industrial Centre for a minimum of 4 weeks.
   - The project approach of Integrated Training II provides an arena for students to develop their personal ability and attitude in teamwork and leadership in real world industrial environment. Projects are structured so that student can bring their training, knowledge, creativity and experience together and consolidate them into one coherent activity.
   - Project work is an important and integral part in the working lives that virtually all engineers will come across at various stages in their career path. These engineering projects may include software and hardware design, planning, costing, parts manufacture, printed circuit board (PCB) and chassis assembly, testing, documentation, evaluation and presentation.
   - The team will simulate a project team or a young company being assigned the task of design and manufacture a prototype of a consumer electronic or IT product for a client. The team has to conduct a market research to come up with an appropriate design and marketing strategy. At the

end of the training period, the team has to create a Web site and present their achievement, manufacturing plan and business plan of this product.

- A professional engineer, particularly in the role of project leader, must have a sound appreciation of all these elements. By accomplishment of a project, students should be able to polish their creativity, understand and appreciate the elements, difficulties and open-ended type problems and solutions that are common in their future career as a professional engineer.

In general, the following task or activities will be required for each project group: -

1. Create new equipment, product or service in the area of electronic and information engineering.
2. Review an existing equipment, design prototype, product or service in the area of electronic and information engineering and deliver an improved prototype.
3. Planning and utilize resources in a multidiscipline industrial environment and deliver the output of the project.
4. Produce engineering documentation for client.
5. Produce and present the project on the Internet for investors or prospective clients.

Method of Assessment:

The assessment is comprised of 100% continuous assessment based on the performance of project deliverables. In an industrial environment, student will experience the discipline and devotion of working condition of junior engineer. Personal ability including creativity, leadership, working attitude, courage, responsibility, problem solving power and presentation style of student will be assessed together with the technical part of the project.

Reference Book:

To be specified according to the nature and contents of individual project.

SUBJECT DESCRIPTION FORM

Subject Title:	VLSI & Computer-Aided Circuit Design	**Subject Code:**	EIE401
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 35 hours Laboratory 7 hours (Equivalent to 21 laboratory hours)

Pre-requisite: Electronic Circuits (EIE304) **Co-requisite:** nil **Exclusion:** nil

Objectives:

To provide students with
1. insights into the area of VLSI circuits and systems based on silicon;
2. a broad spectrum of awareness of the many facets of VLSI design using CAD tools;
3. hands-on experience on VLSI design.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the fundamentals of CMOS VLSI and associated technologies.
2. Solve problems in the design of CMOS logic circuits, with particular reference to speed and power consumption.
3. Acquire hands-on skills of using CAD tools in VLSI design.
4. Appreciate the design process in VLSI through a mini-project on the design of a CMOS sub-system.

Category B: Attributes for all-roundedness
5. Communicate effectively.
6. Think critically and creatively.
7. Assimilate new technological and development in related field.

Syllabus:

1. Overview of VLSI Design
   VLSI design methodology; functional, logic and physical design; gate arrays and standard cells, programmable logic devices; system-on-chip.
2. CMOS Fabrication and Layout
   Fabrication processes in CMOS VLSI; latch-up; characteristics of devices in VLSI; mask layout techniques and design rules.
3. CMOS Logic Circuits
   Transmission gates; static and dynamic gates and flip flops; domino logic; low power design; design for testability.
4. High Speed CMOS Logic Design
   Delay estimation and transistor sizing; device and interconnect capacitance; optimal delay design of buffers; power supply grid; clock distribution.
5. CAD Techniques in VLSI Design
   Circuit and logic simulation, mask layout, layout extraction and verification; standard cell placement and routing.
6. Sub-system Design
   Examples to illustrate sub-system design in VLSI: data path in a microprocessor, random-access-memory.

Laboratory Experiment:

1. Practice of CAD tools for VLSI design: circuit simulation, mask layout, layout extraction and verification, placement and routing.
2. Mini-project: design of a sub-system for computer or communication applications.

Method of Assessment:

Continuous assessment: 50% Examination: 50%

The continuous assessment will consist of a mini-project, a number of assignments, and two tests.

Reference Books:

1. N.H. E. Weste and D. Harris, *CMOS VLSI Design – A Circuits and Systems Perspective*, 3rd ed., Reading: Addison Wesley, 2005.
2. M.M. Vai, *VLSI Design,* 1st ed., Boca Raton: CRC Press, 2001.
3. D.A. Hodges, H.G. Jackson and R.A. Saleh, *Analysis and Design of Digital Integrated Circuits,* 3rd ed., New York: McGraw-Hill, 2003.
4. W. Wolf, *Modern VLSI Design: System-on-chip Design*, 3rd ed., Englewood Cliffs: Prentice-Hall, 2002.

SUBJECT DESCRIPTION FORM

Subject Title: Power Electronics

Subject Code: EIE402

Number of Credits: 3

Hours Assigned: Lecture/Tutorial 39 hours
Laboratory 3 hours
(Equivalent to 9 laboratory hours)

Pre-requisite: Basic Electricity and Electronics I (ENG237)
Basic Electricity and Electronics II (ENG238)
Electronic Circuits (EIE304)

Co-requisite: nil

Exclusion: nil

Objectives:

To introduce the fundamental principles, concepts, techniques, methods, and circuits of power electronics and to familiarize students with the design procedures of power electronic systems.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand the fundamental principles and applications of power electronics circuits.
2. Solve problems and design switching regulators according to specifications.
3. Use Computer-aided techniques for the design of power converter circuits.
4. Appreciate the latest developments in power electronics.

Category B: Attributes for all-roundedness

5. Communicate effectively.
6. Think critically and creatively.
7. Assimilate new technological and development in related field.

Syllabus:

1. Introduction to Power Electronics
   Overview of power electronics systems: applications and areas of future development.
2. Basic Switching Regulator Topologies
   Basic operations. Critical inductance criterion. Continuous- and discontinuous-conduction modes. Practical considerations. Merits and drawbacks.
3. State-Space Averaging and Linearization
   State equations. State-space models. State-space averaging for continuity. Small-signal approximation for linearity. Applications of approximation techniques. Switching regulator transfer functions.
4. Switching Regulators with Transformer Isolation
   Flyback converter. Forward converter. Half- and full-bridge converters. Push-pull converter. Areas of application.
5. Feedback Control Design
   Classical control design. Bode plot and Nyquist stability criterion. Voltage- and current-mode controls.
6. Magnetic Components
   Inductor. Transformer. Saturation, hysteresis, and residual flux.
7. Latest Development in Power Electronics

Laboratory Experiments:

1. Computer-aided design of switching regulator.
2. Design of a buck converter.

Method of Assessment:

Continuous assessment: 40% Examination: 60%

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

Reference Books:

1. Y.S. Lee, *Computer-Aided Analysis and Design of Switch-Mode Power Supplies*, Marcel Dekker, New York, 1993.
2. J.P. Agarwal, *Power Electronic Systems: Theory and Design*, Prentice-Hall, 2001.
3. S. Cuk and R.D. Middlebrook, *Advances in Switched-Mode Power Conversion, Vol. 1, 2 and 3*, Teslaco, 1983.
4. J.G. Kassakian, M.F. Schlecht and G.C. Verghese, *Principles of Power Electronics*, Addison-Wesley, 1991.
5. A.I. Pressman, *Switching Power Supply Design*, 2nd ed., McGraw-Hill, 1999.

SUBJECT DESCRIPTION FORM

Subject Title: High Frequency Circuit Design **Subject Code:** EIE403

Number of Credits: 3 **Hours Assigned:** Lecture/Tutorial 39 hours
Laboratory 3 hours
(Equivalent to 9 laboratory hours)

Pre-requisite: Basic Electricity and Electronics I (ENG237)
Basic Electricity and Electronics II (ENG238)
Electronic Circuits (EIE304)

Co-requisite: nil **Exclusion:** nil

Objectives:

Designing electronic circuits in the tens and hundreds of MHz range can be a challenge because the presence of parasitics poses a lot of problems in the physical circuits. This makes designing high-frequency circuits a rather specialized subject, although much can still be resolved under the lumped circuit assumption. But as the frequency moves up to the GHz range, the use of lumped circuit models can be seriously handicapped because voltage and current change within the physical boundary of the circuit as a result of the wavelength being comparable to the dimension of the physical circuits. A different approach must be used to look at the problem. This course will look mainly at circuit design in the tens to hundreds MHz range and will touch upon some basics for the GHz range design.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the characteristics of transistor devices at high frequencies
2. Analyze high-frequency roll-off problems in transistor amplifiers
3. Design amplifier circuits for high-frequency applications
4. Design matching filters
5. Solve design problems using Smith charts, e.g., transmission line and antenna matching
6. Understand the stability problems in power amplifiers

Category B: Attributes for all-roundedness
7. Communicate effectively
8. Think critically and creatively
9. Assimilate new technological development in related field

Syllabus:

1. Analogue Circuit Fundamentals
   Review of BJT and MOSFET characteristics and models. Basic amplifier configurations and building blocks. Frequency response of transistor amplifiers. Pole splitting. Basic feedback configurations and compensations methods. Review of op-amp circuits and non-ideal behaviours.
2. Radio Frequency Circuit Design
   Effects of load capacitance and feedback capacitance (Miller effect). Important characteristics of transistor capacitances. Choice of transistors for high-frequency design. Configurations of high-frequency amplifiers. e.g., shunt-series pair, follower plus CE, CE plus CB (cascode), follower plus CB (DA). Equivalent ac models for calculation of amplifier response roll-off. Design examples: wideband differential amplifiers and op-amps.
3. High-frequency Filter Design
   Operational Transconductance Amplifier (OTA or gm). OTA design principles. BJT and MOS OTAs. Gm-C filter design principles. Method of signal flow graphs.

4. Distortion Analysis
   Power series analysis of frequency-independent circuits (due to only resistive nonlinearity). Harmonic distortion. Gain expansion and compression. Effects of odd and even order terms. Typical spectra of input and output signals. Inter-modulation (IM) under two sinusoids. Generation of sum and difference components. Interaction of third IM with fundamental frequencies. Problems in receiver design.
5. Impedance Matching
   Principles of narrowband impedance matching. Maximum power transfer. Methods via Q-factor. L-circuits, T-circuits, pi-circuits, tapped capacitor circuits, double-tuned circuits.
6. Transmission Line Matching
   Modelling of transmission lines. Telegraphic equations. Use of Smith chart for matching. Matching of antennae.
7. Power Amplifier Design
   Basic principles of tuned amplifiers. Design procedures. Use of scattering parameters and other 2-port parameters. Concept of power gains. Stability factors. Neutralization and internal feedback.

Mini-project:

Each student is required to complete a mini-project on either one of the following topics:

Topic 1: High frequency roll-off of transistor amplifiers

Topic 2: Design of matching circuits

Topic 3: Transmission line matching

Method of Assessment:

Continuous assessment: 40% Examination: 60%

The continuous assessment consists of assignments, mini-projects, and a test.

Textbooks:

1. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, *Analysis and Design of Analog Integrated Circuits,* New York: Wiley, 2001.
2. K.R. Laker and W.M.C. Sansen, *Design of Analog Integrated Circuits and Systems*, New York: McGraw-Hill, 1994.

Reference Books:

1. Herbert L. Krauss, Charles W. Bostian and Frederick H. Raab, *Solid State Radio Engineering,* New York: Wiley, 1980. (Classic reference)
2. W. Alan Davis and Krishna K. Agarwal, *Radio Frequency Circuit Design,* New York: Wiley, 2001.
3. P. Horowitz and W. Hill, *The Art of Electronics,* New York: Cambridge University Press, 1989. (Classic reference)

SUBJECT DESCRIPTION FORM

Subject Title:	Digital Signal Processing	**Subject Code:**	EIE413
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 39 hours Laboratory 3 hours (Equivalent to 9 laboratory hours)

Pre-requisite:	Mathematics I (AMA201) Mathematics II (AMA202) Linear Systems (EIE312)	**Co-requisite:**	nil	**Exclusion:**	nil

Objectives:

This is an essential subject to provide fundamental signal processing techniques important to many communications and multimedia subjects. Both theory and practical realisation are stressed. After completion of the subject, the student should be able to understand the design principles and the implementation of digital filters and DFT/FFT, and be able to make use of random signal processing concepts and wavelets to perform some simple applications.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand the theories behind and to be able to realize filter equations and DFF/FFT for practical applications.
2. Design FIR/IIR filters on paper by using MATLAB, and implement the design using a programming language and/or digital processor.
3. Understand the basic theory of wavelet transform and the concepts of using simple wavelets for data compression and feature extraction.
4. Understand the importance of random signal processing in DSP, and its application on statistical measures and data modelling.
5. Possess basic background in the DSP area sufficiently for supporting subjects such as: communication principles, computer networks, speech processing, image processing, multimedia, and video technology.
6. Possess necessary background for advance studies in DSP, especially for taking the subject Advanced Digital Signal Processing, or other multimedia signal processing subjects.

Category B: Attributes for all-roundedness

7. Present ideas and findings effectively.
8. Think critically.
9. Learn independently.
10. Work in a team and collaborate effectively with others.

Syllabus:

1. Revision on the Discrete-time Systems and General Realization Techniques
   - 1.1 Basic definition of discrete-time signal. Sampling of continuous-time signal. Time invariance, causality, linearity, convolution. The z-transform and its inverse, delay property and its meaning in the time domain, frequency response and stability.
   - 1.2 Realization of digital filter structures, direct realization, canonic form, cascade and parallel realization of digital systems.
2. Design of Infinite Impulse-response (IIR) and Finite Impulse-response (FIR) Digital Filters
   - 2.1 Revision of analog systems, Butterworth filters and Chebyshev filters. Types of digital filters: IIR and FIR. IIR filter design, bilinear transformation, frequency scaling, transformation from prototype low-pass filter to high-pass filter and band-pass filter. Impulse-invariant and step-invariant approaches.
   - 2.2 FIR filter analysis, Fourier series approach, windowing, Gibbs phenomenon, commonly used windows, concept of linear phase, frequency transformation, low-pass, band-pass, high-pass filters and filter band design.

3. Discrete Fourier Transform and Convolution
   3.1 Convolutions and its applications, circular convolution, convolution by section, overlap-add method and overlap-save method.
   3.2 Fourier series and continuous-time Fourier transform. Discrete Fourier series and discrete Fourier transform (DFT), properties of the DFT, Fourier analysis using the DFT, convolution theorem, the fast Fourier transform (FFT) algorithm and implementation of the FFT.

4. Wavelets
   4.1 Short-time Fourier transform, continuous wavelet theory, dyadic structure, discrete wavelet transform, wavelet and scaling functions, multi-resolution analysis, sample applications of wavelet transform.

5. Random Signal Processing
   5.1 Revision on Random Processes, cross- and auto-correlations, bias and consistence. Power spectrum estimation, non-parametric and parametric approaches, AR, ARMA models.

6. Advanced DSP and Applications
   To discuss not less than one of the following topics,
   6.1 Architectures of digital signal processors and DSP chips.
   6.2 Adaptive digital filters: Concepts of adaptive filtering, basic Wiener filter theory, basic LMS adaptive algorithm. Application example.
   6.3 Multirate digital signal processing: Concepts of multirate signal processing, design of practical sampling rate converters. Application examples.

Laboratory Experiments:

The student will carry out at least three laboratory exercises on the topics below:

1. Laboratory 1: MATLAB for DSP laboratory exercises.
2. Laboratory 2: FIR filter analysis and design.
3. Laboratory 3: IIR filter analysis and design.
4. Laboratory 4: Properties of DFT and the fast Fourier transform.
5. Laboratory 5: Wavelet properties and its applications.
6. Laboratory 6: Parametric power spectrum estimation.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

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

Textbooks:

1. S.K. Mitra, *Digital Signal Processing*, McGraw-Hill Education (Asia), 3rd ed., 2006 Edition.
2. E.C. Ifeacher and B.W. Jervis, *Digital Signal Processing - A Practical Approach*, Prentice-Hall (Pearson Education), 2002.

Reference Books:

1. W.D. Stanley, G.R. Doughterty and R. Doughterty, *Digital Signal Processing*, Reston Pub. Co. Ltd, Prentice-Hall International, Inc., 1984.
2. J.G. Proakis and D.G. Manolakis, *Digital Signal Processing*, 3/e., Prentice-Hall, 1996.

SUBJECT DESCRIPTION FORM

Subject Title: Computer Architecture and Systems **Subject Code:** EIE414

Number of Credits: 3 **Hours Assigned:** Lecture/Tutorial 37 hours
Laboratory 5 hours
(Equivalent to 15 laboratory hours)

Pre-requisite: Computer System Fundamentals (EIE311) **Co-requisite:** nil **Exclusion:** nil

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Objectives:

To provide students with
1. concepts and design techniques of high performance computer architectures and
2. techniques to analyse performance in time domain.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Appreciate the techniques deployed in the design of modern high performance computers.
2. Develop analytical ability in the concurrency domain.
3. Identify and resolve problems arising from concurrent hardware functional units.
4. Identify and resolve problems arising from the concurrent execution of cooperating software structures.
5. Critically evaluate the performance of computers and real-time embedded systems.

Category B: Attributes for all-roundedness
6. Present ideas and findings effectively.
7. Think critically.
8. Learn independently.
9. Work in a team and collaborate effectively with others.

Syllabus:

1. Taxonomy of Computer Architectures
   - 1.1 Revision on the classifications of computer architectures: ISA and HAS, Von Neumann, RISC and CISC.
   - 1.2 Performance issues, examples of evaluation using simulators.
2. Memory System
   - 2.1 Memory system hierarchy: locality principles; cache organizations, replacement policies and write policies; virtual memory, disk latencies and thrashing.
   - 2.2 Memory management: Logical and physical space; address translation, protection and sharing; paging and segmentation; replacement policies.
3. Pipelined Processors
   - 3.1 Pipelined ILP organization: classifications, instruction pipeline, arithmetic pipelines and pre-fetch buffers.
   - 3.2 Dependencies: data dependencies, control dependencies and resource dependencies.
4. Superscalar Processors
   - 4.1 Concurrent instruction execution: decode, issue and dispatch stages; pre-decoding; out-of-order issue and dispatch; operand availability; shelving; register renaming.
   - 4.2 Speculative execution: preserving processor consistency; the reorder buffer.
   - 4.3 Branch processing: detection, speculation and recovery schemes.
5. Concurrent Real-Time Systems
   - 5.1 Mutual exclusion and process synchronization.
   - 5.2 RTOS: Tasks and scheduling; inter-task communication methods; events; memory management user-ISR;
   - 5.3 RTOS services: Case study e.g. uC/OSII.

6. Application-Oriented Processors for Advanced Embedded Systems
   6.1 High performance embedded processors e.g. ARM
   6.2 Embedded DSP and media processors e.g. TMS 320Cxxxx & Nexperia
7. Multiprocessor Systems
   7.1 Cache coherence and memory consistency.
   7.2 Multiprocessor bus; Case study e.g. PCI.

Laboratory Experiments:

1. Superscalar simulation tool.
2. Tracing the operation of superscalar CPU by simulation.
3. Multitasking under a RTOS.
4. Handling user' s hardware interrupts under a RTOS.

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

The continuous assessment will consist of assignments, tests, laboratory work and a mini-project.

Reference Books:

1. D. Sima, T. Fountain and P Kasuk, *Advanced Computer Architectures*, Addison-Wesley, 1997.
2. J.L. Hennessy and D.A. Patterson, *Computer Architecture - A Quantitative Approach*, Morgan Kaufmann, 1996.
3. A. Siberschatz and P. Galvin, *Operating System Concepts*, 5th ed., Addison-Wesley, 1999.
4. J. Labrosse, *Micro C/OS-II*, R & D Books, Miller Freeman, 1999.
5. R. Hamal, *Embedded Systems - Architecture, Programming and Design*, McGraw-Hill, 2004.
6. D. Anderson, *PCI System Architecture*, 4th ed., Addison-Wesley, 1999.

SUBJECT DESCRIPTION FORM

Subject Title: Multimedia Technology **Subject Code:** EIE415

Number of Credits: 3 **Hours Assigned:** Lecture/Tutorial 37 hours
Laboratory 5 hours
(Equivalent to 15 laboratory hours)

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

This subject provides students with thorough understanding of multimedia technologies. After the completion of the subject, the student should be able to appreciate a wide range of techniques and standards adopted in the multimedia industry.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand the requirements of a multimedia system and the formats of different multimedia signals.
2. Understand the different multimedia standards and the technologies.
3. Design simple systems for multimedia retrieval and management.
4. Perform multimedia authoring, and to process and integrate different types of signals to form multimedia presentations.
5. Understand, describe, the technologies for streaming multimedia content over the Internet.
6. Appreciate the architectures and technologies of various multimedia systems, such us Video-on-Demand (VoD), multimedia conferencing, etc.

Category B: Attributes for all-roundedness

7. Communicate effectively.
8. Think critically and creatively.
9. Assimilate new technological and development in related fields.

Syllabus:

1. Introduction to Multimedia Systems
   Perspective of multimedia computing and communications, review of the key enabling technologies, overview of multimedia system requirements and multimedia software tools.
2. Multimedia Signal Representations
   Basics of audio/image/video file formats, introduction to MIDI (Musical Instrument Digital Interface), basics of digital video and color processing.
3. Multimedia Standards
   Image and video compression standards: JPEG, H.261/263/264, MPEG-1 and -2, MPEG-4 Facial animation.
4. Multimedia Information Indexing and Retrieval
   MPEG-7, Content-based retrieval (CBR) in image database, some existing CBR systems/applications. Digital libraries.
5. Optical Storage Media
   CD-Audio, CD-ROM, and Digital Video Disc (DVD).
6. Multimedia Authoring and Integration
   Multimedia authoring: authoring metaphors, multimedia production and presentation, SMIL: concept, structure, timelines, synchronization, implementation.
7. Multimedia Communications
   Quality of Service (QoS) requirements for multimedia communications, traffic modelling of multimedia sources, multiplexing, loss concealment, transport protocol support for multimedia communications. Multimedia on Internet: resource reservation protocol (RSVP), MBone.

8. Case Studies
   Multimedia conferencing, video-on-demand (VOD), set-top box and interactive TV, digital TV and high definition TV (HDTV).

Laboratory Experiments:

1. Analysis of MPEG video coding
2. Audio signal processing
3. Developing simple multimedia applications using SMIL
4. Multimedia production
5. Multimedia integration

Method of Assessment:

Continuous assessment: 40% Examination: 60%

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

Reference Books:

1. M. Mandal, *Multimedia Signals and Systems*, Kluwer Academic Publishers, 2003.
2. F. Halsall, *Multimedia Communications: Applications, Networks, Protocols and Standards*, Addison-Wesley, 2001.
3. Z.N, Li and Mark S. Drew, *Fundamentals of Multimedia*, Prentice-Hall, 2004.
4. C.H. Wu and J.D. Irwin, *Emerging Multimedia Computer Communication Technologies*, Prentice-Hall, 1998.
5. B. Furht, S.W. Smoliar and H.J. Zhang, *Video and Image Processing in Multimedia Systems*, Kluwer Academic Publishers, 1995.

SUBJECT DESCRIPTION FORM

Subject Title:	Distributed Systems and Network Programming	**Subject Code:**	EIE424
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 36 hours Laboratory 6 hours (Equivalent to 18 laboratory hours)

Pre-requisite:	Object Oriented Design and Programming (EIE320)	**Co-requisite:**	nil	**Exclusion:**	nil

Objectives:

This subject will provide students with the principles and practical programming skills of developing distributed systems. It enables students to master the development skill for providing distributed services on the Web. Through a series of lab exercises, students will have the chance of developing interoperable and distributed Web applications.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Understand the enabling technologies for building distributed systems.
2. Understand the different components for developing Web Services.
3. Set up and configure a standard Web Service system and develop simple Web Service applications.

Category B: Attributes for all-roundedness
4. Think critically.
5. Learn independently.
6. Work in a team and collaborate effectively with others.
7. Present ideas and findings effectively.

Syllabus:

1. Introduction to Distributed Systems
   1.1 Characteristics. Design goals. Architecture examples.
2. Enabling Tools and Techniques for Building Distributed Systems
   2.1 Networked Computing
   TCP/IP protocol suite. Socket programming.
   2.2 Component-based Software Development
   Component models. JavaBeans; CORBA; Remote Method Invocation (RMI); OM/DCOM; Enterprise JavaBeans (EJB).
   2.3 Extensible Markup Language (XML)
   XML Markup; parser; CDATA sections; XML namespaces. Document Type Definition (DTD); well-formed XML documents; document type declaration; element of type declarations; attribute declarations.
3. Distributed Services on the Web: Web Services
   3.1 Introduction to Web Services.
   3.2 Simple Object Access Protocol (SOAP): SOAP specification; message processing; use of namespaces.
   3.3 Web Services Description Language (WSDL): Role of WSDL in Web services, WSDL documents, remote web-services invocation using WSDL.
   3.4 Universal Description, Discovery and Integration (UDDI): role of UDDI in Web services; UDDI registries; discovery technologies.

Laboratory Experiment:

Practical Works

1. Remote Method Invocation (RMI)
2. Extensible Markup Language (XML)
3. XML-RPC
4. SOAP
5. WSDL
6. UDDI

Method of Assessment:

Coursework: 40% Examination: 60%

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

Textbooks:

1. M.L. Liu, *Distributed Computing: Principles and Applications*, Addison-Wesley, 2003.
2. C. Ethans, *Web Services Essential,* O. Reilly, 2002.

Reference Books:

1. R. Nagappan, *Developing Java Web services : Architecting and Developing Secure Web services using Java*, Wiley Pub., 2003.
2. U. Wahli, G.G. Ochoa, S.Cocasse, and M.Muetschard*, Websphere Version 5.1 Application Developer 5.1.1 Web Services Handbook*, IBM, 2nd ed., 2004.
3. P. Pacheco, *Parallel Programming with MPI*, Morgan Kaufmann, 1998.
4. S. Graham, etal*, Building Web Services with Java*, Sams, 2nd Ed, 2004.

SUBJECT DESCRIPTION FORM

Subject Title:	Video, Image, and Audio Processing	**Subject Code:**	EIE425
Number of Credits:	3	**Hours Assigned:**	Lecture/tutorial 39 hours Laboratory 3 hours (Equivalent to 9 laboratory hours)

Pre-requisite: Linear Systems (EIE312) **Co-requisite:** nil

Exclusion: Speech and Image Processing (EIE421)

Objectives:

To provide a broad treatment of the fundamentals of speech, image, audio and video processing.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand the fundamentals of speech, image, audio and video signal processing and associated techniques.
2. Solve practical problems with some basic speech, image, audio and video signal processing techniques.
3. Design simple systems for realizing some multimedia applications with some basic speech, image, audio and video signal processing techniques.

Category B: Attributes for all-roundedness

4. Present ideas and findings effectively.
5. Think critically.
6. Learn independently.
7. Work in a team and collaborate effectively with others.

Syllabus:

1. Speech processing
   - 1.1 Physiology of speech generation: characteristic of speech sounds; glottal excitation; speech production models: discrete-time speech production model; discrete-time filter model for speech production; source excitation model.
   - 1.2 Linear prediction analysis: All-pole models; least-squares estimation; spectral matching; spectral envelopes; applications of LP analysis.
   - 1.3 Speech coding: Coder's attributes; waveform coding; vocoders; analysis-by-synthesis coding; code-excited linear predictive vocoder; regular pulse-excited LPC.
2. Image processing
   - 2.1 Fundamentals of digital image: Digital image representation and visual perception, image sampling and quantization.
   - 2.2 Image enhancement: Histogram processing; Median filtering; Low-pass filtering; High-pass filtering; Spatial filtering; Linear interpolation, zooming.
   - 2.3 Image coding and compression techniques: Scalar and vector quantizations; Codeword assignment; Entropy coding; Transform image coding; Wavelet coding; Codec examples.
   - 2.4 Image analysis and segmentation: Feature extraction; Histogram; Edge detection; Thresholding.
   - 2.5 Image representation and description: Boundary descriptor; Chaincode; Fourier descriptor; Skeletonizing; Texture descriptor; Moments.

3. Audio processing
   3.1 Fundamentals of digital audio: Sampling; Dithering; Quantization; psychoacoustic model.
   3.2 Basic digital audio processing techniques: Anti-aliasing filtering; Oversampling; Analog-to-digital converion; Dithering; Noise shaping; Digital-to-analog Conversion; Equalisation.
   3.3 Digital Audio compression: Critical bands; threshold of hearing; Amplitude masking; Temporal masking; Waveform coding; Perceptual coding; Coding techniques: Subband coding and Transform coding; Codec examples.

4. Video processing
   4.1 Fundamentals of digital video: Basics of digital video; digital video formats.
   4.2 Basic digital video processing techniques: Motion estimation; Interframe filtering; Motion-compensated filtering; Error concealment.
   4.3 Video coding techniques: Temporal redundancy; Spatial redundancy; Block-based motion estimation and compensation; Coding techniques: Model-based coding, Motion-compensated waveform coding; Codec examples.

Laboratory Experiments:

1. Audio compression
2. Speech signal analysis
3. Psychoacoustic behavior
4. Motion estimation and its application in video coding
5. Image processing techniques
6. Image compression

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

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

Textbooks:

1. R.C. Gonzalez and R.E. Woods, *Digital image processing*, 2nd ed., Prentice-Hall, 2002.
2. J.R. Deller, J.G. Proakis and J.H.L. Hansen, *Discrete-Time Processing of Speech Signal*, Macmillan Pub. Company, 2000.

Reference Books:

1. Yao Wang, Joern Ostermann and Ya-Qin Zhang, *Video Processing and Communications*, Prentice-Hall, 2002.
2. Ken C. Pohlmann, *Principles of digital audio*, 3rd ed., McGraw-Hill, 1995.
3. L.R. Rabiner and B.H. Juang, *Fundamentals of Speech Recognition*, Prentice-Hall, 1993.
4. T.P. Barnwell III, K. Nayebi and C.H. Richardson, *Speech Coding: A Laboratory Textbook*, John Wiley & Sons, Inc., 1996.

SUSUBJECT DESCRIPTION FORM

Subject Title:	Honours Project	**Subject Code:**	EIE433
Number of Credits:	6	**Hours Assigned:**	Structured Study 84 hours Self-work/Guided Study 168 hours Total 252 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

Engineering is the science of the applying scientific principles and technology to improve human life. This may take the form of invention, design, implementation, so on and so forth. The objective is to come up with solutions to existing problems while considering various constraints. Hence the students studying in a curriculum will be most benefited from doing a project in order to have the chance to practise hands-on application of the knowledge the student has learned throughout the curriculum, while producing something useful or valuable. Against this background, there is a final year project (FYP) component in the curriculum with the objectives:

1. To provide the opportunity to the student so that he/she can apply what he/she has learnt in previous stages in a real-life engineering context.
2. To enable the student to acquire and practise project management skills and discipline while pursuing the FYP.
3. To enable the student to apply engineering knowledge in analysis of problems and synthesis of solution while considering various constraints.

Student Learning Outcomes:

On successful completion of the final year project, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Understand, take up, and master the basic knowledge and skills related to the specific project.
2. Understand the background, the requirements, objectives, and deliverables to be produced.
3. Integrate and apply knowledge learnt in present and previous stages (vertical integration) and across different subjects (horizontal integration).
4. Apply various professional skills in electronic and information engineering to achieve the objectives of the project.
5. Learn to use new tools and facilities, and to gather new information, for the conduction of the project.

Category B: Attributes for all-roundedness

6. Work under the guidance of a supervisor while exercising self-discipline to manage the project.
7. Review critically the student' s own achievement and other related works.
8. Communicate effectively with related parties (supervisor, peers, vendors).
9. Work with others (team partners, outsource company, technical support staff) collaboratively.
10. Realize different constraints, and to make appropriate compromise, when designing a solution to an engineering problem.
11. Disseminate effectively the results and knowledge learnt in the project.
12. Transfer the knowledge and skills learnt in the project.

Syllabus:

The progression of the project will be guided by a framework, which consists of the following indicative stages. The specific details will vary from project to project.

Project Specification

In this stage, the student will work in conjunction with the project supervisor to draw up a concrete project plan specifying at least the following:

1. Background of the project
2. Aims and objectives

3. Deliverables
4. Methodology to be adopted
5. Schedule

Project Execution

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

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

Project Report

After the project is finished, it is important that the student can be able to disseminate the results so that the results can be reviewed by others. Through this dissemination process, project achievements can be communicated, experience can be shared, knowledge and skills learnt can be retained and transferred. The following elements will be important:

1. Project log book
2. Project report (hardcopy and softcopy)
3. Presentation
4. Performance in a Question-and-Answer session

Method of Assessment:

Continuous Assessment: 100%

Reference Books:

To be specified by the project supervisor for each project.

SUBJECT DESCRIPTION FORM

Subject Title: Telecommunication Networks **Subject Code:** EIE443

Number of Credits: 3 **Hours Assigned:** Lecture/tutorial 39 hours
Laboratory 3 hours
(Equivalent to 9 laboratory hours)

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

This subject aims at introducing to the students the knowledge about the telecommunication industry: its services and market, the theoretical basis about performance (queuing theory) and operation (multiplexing, switching, routing, and signaling).

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills

1. Describe and relate fundamentals of telecommunication networks and associated technologies.
2. Apply the principles of queuing theory in evaluating the performance of telecommunication networks.
3. Solve problems and design simple systems related to telecommunications.
4. Appreciate the reasons for switching, and the relative merits of the possible switching modes, e.g. packet and circuit switching
5. Understand the principles of the internal design and operation of communication switches, and the essence of the key protocols that are used with switched networks

Category B: Attributes for all-roundedness

6. Communicate effectively
7. Think critically and creatively
8. Assimilate new technological development in related field

Syllabus:

1 Overview of Telecommunication Networks and Industry
- 1.1 Trends, technologies and network elements in telecommunication networks.
- 1.2 Telecommunication industry in Hong Kong: Regulatory bodies, major telecommunication operators, major telecommunication services and activities.

2. Queuing Theory and Traffic Engineering
- 2.1 Poisson source characteristics.
- 2.2 Analysis of different queuing systems: M/M/1, M/M/2, M/M/N/N queues.
- 2.3 Traffic engineering: Erlang' s formula, blocking probability.

3. PCM and Digital Multiplexing Hierarchy
- 3.1 Telecommunication network hierarchy.
- 3.2 Digital multiplexing hierarchies: T1, E1, T2, and T3 carrier systems.
- 3.3 Plesiochronous and synchronous multiplexing, SONET and SDH transmission systems.

4. Switching Systems Design
- 4.1 Switching fabrics: Switch architecture, performance evaluation; Time division switches: shared memory switch, time-slot-interchange switch; Space division switches: Crossbar, Clos and Banyan.
- 4.2 Traffic management and scheduling in a switch.
- 4.3 Optical switching: wavelength division multiplexing (WDM)
- 4.3 Signalling principles: SS7 signalling and public telephone networks.

Laboratory Experiments:

1. Poisson source properties and their characterization.
2. Simulation study on queueing properties.
3. Design of an N-trunk telephone switch.

Method of Assessment:

Continuous assessment: 40% Examination: 60%

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

Reference Books:

1. R.L. Freeman, *Fundamentals of Telecommunications*, John Wiley, 1999.
2. W. Goralski, *SONET/SDH,* McGraw-Hill, 2002.
3. M. Cole, *Introduction to Telecommunications: Voice, Data and the Internet*, Prentice-Hall, 2002.
4. J. Salrand, *High-performance Communication Networks,* Morgan Kaufmann, 2000.
5. S.K. Bose, *An Introduction to Queuing Systems*, Kluwer Academic/Plenum Publishers, 2002.
6. W.C. Chan, *Performance Analysis of Telecommunications and Local Area Networks*, Kluwer Academic Publishers, 2000.
7. R.L. Freeman, *Telecommunication System Engineering*, 3rd ed., John Wiley, 1996.

SUBJECT DESCRIPTION FORM

Subject Title:	Mobile Communications	**Subject Code:**	EIE447
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 36 hours Project/presentation 6 hours (Equivalent to 18 laboratory hours)

Pre-requisite: Communication Fundamentals (EIE331) **Co-requisite:** nil **Exclusion:** nil

Objectives:

1. To introduce the fundamental design principles & issues in cellular & mobile communications.
2. To enable the student to understand the basic features of cellular-mobile communication systems and digital radio: TDMA (GSM) and DS-CDMA (IS-95, CDMA2000, WCDMA).

Student Learning Outcomes:

On successful completion of this subject, the student will be able:

Category A: Professional/academic knowledge and skills

1. To recognize the frequency spectra allocated for mobile communications in Hong Kong
2. To understand the basic network-architecture of a mobile-communication system.
3. To realize the importance of frequency-reuse concept in mobile communications and to be able to analyze its effect on interference, system capacity and grade of service.
4. To understand various large-scale and small-scale fading-channel models and to be able to analyze their influence on a mobile-communication system' s performance.
5. To appreciate various multiple-access techniques used in mobile communications and their pros/cons.
6. To recognize the relative pros/cons of various digital modulation schemes and to be able to select the appropriate modulation-scheme under a given channel environment.
7. To understand the basic features of mobile communication systems and digital radio: GSM and CDMA (IS-95, CDMA 2000, W-CDMA).

Category B: Attributes for all-roundedness

8. Ability to coordinate work among group members and to work as a team.
9. Ability to present ideas and results in front of an audience.

Syllabus:

1. Introduction to Cellular-Mobile Radiowave Wireless-Communication Systems
   Cellular structure, frequency reuse & cells splitting. Channel assignment. Co-channel interference, adjacent-channel interference, system capacity, and power control.
2. Radiowave Propagation' s Macroscopic-Fading Models
   Free-space radio-wave propagation. Reflection, diffraction, and scattering. model. Various path-loss models: ground-reflection, log-distance, lognormal, Okumura, Hata, EURO-COST extension of Hata.
3. Radiowave Propagation' s Microscopic-Fading Models
   Lognormal, Rician and Rayleigh fading models. Doppler frequency, delay spread, coherence bandwidth, level crossing rate. Characterisation of multipath phenomena. Fading effects due to multi-path time delay spread. Fading effects due to Doppler spread. Simulation of Rayleigh fading channel.
4. Modulations for Mobile Radiowave Communications
   Phase-shift Keying: BPSK, DPSK, QPSK, OQPSK, $\pi/4$ DQPSK. Frequency-shift keying (FSK). Minimum-shift keying (MSK), Gaussian MSK. Direct-sequence spread-spectrum (DS-SS), frequency-hop spread-spectrum (FH-SS). Various modulations' performance over Rayleigh-fading channels.

5. Current Cellular-Mobile Communication Multiple-Access Schemes & Standards
   Multiple-access schemes: frequency-division multiple-access (FDMA), time-Division multiple-access (TDMA), code-division multiple-access (CDMA), hybrid schemes, space-division multiple-access (SDMA). Capacity of CDMA. Current cellular-mobile wireless-communication standards: Global System for Mobile Communications (GSM). IS-95, CDMA 2000, W-CDMA.

Project:

1. To compare empirically measured data against well-known formulas of outdoor radiowave propagation path-loss.

Method of Assessment:

Continuous assessment: 40% Examination: 60%

The continuous assessment will consist of a test, a project written report, and a project oral presentation.

Each student may prepare one single-sided A4 sheet of formulas for his/her personal use in the test and the examination.

Reference Book:

1. Theodore S. Rappaport, *Wireless Communications: Principles and Practice*, Prentice-Hall PTR, 2nd ed., 2002. ISBN: 0-13042232-0

SUBJECT DESCRIPTION FORM

Subject Title:	Bioengineering Signals and Systems	**Subject Code:**	EIE448
Number of Credits:	3	**Hours Assigned:**	Lecture/tutorial 36 hours Laboratory 9 hours

Pre-requisite: Mathematics II (AMA202) **Co-requisite:** nil **Exclusion:** nil

Objectives:

To introduce
1. a broad range of bioengineering systems
2. the engineering foundation of bio-signal data collection,
3. a sample of data analysis techniques for biomedical engineering.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

Category A: Professional/academic knowledge and skills
1. Briefly describe the basics of human physiology and biology with an emphasis on coronary and neurological dynamics.
2. Perform quantitative measurement and analysis of typical bio-signals
3. Describe the operational details of various medical monitoring and data collection devices
4. Demonstrate an understanding of mathematical foundations of population dynamics, epidemiology and transmission of communicable diseases
5. Describe and synthesize the computational process of various contemporary medical devises.

Category B: Attributes for all-roundedness
1. Communicate effectively.
2. Think critically and creatively.
3. Work in a team collaboratively.
4. Demonstrate an ability to think logical as well as laterally.

Syllabus:

1. Introduction
   1.1 Introduction to bioengineering. Overview of biomathematics, bioengineering, biomedical engineering and medical physics. A historical perspective.
2. Bioelectric phenomena
   2.1 Cardiovascular system: the human heart, the cardiac cycle, cardiac mechanics, biological oscillators and reaction-diffusion
   2.2 Neurophysiology: The neuron, action potential, ionic concentrations and channels, Hodgkin-Huxley and FitzHugh-Nagumo equations.
3. Biomedical instrumentation and measurement
   3.1 Electroencephalography: EEG signal and its characteristics, EEG rhythms (δ, θ, α and β) EEG analysis (linear methods)
   3.2 Electrocardiography: 12-lead and 3-lead ECG, ECG morphologies, QRS detection, Estimation of RR interval, ECG data compression
   3.3 Brief overview of other signals: Electromyography, Inductance Plethysmography. Imaging: Ultrasound, Computed Tomography, Nuclear Magnetic Resonance and Magnetic Resonance Imaging,
4. Biomedical signal processing
   4.1 Signal acquisition, Z-transform, wavelet transform, fuzzy logic and machine learning
   4.2 Case studies selected from: Cardiac arrhythmia and automatic defibrillation, automated detection of carcinoma, automated sleep staging,

5. Epidemiology
   5.1 Population dynamics: predator-prey dynamics, Lotka-Volterra systems, symbiosis, chaos.
   5.2 Epidemic models: SIR, SEIR, SIS, stratification, complex networks. Geographical spread of disease.
   5.3 Examples/Case studies selected from: Black death, Venereal diseases, Gonorrhoea, HIV, Influenza, SARS, Avian Influenza and emergent diseases.

Laboratory Experiment:

Experiment/Mini Project:

A selection from the following topics (minimum 9 hours work) to be completed in small groups:

1. Instrumentation development for measurement of Galvanic Skin Response (GSR).
2. EEG measurement and rhythm detection
3. Automated sleep staging from pre-recorded data library
4. Analysis of transmission parameters for SARS epidemic in Hong Kong.
5. GSR, Pulse and Respiration for detection of psychological stress.

Method of Assessment:

Continuous assessment: 40% Examination: 60%

Text/Reference Books:

1. J.D. Murray, *Mathematical Biology*, 2nd ed., Springer, 1993.
2. J. Enderle, S. Blanchard and J. Bronzino, *Introduction to Biomedical Engineering*, Academic Press, 2000.
3. Jerry L. Prince and J. M. Links, *Medical Imaging: Signals and Systems*, Pearson Prentice-Hall Bioengineering, 2006.
4. D.C. Reddy, *Biomedical Signal Processing: Principles and Techniques*, McGraw-Hill, 2005.

SUBJECT DESCRIPTION FORM

Subject Title:	Optical Communication Systems and Networks	**Subject Code:**	EIE449
Number of Credits:	3	**Hours Assigned:**	Lecture/tutorial 36 hours Laboratory 6 hours

Pre-requisite: Communication Fundamentals (EIE331) **Co-requisite:** nil **Exclusion:** nil

Objectives:

The aim of this course is to introduce to the students the design and operation principles of modern optical communication systems and networks. Upon completion of the subject, students are expected to be familiar with commonly used components and subsystems in optical communication and network systems, and be able to design a point to point optical communication link.

Student Learning Outcomes:

On successful completion of this subject, the students will be able to:

1. Understand the basic operating principles of single mode and multimode fibres.
2. Understand the basic operating principles of light emitting devices including Light Emitting Diodes(LEDs) and semiconductor lasers .
3. Understand the basic principles of optical detectors, amplifiers and modulators.
4. Understand the principles of passive optical devices including couplers, isolators and circulators.
5. Understand the principles of an optical communication system and be able to design a simple point to point link.
6. Understand the principles of wavelength division multiplexing(WDM) and WDM networks.

Syllabus:

1. Optics
   1.1 Reflection and refraction. Optical coherence, Polarization of light, interference and interferometers.
2. Optical fibre
   2.1 Principles of optical waveguiding, single mode and multimode fibres and their transmission characteristics.
3. Active components
   3.1 LEDs and Semiconductor lasers: operation principles and different types. Semiconductor optical detectors: PINs and APDs. Optical amplifiers: Semiconductor optical amplifiers(SOAs) and EDFAs. Modulators.
4. Passive components
   4.1 Coupler, isolator, Wavelength division multiplexer and demuiltiplexer.
5. Optical communication systems
   5.1 Transmission impairments: noise, dispersion, nonlinearity and crosstalk. Point to point link design: power budget and dispersion budget. Wavelength Division Multiplexing(WDM). Design of multi-span WDM links.
6. Optical communication networks.
   6.1 WDM add/drop multiplexer, WDM optical crossconnect, WDM optical network: control and protection.

Laboratory Experiment:

1. Optical fiber and passive component measurements.
2. Erbium doped fiber amplifier.

Method of Assessment:

Continuous assessment: 40% Examination: 60%

The continuous assessment will consist of a number of assignments and test.

Reference Books:

1. G. Kaiser, *Optical Fiber Communications*, 3rd ed., McGraw-Hill, 2000.
2. Jeff Hecht, *Understanding Fiber Optics*, 4th ed., Prentice-Hall, 2002.

SUBJECT DESCRIPTION FORM

Subject Title:	Society and the Engineer	**Subject Code:**	ENG403
Number of Credits:	2	**Hours Assigned:**	Lecture/Tutorial 24 hours Tutorial 4 hours Total 28 hours

Pre-requisite: nil **Co-requisite:** nil **Exclusion:** nil

Objectives:

This subject is designed for engineering students as a complementary subject about the role of the professional engineer in practice and their responsibilities towards the profession, colleagues, employers, clients and the public. The objectives of the subject are to enable students to:

1. Appreciate the historical context of modern technology and the nature of the process whereby technology develops.
2. Understand the social, political, economic responsibility and accountability of a profession in engineering and the organizational activities of professional engineering institutions.
3. Appreciate the relationship between technology and environment and the implied social costs and benefits.
4. Be aware of the short-term and long-term effects on the use of technology relating to safety, health and welfare aspects.
5. Observe the professional conduct, the legal and more constraints relating to various engineering aspects.

Student Learning Outcomes:

Category A: Professional/academic knowledge and skills

1. Describe different types of intellectual protection and the evaluate impacts of modern technology on education, business and societal development [1,5].
2. Explain the importance of professional conduct and responsibilities in various engineering activities [2,5].
3. Identify the effects on the use of technology relating to health and safety, environment and welfare of the public in real life cases [3,4].
4. Interpret the academic, training and professional experience requirement of local and overseas of professional engineering institutions. [2]

Category B: Attributes for all-roundedness

5. Discuss, in a team setting, the social problems related to engineers and present the findings. [2, 3, 4,5].

Syllabus:

1. Trend and transfer of technology. Impact of technology on society. Innovation and creativity. Quality assurance and product life-cycle.
2. Environmental protection and related issues. Role of the engineer in energy conservation, ecological balance and sustainable development.
3. The outlook of Hong Kong' s industry, its supporting organizations and impact on development from the China Markets.
4. Industrial health and safety including the work of the Labour Department and the Occupational Health and Safety Council. Industrial legislation.
5. The Professional Institutions: both local and overseas. Training of engineers.
6. Professional ethics, bribery and corruption including the work of the ICAC. Social responsibilities of engineers.
7. Intellectual property right such as patents and copyright protection. Contract law for engineers.

Method of Assessment:

Continuous Assessment: 60% Examination: 40%

Reference Book:

1. Johnston, F. Stephen, Gostelow, J.P. and King, W. Joseph, *Engineering and society Challenges of Professional Practice*, Upper Saddle River, N.J.: Prentice-Hall, 2000.