Department of Electronic and Information Engineering

Bachelor of Science (Honours) Degree Programme in

Internet and Multimedia Technologies

Full-time Credit-based

Code: 42077

Programme Booklet

2006/2007

BSc(Hons) in Internet and Multimedia Technologies (Full-Time/Sandwich/ Cooperative Education Scheme)

Contents

1. GENERAL INFORMATION

1.1 Cohort of Intakes

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/bsc.html for the most updated information. Should any discrepancies between the contents of the booklet and University regulations arise, University regulations will always prevail.

1.2 Programme Information

Title of Programme	**Bachelor of Science (Honours) Degree in Internet and Multimedia Technologies**
Host Department	Department of Electronic and Information Engineering (EIE)
Programme Structure	Credit-based
Final Award	BSc(Hons) in Internet and Multimedia Technologies 互聯網及多媒體科技〔榮譽〕理學士

Modes of attendance and total credits for graduation	
<u>For students who enter this programme by following a local Advanced-level education system</u>:	
Mode of Attendance	Full-time/Sandwich/Cooperative Education Scheme
Duration	Full-time mode: 3 years nominal, 6 years maximum
	Sandwich mode: 4 years nominal, 7 years maximum
	Cooperative Education Scheme (CES) mode: 3½ years nominal, 7 years maximum
Total Credits for Graduation	90 (plus 5 practical training credits and a minimum of 1 Work-Integrated-Education training credit)
<u>For students who have to study the Foundation-Year Curriculum</u>:	
Mode of Attendance	Full-time/Sandwich/Cooperative Education Scheme
Duration	Full-time mode: 4 years nominal, 8 years maximum
	Sandwich mode: 5 years nominal, 9 years maximum
	Cooperative Education Scheme (CES) mode: 4½ years nominal, 9 years maximum
Total Credits for Graduation	120 (plus 5 practical training credits and a minimum of 1 Work-Integrated-Education training credit)

2. AIMS AND OUTCOMES OF THE PROGRAMME

2.1 Programme Aims

Internet and multimedia technologies are among the key technologies that support the economic growth worldwide. Products with multimedia features such as digital cameras, personal digital assistants, 2G/2.5G mobile phones with built-in cameras, 3G mobile phones, are in great demand and new models are being developed almost everyday. Moreover, with the increasing popularity of wired broadband communications and wireless 2.5G/3G mobile communications, more and more multimedia contents are being created, delivered and shared among users via the Internet. In the years to come, there will be a rapid convergence of computer, communications and consumer electronics. There will also be a need of professionals who possess knowledge in all three areas of computer networks, multimedia signal

processing and electronics. The Programme primarily aims to produce graduates that will fulfill such a need by providing sufficient technical training to students for a career in the field of Internet and multimedia technologies. Moreover, the Programme aims to develop all-rounded students to adapt to the rapidly changing environment. All students will also acquire some form of work-integrated education before graduation.

Specifically, the Programme is designed to equip students with

- the necessary practical skills in the application of Internet and multimedia technologies through hands-on experience and industrial placements;
- an in-depth and up-to-date knowledge of Internet and multimedia technologies;
- the skills to evolve into self-learners who have the necessary foundation to continue to update their expertise;
- fundamental theory and practical skills adaptable to a workplace environment;
- analytical thinking, problem solving, interpersonal and communication skills;
- the ability to develop as creative learners who can work with abstract ideas and implement them in a practical environment; and
- the necessary knowledge and skills to enable them to function in a variety of professional roles.

Upon graduation, students should have acquired sufficient knowledge to commence their careers in the following areas:

- Digital entertainment industry – designing computer games, creating digital effects for movies, planning, installing, configuring and maintaining digital broadcasting equipment.
- Internet-related business – developing applications with multimedia features on networks, particularly on the Internet.
- Data network centres – planning, installing, configuring and maintaining general computer networks.
- Mobile communications and computing – developing applications particularly for the current and future mobile systems that involve much multimedia contents, such as mobile games, mobile video streaming systems, and mobile information systems.
- Electronic industry – developing embedded electronic products with multimedia features, such as electronic toys, electronic educational units, and personal entertainment units.

2.2 Programme outcomes

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

Category A: Professional/academic knowledge and skills

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

(i) identify the different aspects of Internet and multimedia systems;
(ii) design and implement digital systems related to Internet and multimedia technologies;
(iii) design and develop digital electronic products related to Internet and multimedia technologies;
(iv) identify, analyze and solve technical problems related to Internet and multimedia technologies;
(v) apply computer programming techniques to solving practical engineering problems;
(vi) apply mathematical techniques to modelling and solving problems;
(vii) appreciate and identify factors/issues related to product/industrial design; and generate and evaluate design solutions to solve a specific problem; and
(viii) appreciate computer games' designs and complexities; and design, analyze, implement and evaluate computer games.

Category B: Attributes for All-Roundedness

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

(i) communicate effectively, and present ideas and findings clearly in oral and written forms;
(ii) think critically and creatively;
(iii) demonstrate self-learning and life-long learning capability;
(iv) collaborate effectively with other members in a team, and demonstrate leadership capability;
(v) understand the essence of entrepreneurship;
(vi) realize and appreciate cultural diversity and globalization; and
(vii) recognize social responsibility and ethics.

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

In addition to the above general requirements, applicants must also satisfy the following programme-specific requirements:

- C or above in HKCEE Mathematics or Additional Mathematics, AND
- D or above in HKCEE Physics or Engineering Science

Alternative Entry Route:

- A Higher Diploma in related disciplines; OR
- A Higher Certificate in related disciplines; OR
- A Diploma (with Credit) in related disciplines; OR
- An Associate Degree in related disciplines.

Alternative Entry Route with Credit Transfer:

- Holders of a Higher Diploma in related disciplines may be given credit transfer for some Year One and Year Two 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 STRUCTURE AND SPECIFIED STUDY PATTERN

4.1 Programme Structure

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.

The Programme is a credit-based, 3-year full-time course. The number of credits required for graduation is 90, plus 5 practical training credits and 1 WIE training credit. At the end of Year 2, students may take the Industrial Training lasting normally for one year before they commence their final year of studies; or they may opt for the Cooperative Education Scheme (CES) in which they will engage in industrial training while concurrently pursuing study in the University until graduation.

All subjects in the first two years of studies in the Programme are compulsory and they aim to provide a solid foundation to students. During the first year of studies, moreover, students are required to complete a 5-week practical training at Industrial Centre. The practical training consists of two parts: Computer Training and Electronic Practice. The two weeks' computer training will be completed by the end of the second semester while the three weeks' electronic practice will be conducted during the summer.

During the final year of studies, students will be allowed to select 5 electives from a pool of subjects according to their own interest. Also, they must complete an Honours Project. In addition, students will take compulsory subjects on marketing and management, and one Broadening General Education non-technical elective subject (another General Education subject "China Studies", which is compulsory, is to be taken in Year 1). The objectives of taking such "non-technical" subjects are to broaden the knowledge base of students and to enhance the all-rounded education of students. Before graduation, students must obtain a minimum of 1 training credit on Work-Integrated Education (WIE), which can be in the form of CES, industrial training, industrial attachment, industrial project, Preferred Graduate Development Programme (PGDP), or jobs as deemed appropriate by the Programme Leader.

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.

4.3 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 — Semester 1

AMA103	Foundation Mathematics I for Science and Engineering	3 credits	Compulsory
APSS184	Understanding the Hong Kong Community	3 credits	Compulsory
ELC1004	English for University Studies I	3 credits	Compulsory
AF1602	Hong Kong Business Environment	3 credits	Compulsory
AP101	College Physics	3 credits	Compulsory

Foundation Year — Semester 2

AMA105	Logic : Qualitative and Quantitative	3 credits	Compulsory
ELC1005	English for University Studies II	3 credits	Compulsory
AMA104	Foundation Mathematics II for Science and Engineering	3 credits	Compulsory
AP102	College Physics II	3 credits	Compulsory
APSS186	Understanding Ethics in Daily Life	3 credits	Compulsory

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.

Year 1 — Semester 1

AMA227	Mathematics I	3 credits	Compulsory
EIE225	Introduction to Electronics and Multimedia Technologies	3 credits	Compulsory
ELC3501	English for Engineering Students	2 credits	Compulsory
ENG224	Information Technology	3 credits	Compulsory
ENG236	Computer Programming	3 credits	Compulsory
GEC2801	China Studies	2 credits	Compulsory
IC291	Practical Training	5 training credits	Compulsory

Year 1 — Semester 2

AMA228	Mathematics II	3 credits	Compulsory
EIE210	Electronics Design	3 credits	Compulsory
EIE211	Logic Design	3 credits	Compulsory
EIE312	Linear Systems	3 credits	Compulsory
ELC3501	English for Engineering Students (cont'd)	---	Compulsory
ENG236	Computer Programming (cont'd)	---	Compulsory
SD2491	Product Design and Social Considerations	2 credits	Compulsory
IC291	Practical Training (cont'd)	---	Compulsory

Year 1 — Semester 3

IC291	Practical Training (cont'd)	---	Compulsory

Year 2 — Semester 1

COMP407	Computer Graphics	3 credits	Compulsory
EIE311	Computer System Fundamentals	3 credits	Compulsory
EIE320	Object-Oriented Design and Programming	3 credits	Compulsory
EIE325	Telecommunication Technologies	3 credits	Compulsory
SD348	Introduction to Industrial Design	3 credits	Compulsory
SD3982	Computer Game Development I	2 credits	Compulsory

Year 2 — Semester 2

EIE322	Interface and Embedded Systems	3 credits	Compulsory
EIE328	Digital Signal Processing for Multimedia Applications	3 credits	Compulsory
EIE330	Integrated Project	2 credits	Compulsory
EIE333	Data and Computer Communications	3 credits	Compulsory
SD3983	Computer Game Development II	3 credits	Compulsory

Year 3 — Semester 1

EIE430	Honours Project	6 credits	Compulsory
Level 4	Technical Elective	3 credits	Elective
Level 4	Technical Elective	3 credits	Elective
Level 4	Technical Elective	3 credits	Elective
MM2711	Introduction to Marketing	3 credits	Compulsory

Year 3 — Semester 2

EIE430	Honours Project (cont'd)	---	Compulsory
MM2021	Management and Organisation	3 credits	Compulsory
Level 4	Technical Elective	3 credits	Elective
Level 4	Technical Elective	3 credits	Elective
GECxxx	Broadening General Education Subject	2 credits	Elective

Final Year Technical Electives

COMP436 Middleware and Distributed Objects
EIE408 Principles of Virtual Reality
EIE414 Computer Architecture and Systems
EIE424 Distributed Systems and Network Programming
EIE425 Video, Image and Audio Processing
EIE426 Artificial Intelligence and Computer Vision
EIE427 Mobile and Pervasive Computing
EIE428 Multimedia Communications
EIE429 Corporate Networking
EIE431 Digital Video Production and Broadcasting
EIE432 Web Systems and Technologies

General Education Subjects

Students are required to complete two 2-credit General Education subjects (one "China Studies" subject and one under the "Broadening" category).

5. HONOURS PROJECT

The Honours Project is considered to be of great importance. This is reflected in the weighting given to it, being equivalent to two standard-size subjects. The objective 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 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 period.

5.1 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 students. Projects in collaboration with an external company are offered to students based on academic results and interview performance.

The assignment of projects is expected to be completed by the month of June preceding the beginning of the final year of studies. Guidelines on the operation of the project are given in Section 5.3. 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 the project objective. The project supervisor will be alerted so that timely advice is given to students.

5.2 Project Assessment

At the completion of the project, students will be required to give an oral presentation/demonstration of the 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 an assessment 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.

A maximum of 10% of the total mark will be given to the language component of the 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 the Project Management Team, will read all reports and the respective assessment forms and will thereby oversee the overall standard of the projects to ensure a reasonable degree of uniformity of assessment.

5.3 Guidelines on the Operation of the Honours Project

(i) Project Plan

Each student is required to submit a lucid, comprehensive Project Plan to the student's 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 project development.

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

- Statement of problems 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 with the final report. The log-book should record anything that is important to the project. Typical contents include monthly summaries, notes of meetings, planning and actions, design details, experimental data and analysis, and 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 the 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

Students are required to present their projects to their classmates and staff during the project presentation week.

(vi) Submission of Project Report

Supervisors will ensure that their project students would finish their project development so that sufficient time should be available for students to prepare

their written final reports. Two hardcopies and one softcopy of the final report are required for each project.

(vii) Demonstration

Each student has to set up a poster and/or their final products in laboratories to demonstrate their projects to students, staff and industrialists.

6. MODE OF STUDY AND FRAMEWORK

6.1 Mode of Study

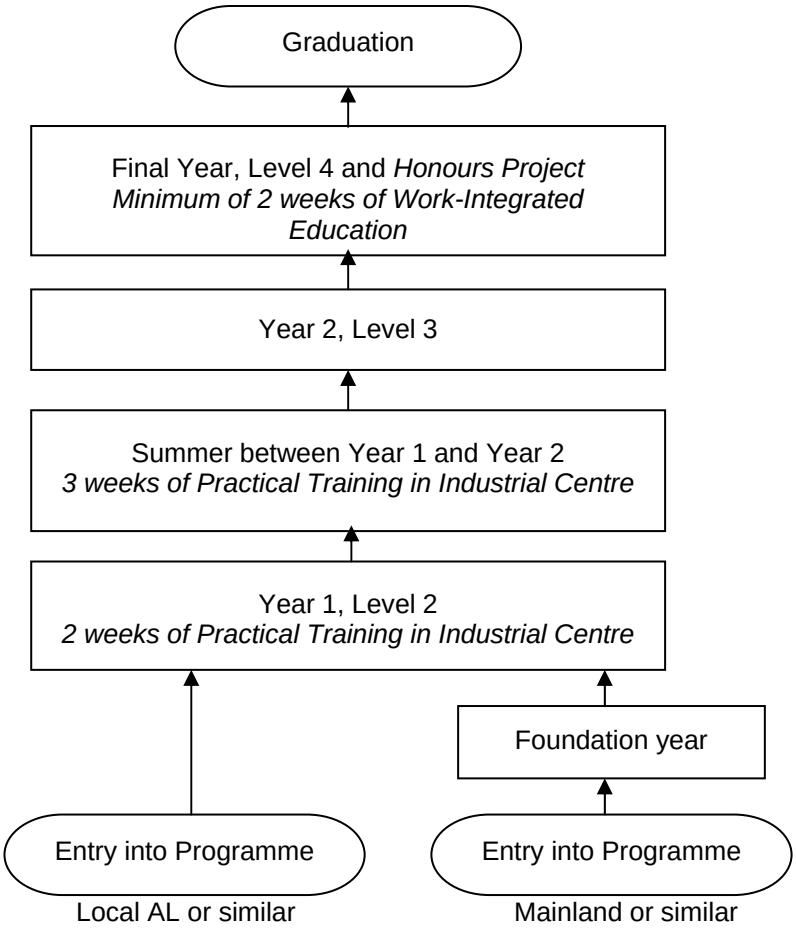
The following information about the various modes of study apply to students who enter the programme either after having finished the Foundation Year, or through the local Advanced Level examination system or similar. The different years of the various modes of study are referred to as *Foundation Year,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

All students will pursue identical study in Year 1 and Year 2. After Year 2, 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 4.

There are three modes of attendance, namely Full-time mode, Sandwich mode, and Cooperative Education Scheme (CES) mode.

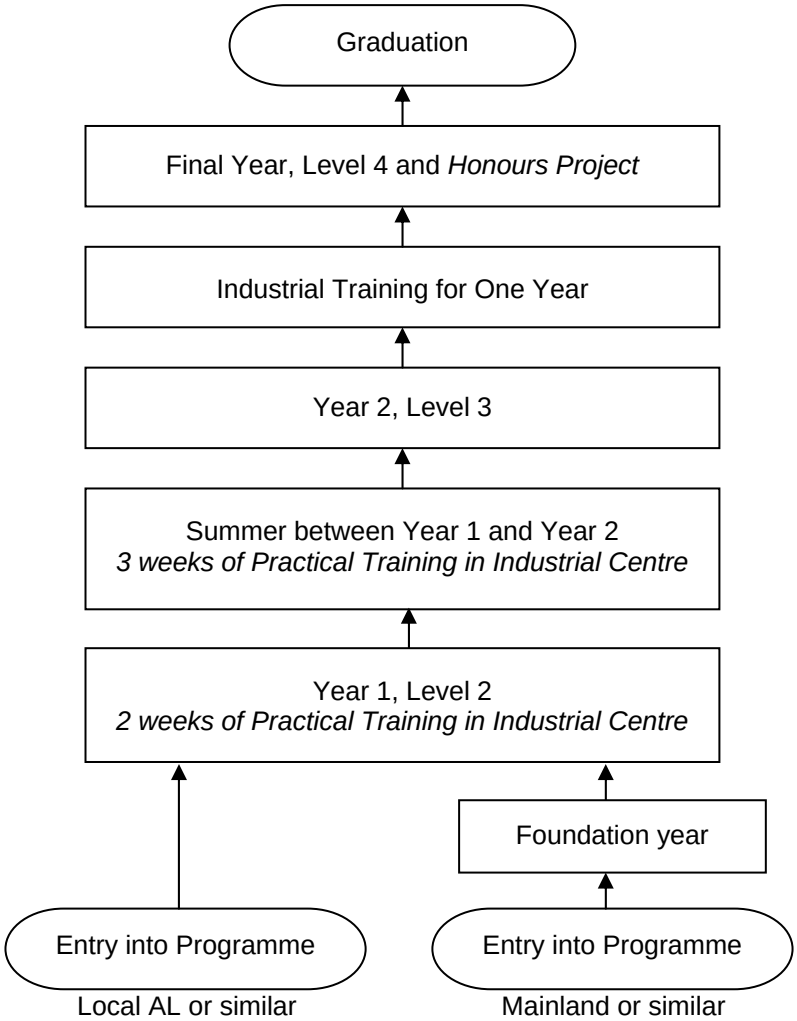
(i) Full-time mode

Under the Full-time mode, students will normally pursue three years of study in full time and then graduate at the end of the third year after having satisfied all programme requirements.



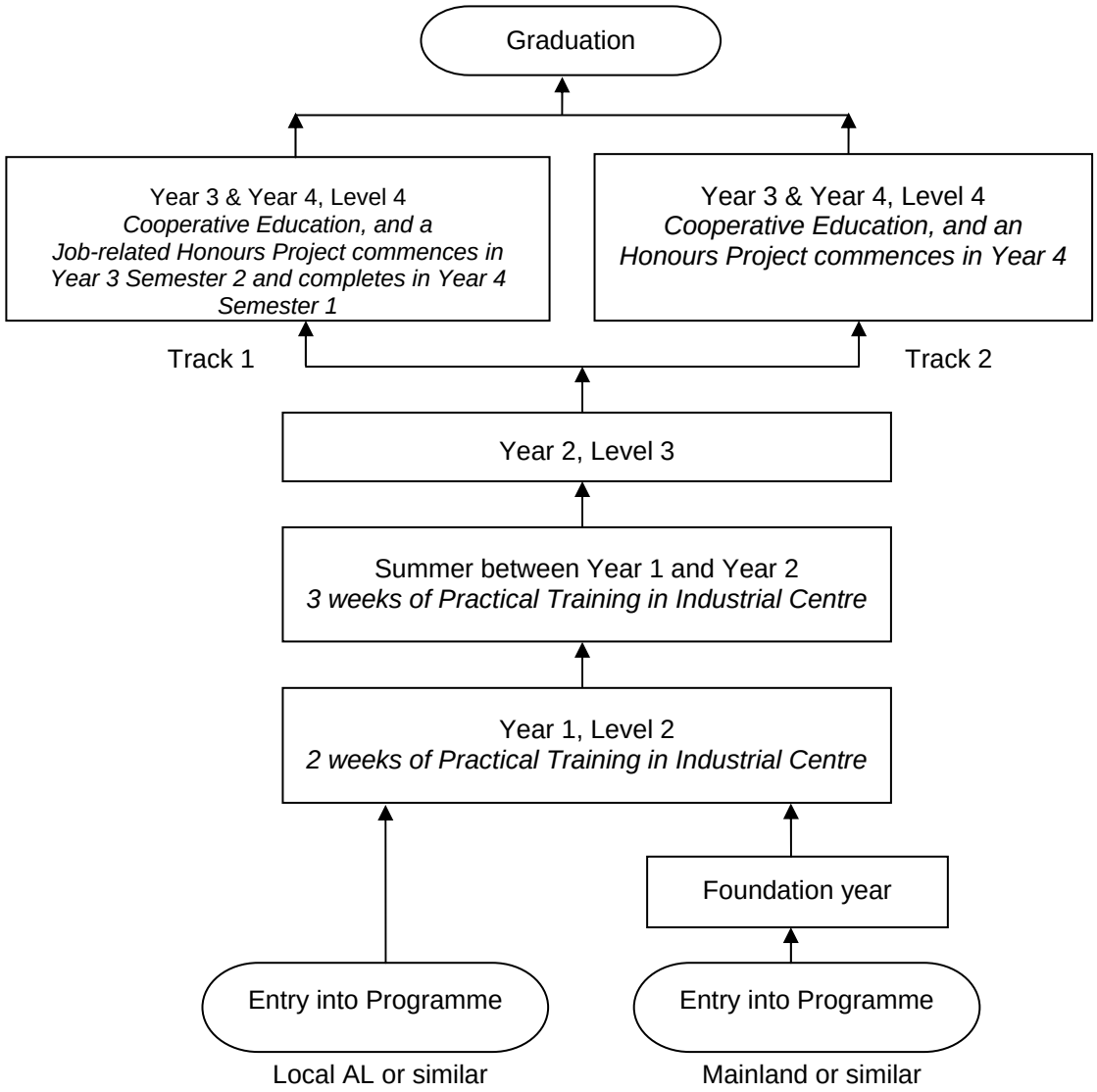
(ii) Sandwich mode

Under the Sandwich mode, students will pursue the first and second year of study in full time, and then engage in industrial training lasting normally for one year. During the industrial training period, students may choose to study one subject each semester. After the industrial training year, students will pursue the fourth year of study in full-time again. Normally students will graduate at the end of the fourth year after having satisfied all programme requirements.



(iii) Cooperative Education Scheme (CES) mode

Under the CES mode, students will pursue the first and second year of study in full-time. From Semester 3 of Year 2 up to graduation, students will engage in industrial training while concurrently pursuing study of eight subjects in the University with day-release (one day leave per week) given by the employer. Students will be assigned with an industrial advisor from the enterprise where the student is being deployed, and an academic advisor from the EIE Department for guidance. In early Year 3 Semester 2, students will work together with the advisors to come up with a proposal for a job-related Honours Project, which will commence in Year 3 Semester 2 and complete in Year 4 Semester 1. In this case, students will graduate at the end of the first semester of the fourth academic year after having satisfied all programme requirements. This progression pattern is shown as Track 1 below. In case of students not taking up a job-related Honours Project, students may choose to take up a normal Honours Project and the study will be extended to the end of Year 4 Semester 2. This progression pattern is shown as Track 2 below.


Graduation
Year 3 & Year 4, Level 4
Cooperative Education, and a Job-related Honours Project commences in Year 3 Semester 2 and completes in Year 4 Semester 1
Year 3 & Year 4, Level 4
Cooperative Education, and an Honours Project commences in Year 4
Track 1
Track 2
Year 2, Level 3
Summer between Year 1 and Year 2
3 weeks of Practical Training in Industrial Centre
Year 1, Level 2
2 weeks of Practical Training in Industrial Centre
Foundation year
Entry into Programme
Local AL or similar
Entry into Programme
Mainland or similar

6.2 Framework for Industrial Training and Cooperative Education Scheme

Students who follow either the Sandwich mode or the CES mode of study will undergo Industrial Training or Cooperative Education after the second year of study. This Section sets out the framework for these trainings to be pursued.

(i) Training Contents of Industrial Training and Cooperative Education

The training will follow a structured scheme prepared jointly with the sponsoring firm and will be tailored for the student with reference to the firm to which the student will be attached.

(ii) Administration of the Industrial Training and Cooperative Education

Training will take place under the joint supervision of an Industrial Supervisor who will be appointed by the firm to which the trainee is attached, and a University Training Tutor appointed by the Department. The latter will liase with the Industrial Supervisor to monitor the progress of the student. The Tutor will make frequent contact with the student and will visit the student on-site at regular intervals.

(iii) Log-Book and Report

The trainee is required to keep a log-book in which a brief daily entry is made. The student will submit a monthly report to the Industrial Supervisor and the University Training Tutor. At the end of the training period, the student will submit a final written report. The student will be given an oral examination on the report, and will be required to make an oral presentation to an audience of students and staff, highlighting experience gained.

(iv) Assessment of Industrial Training and Cooperative Education

For the Sandwich mode, the assessment will be completed in the first two weeks of the fourth year. For the CES Track 1 mode of study, the assessment will be completed within the examination week at the end of Semester 1 in the fourth year. For the CES Track 2 mode of study, the assessment will be completed within the examination week at the end of Semester 2 in the fourth year.

In the assessment of industrial training, the key consideration is the extent to which the objective of the training scheme has been met. The assessments of the log-book, the monthly report, the assignment, the final report, and the oral presentation are means to this end. The assessment components, their relative weightings and the corresponding assessors are set out as follows:

Component	Assessor	Weighting
Log-book, monthly report and assignment	Industrial Supervisor	40%
Oral examination, presentation, and final report	University Training Tutor	60%

For the Sandwich mode and the CES mode of study, a pass in Industrial Training or Cooperative Education Scheme respectively is mandatory before the student is eligible for the award of a degree.

7. PRACTICAL TRAINING

Students are required to undergo training at the University's Industrial Center (IC), accumulating 5 training credits outside the 90-credit curriculum. The IC training is an important part of the Programme in which students are given hands-on training on various subject matters related to computer literacy, usage of mathematical packages, design and fabrication of prototype of multimedia electronic product. The IC training is good for students to master skills and knowledge in an authentic environment.

Students will be assessed and graded in the normal manner from A+ to F. Moreover, the grades obtained from these computer training courses will be counted towards the GPA but not to the Weighted GPA.

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 duration, the number of training credits obtained by the students will vary. In order to graduate from this programme, a minimum of one 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 networking and multimedia 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. 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 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

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 a 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 at different stages.

8.5.1 Preparation

The Department will actively align with the industry to get placement opportunities for WIE. Moreover, it is important for 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 (AMA, AP, 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 scrutinize 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 (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. ELIGIBILITY FOR 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 BSc(Hons) in IMT award are specified in the following Sections 25.1 to 25.3. 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 25.3 below in order to be eligible for the BSc(Hons) in IMT award.

25.1 Students are required to acquire a total of 90 credits in order to graduate from this Programme.

A student would be eligible for award if he satisfies all the subject requirements listed below:

(i) Complete all compulsory subjects, the practical training and the honours project.
(ii) Complete 5 technical electives and 1 General Education elective.
(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.
(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 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.

25.3 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.

26. GUIDELINES FOR AWARD CLASSIFICATION

26.1 The guidelines for award classification are stated in the following. In using these guidelines, the Board of Examiners shall exercise its judgement in coming to its conclusions as to the award for each student, and where appropriate, may use other relevant information.

26.2 This programme uses Weighted GPA as a guide for helping to determine award classifications. All Level 2 subjects carry a weighting of 0.2. All Level 3 and Level 4 subjects carry a weighting of 0.4. The weighting of each level is a measure of the relevance of the level to the classifications of the degree.

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 = weight assigned according to the level of the subject.
n = number of all subjects counted in GPA calculation as set out in Section 24.3, 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 following 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 Boards 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.

27. 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.

28. SYLLABI

(Please see pages 45 to 139)

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 ed.. 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. 陳墳慶編, *《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:	Mathematics I	**Subject Code:**	AMA227
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 engineering mathematics. The emphasis will be on 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. apply appropriate mathematical techniques to model and solve problems in engineering;
3. develop and extrapolate mathematical concepts in synthesizing and solving new problems;
4. search for useful information in solving problems;
5. 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. Calculus of One Variable
   Elementary functions; Fundamental Theorem of Calculus; Techniques of integration.
4. Infinite Series
   Fourier series expansion of a periodic function; Half-range expansions; Basic properties of Fourier transform; Simple applications.

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. H. Anton, *Elementary Linear Algebra*, 8th ed., John Wiley & Sons, 2000.
2. G.B. Thomas, R.L. Finney, J.R. Hass and F.R. Giordano, *Thomas' Calculus*, 11th ed., Addison-Wesley, 2004.
3. E. Kreyszig, *Advanced Engineering Mathematics*, 8th ed., John Wiley & Sons, 1999.

4. A. Croft, R. Davison and M. Hargreaves, *Engineering Mathematics*, 3rd ed., Prentice-Hall, 2001.

SUBJECT DESCRIPTION FORM

Subject Title:	Mathematics II	**Subject Code:**	AMA228
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:

This subject aims to provide students with some basic probabilistic and statistical concepts and methods. The emphasis will be on application of statistical methods to solving practical problems.

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

1. apply mathematical reasoning to analyse essential features of different problems in engineering;
2. develop and extrapolate statistical concepts in synthesizing and solving new problem;
3. search for useful information and use statistical packages in solving statistical problems;
4. think critically about the uses and limitations of various statistical methods for solving problems in commerce and industry;
5. undertake continuous learning.

Syllabus:

1. Ordinary Differential Equations
   First and second order linear ordinary differential equations; Laplace transform; Convolution theorem.
2. Descriptive Statistics
   Categorical and Numerical data; Frequency distributions; Mean, mode and median; Range and quartile; Standard Deviation.
3. Probability
   Rules of sums and products; Combinatorial probability; Independence and mutual exclusion; Bayes' theorem.
4. Random Variables
   Discrete and continuous random variables; Binomial, Poisson, Exponential and Normal distributions; Law of large numbers; The Central Limit Theorem.
5. Markov Process
   Recursions and Markov chains; Applications to queuing theory.

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. M.R. Middleton, *Data Analysis Using Microsoft Excel: Updated for Office XP*, 3rd ed., Duxbury Press, 2003.
2. 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.

SUBJECT DESCRIPTION FORM

Subject Title: Electronics Design **Subject Code:** EIE210

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

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Objectives:

To provide a broad treatment of the fundamentals of electronics design, with emphasis of multimedia technologies.

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 electronics systems and the associated technologies.
2. Solve problems and design simple electronics systems related to multimedia technologies.
3. Apply theory to practice by doing laboratory experiments on important electronics techniques.
4. Appreciate the importance of creativity and critical thinking in the creation of ubiquitous electronics systems in a modern society, and to realize that there is no unique solution for any particular situation and that engineers have to find “optimum” solutions, or make optimum 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. Introduction to electronics systems
   Overview of the fundamental components in electronics systems: analog and digital subsystems and their components. Basic relation between human sensory organs and audiovisual signals. Need for amplification and filtering. Need for logic manipulation and actuation.
2. Analog subsystems
   DC power supplies and regulators. Characteristics and applications of practical operational amplifiers. The basic concept of negative feedback and their effects on circuits. Feedback oscillators. Characteristics and classification of power amplifiers. Basic filter principle and approximations. Frequency response and realization of analog filters: passive and active filters. Brief introduction to discrete-time implementation of analog filters: SC filters.
3. Digital subsystems
   Operation and design of CMOS logic gates. Typical operation and design of flip-flops, registers, counters. Multi-vibrators and timers. Estimation of the speed of operation. Memory circuits: structure and operation of ROM, RAM.

Laboratory Experiments:

1. Active analog filters
2. Power amplifiers
3. Voltage regulators

Case Study: Composite video signals

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

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

Textbooks:

1. Tom Floyd, *Fundamentals of Analog Circuits*, 2nd ed., Upper Saddle River, N.J: Prentice-Hall, 2002.
2. R. Schaumann and M.E. Van Valkenburg, *Design of Analog Filters*, Oxford University Press, 2001.

Reference books:

1. P.R. Gray and R.G. Meyer, *Analysis and Design of Analog Integrated Circuits,* 4th ed., New York, N.Y: Wiley, 2001.
2. Jan M. Rabaey, *Digital Integrated Circuits: A Design Perspect*ive, 2nd ed., Upper Saddle River, N.J : Pearson Education International, 2003.

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:	Introduction to Electronics and Multimedia Technologies	**Subject Code:**	EIE225
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 33 hours Laboratory 9 hours

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

Objectives:

Introduce the fundamental concepts and theory of (i) electronics principles & components and (ii) multimedia technologies. Develop ability for solving problems involving electronics circuits and multimedia technologies. Provide experimentation on electronics and multimedia systems.

Student Learning Outcomes:

Professional/academic knowledge and skills
Upon completion of this course, students are expected to be able
1. To understand the underlying basic theory of analogue & digital electronics and multimedia technologies,
2. To understand the basic building blocks of electronics & multimedia systems,
3. To conduct experiments in basic electronics and multimedia systems,
4. To appreciate the applications of electronics technologies in multimedia systems.

Attributes for all-roundedness
5. To be able to learn independently.
6. Team Work and Presentation Skills.
7. To appreciate the importance of creativity and critical thinking, and to realize the impact and applications pf electronics and multimedia technology.
8. Case studies allow students to develop a fuller understanding of social and community issues related to the application of electronic and multimedia systems.

Syllabus:

1. DC Circuits
   - 1.1 Quantities and Units
   - 1.2 Voltage, Current, and Resistance
   - 1.3 Ohm's Law, Energy, and Power
   - 1.4 Series and Parallel Circuits
   - 1.5 Magnetism and Electromagnetism
2. AC Circuits
   - 2.1 Introduction to Alternating Current and Voltage
   - 2.2 Capacitors and RC circuits
   - 2.3 Inductors and RL Circuits
   - 2.4 RLC Circuits and Resonance
   - 2.5 Time Response of Reactive Circuits
   - 2.6 Transformers
3. Devices
   - 3.1 Diodes and Applications
   - 3.2 Transistors and Applications
   - 3.3 The Operational Amplifier
   - 3.4 Basic Op-Amp Circuits and Applications
4. Digital Circuits
   - 4.1 Binary Number System and Arithmetic
   - 4.2 Boolean Algebra

4.3 Basic Logic Gates and Applications

5. Introduction to Multimedia Technologies
   5.1 Basics of Multimedia signals
   5.2 Digital Multimedia
6. Multimedia Authoring and Data Representation
   6.1 Multimedia Authoring and Tools
   6.2 Graphics and Image Data Representation
   6.3 Colour in Image and Video
   6.4 Fundamental Concepts in Video
   6.5 Basics of Digital Audio.
7. Multimedia Data Processing
   7.1 Data Storage
   7.2 Data Compression
   7.3 Communication and Retrieval

Laboratory Experiment:

Students are required to

1. Carry out a number of short experiments using Electronic Project Kit to appreciate the applications of (i) analogue electronic circuits and (ii) digital electronic circuits,
2. Appreciate the method of quantization and sampling using the audio interface on a PC with suitable data acquisition software
3. Appreciate the method of multimedia data storage and processing, with emphasis on image and video information.

Case Studies:

Detail study of a typical multimedia system and to appreciate the applications of electronic technologies in multimedia systems.

Assessment Methods

Continuous Assessment: 40% Examination: 60%

The continuous assessment consists of a number of short quizzes, assignments, the case study, laboratory reports and tests. The assessment criteria will be made known to the students prior to conducting the assessment.

Textbooks:

1. Thomas L. Floyd, *Electronics Fundamentals: Circuits, Devices and Applications,* 7/e, Addison-Wesley, 2006.
2. Ze-Nian Li and Mark S. Drew, *Fundamentals of Multimedia*, Prentice-Hall, 2004.

Reference Book:

1. R. Steinmetz and K. Nahrstedt, *Multimedia: Computing, communications and Applications*, Prentice-Hall, 2002.

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:	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: 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: Practical Training	**Subject Code:** IC291
Number of Credits: 5	**Hours Assigned:** 5 weeks (Refer to Training Pattern)

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

Objectives:

The objective of this course is to train student with hands-on electronic practice, multimedia electronic product prototype fabrication techniques and practical computing skill. Practical Training will be conducted in Industrial Centre (IC) of the university.

Student Learning Outcomes:

Category A: Professional/academic knowledge and skills

1. Practise and learn the basics for best practice in computer operation with client-server computing on contemporary data network for professionals in engineering and technology.
2. Practise and learn the basics of de facto scientific computing software for professionals in engineering and technology.
3. Practise and learn professional practice in printed circuit board assembly fabrication so as to enable the construction, troubleshooting and testing of simple printed circuit board assembly.
4. Practise and learn the essence of multimedia electronic product prototype fabrication techniques so as to enable the construction of simple multimedia electronic product prototype.
5. Practise and create web site for project presentation across Internet.

Category B: Attributes for all-roundedness

6. Practise technical communication skill, produce training log and report.
7. Cultivate personnel ability and attitude by working in project group under an industrial environment.
8. Understand the variation of different personalities of members within a project group, practise adaptation so as to work in harmony with other group members while focusing on the effective delivery of project commitment.
9. Nourish leadership ability and creativity in group work
10. Demonstrate critical thinking and creativeness in electronic project development and prototype fabrication under an industrial environment.

Syllabus:

1. IC 1106 - Electronic Practice for Electronic and Information Engineering (1 week)
   a. Introduction to electronics and its products, cost factors and technical aspects. Introduction to common electronic circuits and components, soldering and desoldering techniques. Introduction to surface mount techniques, choices & properties of related materials.
   b. PCB design, circuit artwork, etching process, prototype PCB fabrication. Hands on practice of PCB circuit design in EDA environment. Use of basic test instruments. Mounting and installation of electronic circuits, wiring of subassemblies.
   c. Training and practice in programming PC interface control.
   d. Training and practice in embedded device programming.

2. IC 1109 – Advanced Electronic Practice with Multimedia Application (2 weeks)
   a. Training in design modification from circuit prototype for multimedia application.
   b. Embedded device programming practice for multimedia electronic product
   c. Multimedia electronic product prototype fabrication
   d. Testing and troubleshooting techniques in multimedia electronic product
   e. Project presentation using Internet

3. IC3003 - Basic Scientific Computing (30 hours)
   a. Approach and techniques in using the MATLAB Development Environment
   b. Mathematical Operations, matrices, linear algebra, polynomials and interpolation, data analysis and statistics, function functions, differential equations

c. Programming, M-files programming and application examples, flow control statements, function files
d. Graphical user interface, data structures, input/output, and object-oriented capabilities
e. 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

4. IC3004 - General Computer and Network Skills (30 hours)
   a. General skills on installing software from Internet; file decompressing; general troubleshooting in PC; virus scan and cleaning; creating PDF documents, Installing, upgrading, configuring, managing and troubleshooting Microsoft Windows (contemporary version)
   b. Managing access to resources, system configuring and data, files and disks management
   c. Network Configuration, TCP/IP addressing, name resolution and IP routing
   d. Remote access configuring and mobile computing

Training Pattern:

IC3003 Year 1 term time; IC3004 Year 1 term time or summer as elected by student; training in electronic practice in Year 1 Summer.

Teaching and Learning Approach:

The teaching and learning approach is based on practical workshop training arranged in modules and it can be broadly divided into two parts based on their contents:-

1. Training in electronic practice will enable student to learn the requirement of practical electronic product fabrication, appreciate the fabrication process so as to create, develop and integrate their knowledge into future design. On completion of the training, student should be able to manage the fabrication of multimedia electronic product prototype for design and development.

   In module IC1106, student will learn the basics of electronic product construction practice, printed circuit assembly prototype construction skills, techniques and best practice of the electronic industry. Training activities will include tutorials, practical assignments, test and report.

   For module IC1109, students will participate in training groups under an industrial environment with an objective to produce a prototype of electronic product. The product will normally contain multimedia feature with embedded controller application. Student will develop the product under an electronic design automation environment and tackle different parts of product design so as to produce a working prototype for demonstration. Student will experience practical problems that are commonly encountered in the electronic industry during product development. Student will derive solutions to overcome difficulties, produce deliverables for the project in a given time frame. Individual merit will be assessed together with group performance. As such, the training task and activities will be organized in a way to enable a clear identification of work involved while allowing students to work independently and in groups for assessment.

   Besides fabrication technologies and prototype implementation, students should be able to cultivate their personal quality, creativity, management skills and leadership in teamwork collaborations. Tutorials and inductions will be provided as require. In addition to the quality and output of the practical tasks such as PCB assembly fabrication, chassis fabrication, prototype testing and demonstration, assessment will include creativeness and a web site for product presentation on the Internet.

2. Computer training is delivered through a series of instructor led hands-on training courses. Students are required to complete two computer training modules that are essential to their studies in multimedia technology. Tutorials and practical assignments will be given in class so as to enable learning through practical work. Test will be conducted at the end of individual module. Computer training aims to guarantee student with an adequate level of practical computer skills for academic studies and later in their professional lives.

Method of Assessment:

Assessment is comprised of 100% continuous assessment in practical assignment, report, presentation and test. The weighting of assessment components are tabulated as follows:-

Assessment Component	Weighting
Practical Assignment	50%
Report and Presentation	30%
Test	20%
Total	100%

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*, 2nd ed., 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. *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:	Introduction to Marketing	**Subject Code:**	MM2711
Number of Credits:	3	**Hours Assigned:**	Lectures 28 hours Seminars 14 hours

Pre-requisite: nil **Co-requisite:** nil
Exclusion: Marketing and the Consumer (MM2791)

Role and Purpose:

This core subject introduces the basic principles and concepts of Marketing. It provides an analytical foundation for further study of Marketing and also contributes to the Learning Outcomes for all students in two ways. First, the content directly addresses the creation of value, ethics, cultural diversity and globalization. Second, the classroom activities and assessments develop students' teamwork, ability to communicate in English, creative thinking and learning to learn.

Learning Outcomes:

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

1. Understand the role and value of marketing in today's increasingly competitive, dynamic and turbulent environment.
2. Analyse market situations in different cultural / global environments, identifying marketing opportunities and threats; and understand organisations' response process to these environments.
3. Synthesise the process of marketing planning and the process of corporate planning.
4. Formulate marketing mix strategies and programmes and implement them.
5. Apply marketing theories, models, and information technology to practical marketing situations.
6. Establish the relationship between marketing & society in the context of social responsibility and marketing ethics.

Indicative Contents:

1. Fundamentals of Modern Marketing
   Marketing in the modern organization, types of marketing, overview of the marketing process, strategic marketing planning, introduction to the marketing mix, developing competitive advantages.
2. Analysing Marketing Structure and Behaviour
   Global and competitive marketing environment, consumer and organization markets and their buying behaviour.
3. Researching and Planning of Marketing Activities
   Marketing research and audit, marketing information system, marketing planning and forecasting.
4. Selecting Market Opportunities
   Market segmentation, market targeting, product positioning, pricing, promotion and placing.
5. Introduction to the Marketing Mix
   Product, Pricing, Promotion and Placing.
6. Marketing and society
   Social and Marketing ethics: marketing impacts on individual consumers, society and other businesses.

Teaching/Learning Approach:

Keynote lectures, requiring the active engagement of students, will provide them with the conceptual frameworks required for the analysis of Marketing issues. Classroom work will involve teams of students working together to prepare and give presentations, and to critique the work presented by others. Emphasis is placed throughout on the application of theory to the solution of practical and realistic marketing problems in the local and the global setting.

Method of Assessment:

Coursework: 50% Final Examination: 50%

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

Indicative Reading:

Recommended Textbook:

1. P. Kotler and G. Armstrong, *Principles of Marketing*, New Jersey, Prentice-Hall, 2004.

References:

1. E.L. Boone and L.D. Kurtz, *Contemporary Marketing*, Thomson, South-Western, 2004.
2. M.J. Etzel, B.J. Walker and W.J. Stanton, *Marketing*, McGraw-Hill /Irwin, 2004.
3. Lamb Hair McDaniel, *Marketing*, Thomson, South-Western, 2004.

SUBJECT DESCRIPTION FORM

Subject Title: Product Design and Social Considerations

Subject Code: SD2491

Number of Credits: 2

Hours Assigned: Lecture/Seminar 21 hours
Tutorial/Exercise 7 hours

[The timetable arrangement for the subject is flexible. For example, it can be offered in a 14-week mode (2 hours/week), or a 7-week mode (4 hours/week).]

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

Brief Description and Aims:

Social factors are important in product design. Through a research and design project, students will be able to obtain a fundamental concept and experience in design, in particular considering the social factors. Local contexts related to Hong Kong and Chinese mainland are emphasised in this subject.

Learning Outcomes:

Professional skills
1. To develop fundamental skills in product design.
2. To identify social factors/issues related to a particular design or everyday topic.
3. To conduct research to explore a particular topic related to daily life and product design.
4. To generate design solution(s) to solve a specific problem.
5. To present their design ideas by using 2-D and 3-D methods.

Transferable skills
6. To apply the research and design experience related to social consideration in other related subjects and future career.

Indicative Contents:

1. Social factors in design
2. Cultures and society
3. Subcultures and design
4. Daily activities and design
5. User, design and designer
6. Fundamental inclusive and universal concepts in design
7. Fundamental social/design research

Each student is required to conduct research and identify a design project. The project activities include:
1. Investigation of a current social issue
2. Identification of a design need and title
3. Proposal of design solution(s)
4. Presentation(s): 2-D and 3-D

Method of Assessment:

Coursework (design project) 100%

1. The ability to carry out an independent investigation related to social issues of product design, in particular related to the local context (20%).
2. The ability to apply findings in design project (25%).
3. The ability to develop design ideas (40%).
4. The ability to present design ideas (visual and verbal) (15%).

Indicative References:

1. P. Alasuutari, *Researching Culture: Qualitative Method and Cultural Studies*, London, Thousand Oaks, New Delhi: Sage Publications, 1995.
2. W.E. Bijker, *Of Bicycle, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*, Cambridge, Mass., London: The MIT Press, 1995.
3. D. Mackenzie, *Green Design: Design for the Environment*, 2nd ed., London: Laurence King, 1997.
4. D.A. Norman, *The Design of Everyday Things*, London: The MIT Press, 1998.
5. N. Whiteley, *Design for Society*, London: Reaktion Books, 1993.

Journals:

1. Design Issues
2. The Design Studies
3. The Design Journal
4. Journal of Popular Culture
5. Popular Culture Review

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

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 (AMA227) **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.sum.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:	Telecommunications Technologies	**Subject Code:**	EIE325
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 36 hours Laboratory 6 hours (Equivalent to 18 laboratory hours)

Pre-requisite: Information Technology (ENG224)
Linear Systems (EIE312)

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

Objectives:

To equip students with the fundamentals of data communication systems, and to train students to appreciate the underlying principle of modern communication 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 telecommunication systems and associated technologies.
2. Solve problems and design simple systems related to telecommunications.
3. Apply theory to practice by doing laboratory experiments on important telecommunication techniques.

Category B: Attribute for all-roundedness
4. Team work and presentation skills will be developed through the case study.
5. Judicious choice of case studies will also allow students to develop a fuller understanding of social and community issues related to the application of telecommunications technologies.
6. To appreciate the importance of creativity and critical thinking, and to realize that there is no perfect telecommunication system for any particular situation and that engineers have to find “optimum” solutions, or make optimum designs.

Syllabus:

1. Introduction
   A communication model. Digital data communications and networks.

2. Data Transmission and Channel
   Review of time and frequency domain representations, Fourier Series, Fourier transform, sampling and aliasing. Analogue and digital data transmission. Data rate and required bandwidth. Channel impairments. Characterisation and attenuation of transmission media, twisted pair, cable, optical fibre, free space.

3. Data Encoding
   Line coding. Digital modulation: ASK, FSK, PSK, QAM. Analogue modulation: amplitude modulation. Pulse-code modulation, uniform and non-uniform quantization.

4. Data Link Control
   Propagation delay, effective throughput. Sliding window protocol. Flow and Error Control, stop-and-wait ARQ, selective reject ARQ, performance. Data link control protocols, characteristics, basic frame structure, operations.

5. Data Communication Interface. Multiplexing and Switching
   Asynchronous and synchronous transmission. Line configurations, simplex, duplex and half-duplex. Interfacing. Clock synchronization. Frequency division multiplexing. Synchronous time division multiplexing. Code division multiplexing. Multiplexing hierarchies, T1, E1, T2 and T3 carrier systems. SONET and SDH transmission systems. Overview of Circuit and Packet Switching.

6. Current Applications
   Fixed telephone network. Private automated branch exchange. RS-232. V.90 56kbps modem. ADSL,

discrete multitone, xDSL. Cable modem. Hybrid fibre coax. Other selected applications examples such as mobile cellular network, satellite networks, global position system.

Laboratory Experiment:

1. Construction and testing of a simple FSK modem (9 hours)
2. Simulation of analogue modulation using MATLAB (3 hours)
3. Simulation of digital line coding and estimation of BER using MATLAB (3 hours)
4. Simulation of code division multiple access using MATLAB (3 hours)

Case Study:

1. A detailed study of one of the current applications of telecommunication technologies addressed in this course (for example, section 6 of the Syllabus).

Method of Assessment:

Continuous Assessment: 40% Examination: 60%

The continuous assessment consists of a number of short quizzes, assignments, the case study, laboratory reports and two tests.

Textbook:

1. W. Stallings, Data and computer communications, 7th ed., Prentice-Hall, 2004.

Reference Books:

1. L. Leon-Garcia and I. Widjaja, Communication Networks, McGraw-Hill, 2000.
2. B. Forouzan, Data Communications and Networking, McGraw-Hill, 2002.

SUBJECT DESCRIPTION FORM

Subject Title:	Digital Signal Processing for Multimedia Applications	**Subject Code:**	EIE328
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 33 hours Laboratory 9 hours

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

Objectives:

This subject provides students with the concepts of using digital signal processing techniques for multimedia applications. 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 concepts of using digital signal processing techniques for multimedia applications.
2. Understand the formats of different multimedia signals
3. Understand the fundamentals of using digital signal processing techniques for different multimedia standards and the technologies.
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 products, such us DVD player, digital video camera, MP3 player, 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
   Perspective of multimedia computing and communications, review of the key enabling technologies, overview of multimedia system requirements and multimedia software tools.

2. Digital Signal Processing for Multimedia Compression
   Media and data streams. DSP for multimedia processing and coding. DSP for image processing and coding and audio coding. Image and video coding standards. Audio coding standards.

3. Tools for Multimedia Integration
   Synchronized Multimedia Integration Language (SMIL), Virtual Reality Modelling Language (VRML), and MPEG-4 Multimedia Standard.

4. Digital Signal Processing for Multimedia Communications
   Quality of service (QOS) requirements for multimedia communications. Traffic modeling of multimedia sources. Error resilience and concealment. Application example: Video conferencing - standards, multimedia multiplexing and synchronization. Multimedia streaming - streaming servers and players, standards, and protocols.

5. Digital Signal Processors for Multimedia Applications
   Digital signal processors - SIMD techniques, MMX technologies, Symmetric Multiple processor (SMP) technologies.

6. Digital Signal Processing for Multimedia Products
   To discuss not less than one of the following topics
   6.1 DVD player
   6.2 Digital video cameras
   6.3 Digital video cassette recorder
   6.4 MP3 Player

Laboratory Experiments:

1. Developing Simple Multimedia Applications using SMIL
2. Developing Interactive Multimedia Applications using SMIL
3. Developing 3D Multimedia Applications using VRML.
4. Developing Advanced 3D multimedia applications using VRML

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:	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: Electronics Design (EIE210)
Computer Systems Fundamentals (EIE311)

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: 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: Telecommunication Technologies (EIE325) **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:	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:	Introduction to Industrial Design	**Subject Code:**	SD348
Number of Credits:	3	**Hours Assigned:**	Lecture/Seminar 28 hours Tutorial/Exercise 14 hours

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

Brief Description and Aims:

This course gives an introduction to the field of Industrial Design as a creative discipline, a discipline which synthesises knowledge from fields as diverse as e.g. the Arts, the Sciences and Engineering. Industrial Design is known for its capacity to innovate and to add value to products and services. Industrial Designers solve problems centred on user needs with the intent to improve the quality of people's lives. The design process incorporates unique problem solving methods and creativity process. Industrial Design intends to work with technological and ecological parameters in an appropriate way. The development and use of state of the art tools and technologies puts Industrial Design in a significant position socially and economically.

It is the aim of this course to equip students with enough knowledge and experience of Industrial Design to appreciate the profession, relate to its practitioners in different work situations, employ the design process appropriately for problem solving and innovation, and to realise the importance of a user centred approach to the creation of new products and services.

Learning Outcomes:

Professional skills

1. To appreciate the industrial/product design profession, relate to its practitioners in different work situations.
2. To employ the design process appropriately for problem solving and innovation.
3. To realise the importance of a user centered approach to the creation of new products and services.
4. To apply visualisation skill in project presentation.

Transferable skills

5. To understand objectives of industrial/product design, and apply knowledge and experience in other related subjects and future career.

Indicative Contents:

The field of Industrial Design is introduced through a series of lectures featuring a review of milestones of design achievements internationally and locally. The relationships between Design, culture and society are highlighted through a look at topics like cultural identity in product design, user centred design, employment of technologies, and design and sustainability.

Further lectures and seminars cover two major parts of Industrial Design and its professional practice:

1. The essentially theoretical foundation of the industrial design process and methodology covering topics such as
   - Design and culture
   - Form, aesthetics and semantics
   - Human factors and ergonomics in design
   - Research and problem identification
   - Design requirements and design brief
   - Design development and specifications
   - Design evaluation and concept selection

2. The essentially practical aspects of the industrial design process covering topics such as
   - Design visualisation, presentation and communication
   - Product prototyping and user testing
   - Manufacturer and marketing relations

Emphasis in the practical exercises is placed on student's creativity in relation to designing. Students explore different approaches to problems and experience methods of problem solving with the designer's tools.

Method of Assessment:

Coursework (design project): 100%

1. The ability to understand design process (10%).
2. The ability to conduct investigation and then to apply their findings in design (30%).
3. The ability to develop design ideas (45%).
4. The ability to present design ideas (visual and verbal) (15%).

Indicative References:

1. *Design: Education, Culture and Technology*, Taipei: Asia-Pacific Books Publisher, 1997.
2. *Design Issues*. The MIT Press. (Journal)
3. *Design Management Journal*. The Design Management Institute. (Journal)
4. *Design Studies*. Elsevier Science. (Journal)
5. T.E. Graedel, *Industrial Ecology*, 2nd ed., Upper Saddle River, NJ: Prentice-Hall, 2003.
6. P.W. Jordan, *Putting the Pleasure into Products*, IEE Review, 249-252, November 1997.
7. J.Y.C. Kwok, (Ed.), *(Re)-Discovering Design: A Critical Consideration of the Hong Kong Culture of Design*, Hong Kong: A Better Tomorrow Workshop Ltd., 1997.
8. D. Mackenzie, *Green Design: Design for the Environment*, 2nd ed., London: Laurence King, 1997.
9. D.A. Norman, *The Invisible Computer: Why Good Products can Fail, the Personal Computer is so Complex and Information Appliances are the Solution*, Cambridge, Mass., London: The MIT Press, 1998.
10. D.A. Norman, *The Design of Everyday Things*, London: The MIT Press, 1998.
11. H. Roqueta, *Product Design*, London: Te Neues, 2002.
12. N. Stanton, (Ed.), *Human Factors in Consumer Products*, London: Taylor & Francis, 1998.
13. K.T. Ulrich, *Product Design and Development*, 3rd ed., New York, NY: McGraw-Hill/Irwin, 2004.
14. N. Whiteley, *Design for Society*, London: Reaktion Books, 1993.
15. J. Zeisel, *Inquiry by Design*, Reprinted ed., Cambridge: Cambridge University Press, 1997.

SUBJECT DESCRIPTION FORM

Subject Title:	Computer Game Development I	**Subject Code:**	SD3982
Number of Credits:	2	**Hours Assigned:**	Lecture/Tutorial 22 hours Laboratory 20 hours

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

Objectives:

1. To provide a broad overview of fundamental elements and concepts in computer games design and development, and in their production process.
2. To provide students with hands-on experience in designing and developing a computer game.

Student Learning Outcomes:

Professional/academic knowledge and skills

1. Design, analyze, implement and evaluate computer games.
2. Appreciate computer games' designs and complexities.
3. Demonstrate understanding of game production process through developing a computer game in a team starting from ideas.

Attitudes of all-roundedness

4. Collaborate, organize and communicate with others in effective team work.
5. Realize the interdisciplinary nature in computer games development and appreciate importance of collaboration.
6. Be creative and critical to game and play design.

Syllabus:

1. Game design overview
   History of computer games, types of computer games (video, console, arcade, hand-held, wireless, mobile); game genres; play mechanics; game rules; game balancing: obstacle/aid, penalties/rewards; board game, role-playing game; interface design, information design, human-computer interaction design; integration of visual, audio, tactile and textual elements; visual design: composition, lighting and color, graphics design; Audio design: music, sound effects; storytelling; game theory.

2. Media and tools
   Game arts; tools and standards of media: image and audio; JPEG, PNG, GIF, MP3, Ogg.

3. Game production process
   Evaluating game concepts; game design documentation, storyboard, playtest; content creation, team roles, group dynamics, risk assessment; software engineering, project management; prototyping, iterative development; pre-production, production, testing.

4. Game programming
   Game loop; game engine architecture; DirectX; physics and collision detection.

Method of Assessment:

Laboratory: 20% Mini-project: 80%

Reference Books:

1. Tom Miller, *Managed DirectX® 9 Kick Start: Graphics and Game Programming*, 2003. (QA76.575 .M55 2004eb)
2. Alan Thorn, *DirectX 9 User Interfaces: Design and Implementation*, Wordware Publishing, 2004 (QA76.9.U83 T53 2004eb)

3. Andrew Rollings, Dave Morris, *Game Architecture and Design*, New Riders Publishing, 2003. (QA76.76.C672 R654 2004)
4. Katie Salen and Eric Zimmerman, *Rules of Play: Game Design Fundamental*, 2004. (QA76.76.C672 S25 2004)
5. Francois Dominic Laramee, *Game Design Perspectives*, Charles River Media, 2002. (QA76.76.C672 G34 2002)
6. John Scott Lewinski, *Developer's Guide to Computer Game Design*, WordWare Publishing Inc, 2000. (QA76.76.C672 L49 2000)
7. Erik Bethke, *Game Development and Production*, WordWare Publishing Inc, 2003. (QA76.76.C672 B47 2003)
8. David Michael, *The Indie Game Development Survival Guide*, Charles River Media, 2003. (QA76.76.C672 M53 2003)
9. IGDA (www.igda.org).

SUBJECT DESCRIPTION FORM

Subject Title:	Computer Game Development II	**Subject Code:**	SD3983
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 35 hours Laboratory 20 hours

Pre-requisite: Computer Game Development I (SD3982)
Computer Graphics (COMP407)

Co-requisite: nil

Exclusion: nil

Objectives:

1. To introduce students with fundamental concepts and algorithms to develop advanced 3D computer games.
2. To develop foundations for students to explore new algorithms for future 3D computer games.

Student Learning Outcomes:

Professional/academic knowledge and skills

1. Identify essential building blocks in advanced 3D computer games.
2. Understand, analyze, implement and evaluate real-time algorithms in developing advanced 3D computer games.
3. Realize trends in real-time algorithms in advanced 3D computer games.
4. Explore new algorithms for future 3D computer games.

Syllabus:

1. Introduction
   3D game programming (Direct3D); Game engine architectures; scripting.
2. Graphics and rendering
   Graphics rendering pipeline; 3D hardware: programmable graphics pipeline, shading languages, procedural shading, lighting, effects; 3D modeling, texturing, animation.
3. 3D Audio
   Fundamentals of 3D and multi-channel sound; modeling for effects, echo, room size simulation.
4. Artificial intelligence
   Path planning; agent architecture; decision-making systems; genre-specific AI (FPS, RTS, RPG, racing and sport AI), behavioral modeling, artificial life.
5. Physics
   Physics basic concepts; kinematics, kinetics, dynamics; Newton's laws, mass, moment of inertia, friction, force; constrained motion; particle systems.
6. Network
   Multiplayer game architecture, networking, protocols, topologies, security, database; online game systems.

Laboratory Experiment:

3D modeling software (3D Studio Max).

Method of Assessment:

Laboratory: 30% Mini-project: 70%

Reference Books:

1. Tomas Moller, *Real-Time Rendering*, A.K. Peters, 1999. (T385.M635 1999)
2. James D. Foley, *Computer Graphics: Principles and Practice*, 1996. (T385 .F63 1995)

3. Alan Watt, *3D Games: Real-time Rendering and Software Technology*, Addison-Wesley, 2001. (QA76.76.C672 W39 2001)
4. Rick Parent, *Computer Animation: Algorithms and Techniques*, Morgan Kaufmann, 2001. (TR897.7 .P34 2002)
5. David M. Bourg, *Physics for Game Developers*, O'Reilly, 2002. (QC23.2 .B68 2002)
6. Ahmed A. Shabana, *Computational Dynamics*, Wiley, 2001. (QA845 .S44 2001)
7. Patrick Henry Winston, *Artificial Intelligence*, Addison-Wesley, 1992. (Q335.W56 1992)
8. Steve Rabin, *AI Game Programming Wisdom*, Charles River Media, 2002. (QA76.76.C672 A53 2002)
9. Steve Rabin, *AI Game Programming Wisdom 2*, Charles River Media, 2002. (QA76.76.C672 A532 2004)
10. Todd Barron, *Multiplayer Game Programming*, Prime Tech, 2001. (QA76.76.C672 B37 2001)
11. Andrew Mulholland, *Developer's Guide to Multiplayer Game*, WordWare Publishing Inc, 2002. (QA76.76.C672 M85 2002)

SUBJECT DESCRIPTION FORM

Subject Title: Computer Graphics **Subject Code:** COMP407

Number of Credits: 3 **Hours Assigned:** Lecture 28 hours
Laboratory 14 hours
(Equivalent to 18 laboratory hours)

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

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Objectives:

To provide students with the fundamental basis of 2D and 3D computer graphics and image synthesis architecture, algorithms, and data flow, and to train students the principles of modern computer graphics programming.

Student Learning Outcomes:

Category A: Professional/academic knowledge and skills
1. To become familiar with 3D computer graphics API programming,
2. To understand the interactive computer graphics architecture,
3. To attain basic skills in 3D computer graphics modeling and rendering.

Category B: Attributes for all-roundedness
4. In-depth knowledge of display systems, image synthesis, shape modeling, and interactive control of 3D computer graphics applications.
5. Appreciation of modern computer system enhanced with 2D and 3D visual information.
6. Understand how to deal with constraints in the representation of visual information and how to add visual components into a general computer system.

Syllabus:

1. Basic Computer Graphics Hardware/Software Interfaces (16 hours)
   Graphical input/output devices, 2D primitive drawing, rasterization, 2D transformation, 3D transformation and projection, synthetic camera and viewing volume, clipping, object modeling and hierarchical structures.
2. Image Synthesis and Generation Techniques (12 hours)
   Some of the important image generation techniques including hardware-based rendering, scan-conversion, local illumination models, reflections and shading. Related issues such as anti-aliasing and texture mapping will also be discussed.
3. Applications of Computer Graphics (14 hours)
   Introduction to OpenGL and device independent Application Programming Interfaces (API), virtual reality, hardware supported 3D modeling and rendering.

Laboratory Experiment:

Laboratory exercises will normally be conducted using the currently available computer graphics API such as OpenGL. The students will experiment with:

1. Framebuffer control
2. pixel processes
3. 2D drawings and rasterization
4. 3D transformations and projections
5. Scene hierarchy and modeling objects
6. Color and rendering
7. Interactive animation

Case Study:

A study of digital drawing and rendering tools and applications to object modeling, spatial partitioning and interactive animation control will be given.

Method of Assessment

Continuous Assessment: 60% Examination: 40%

The continuous assessment consists of a number of short quizzes, assignments, laboratory experiments.

Textbook:

1. Hill, F.S. Jr., *Computer Graphics Using Open GL*, 2nd ed., Prentice-Hall, 2001.

Reference Books:

1. Angel, E.S., *Interactive Computer Graphics, A top-down approach with OpenGL*, 2nd ed., Addison-Wesley, 2000.
2. Angel, E.S., *OpenGL: A Primer*, Addison-Wesley, 2000.
3. Watt, A., *3D Computer Graphics*, 3rd ed., Addison-Wesley, 2000.
4. Hearn, D. and Baker, M., *Computer Graphics*, 2nd ed., Prentice-Hall, 1994.

SUBJECT DESCRIPTION FORM

Subject Title:	Middleware and Distributed Objects	**Subject Code:**	COMP436
Number of Credits:	3	**Hours Assigned:**	Lecture 36 hours Seminar/Laboratory 6 hours

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

Objectives:

1. To present an integrated view of the basic building blocks of a distributed system and how middleware can help developers to more easily satisfy the requirements of building distributed systems.
2. To provide the foundation knowledge of middleware, particularly object-oriented middleware.
3. To provide training in using CORBA as middleware to build practical distributed systems.

Student Learning Outcomes:

After taking this subject, the students should be able to:

Category A: Professional/academic knowledge and skills

1. understand the basic structure of distributed systems;
2. understand the motivation of using middleware;
3. understand the basic theories underlying the design of middleware;
4. learn to make judgment in choosing a suitable middleware for application problems;
5. understand the basic concepts of CORBA;
6. develop distributed object-based systems using CORBA.

Category B: Attributes for all-roundedness

7. apply the technical knowledge learned to solve real-life practical problems;
8. appreciate and evaluate existing and new technologies.

Syllabus:

1. Introduction to distributed systems (4 hours)
   Distributed system requirements; transparency in distributed systems; object-oriented approach to distributed systems; local versus distributed objects.
2. Principles of object-oriented middleware (4 hours)
   Why middleware; types of middleware; object-oriented middleware; developing systems with object-oriented middleware.
3. Fundamentals of CORBA (8 hours)
   Architecture; Interface definition language (IDL); system development using CORBA.
4. Communication between distributed objects (4 hours)
   Synchronous requests; oneway requests; deferred synchronous requests; asynchronous requests; dynamic invocation; pros and cons of different communication paradigms of CORBA.
5. Portable Object Adaptor (POA) (10 hours)
   Objects vs. servants; lifecycle of objects; request invocation via POA; servant activator and servant locator; case study: using POA to implement various load balancing solutions for distributed systems.
6. Common object services (2 hours)
   Naming service; event service.
7. ICE: emergent OO middleware (4 hours)
   Comparing CORBA and ICE; introduction to ICE programming.

Laboratory Experiment:

In the laboratory session, students will learn how to develop distributed systems using an implementation of CORBA, called VisiBroker (or the Borland Enterprise Server – VisiBroker Edition), using Java as the programming language.

Case Study:

Case studies on load balancing with CORBA.

Method of Assessment

Continuous Assessment: 55% Examination: 45%

Note: To pass this subject, students must obtain grade D or above in BOTH the coursework and the final examination.

Textbook:

1. W. Emmerich, *Engineering Distributed Objects*, Wiley, 2000.

Reference Books:

1. F. Bolton, *Pure CORBA*, Sams, 2002.
2. R. Orfali, D. Harkey and J. Edwards, *Client/Server Survival Guide*, 3rd ed., Wiley, 1999.
3. IEEE Distributed Systems Online, http://dsonline.computer.org.
4. Articles from journals, magazines, and conference proceedings, including ACM TOCS, IEEE TPDS, IEEE TSE, IEEE TOC, CACM, IEEE Computer, ICDE, DOA.

SUBJECT DESCRIPTION FORM

Subject Title: Principles of Virtual Reality **Subject Code:** EIE408

Number of Credits: 3 **Hours Assigned:** Lecture/Tutorial 33 hours
Laboratory 9 hours
(Equivalent to 27 laboratory hours)

Pre-requisite: Computer Graphics (COMP407) **Co-requisite:** nil **Exclusion:** nil

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Objectives:

To provide the theoretical and practical knowledge about virtual reality technologies and the fundamental concepts involved in building and displaying virtual worlds.

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 underlying enabling technologies of VR systems,
2. Design and create a virtual environment, and
3. Design an appropriate virtual reality solution for an application.

Category B: Attributes for all-roundedness
4. Learn independently.
5. Acquire team work and presentation skills.
6. Appreciate the importance of creativity and critical thinking, and to realize that there is no perfect virtual reality system for any particular situation and that engineers have to find “optimal” solutions, or make practical designs.
7. Develop a fuller understanding of social and community issues related to the application of virtual reality systems from case studies.

Syllabus:

1. Introduction to Virtual Reality
   - 1.1 Historical Development of Virtual Reality
   - 1.2 The Benefits of Virtual Reality
2. 3D Computer Graphics
   - 2.1 Transformations and the 3D World
   - 2.2 Modelling Objects, Dynamic Objects
   - 2.3 Physical Modeling: Constraints; Collision Detection, Surface Deformation
   - 2.4 Perspective Views; Stereoscopic Vision
3. Human Factors
   - 3.1 Vision and Display
   - 3.2 Hearing, Tactile and Equilibrium
   - 3.3 Health and Safety Issues
4. VR Hardware
   - 4.1 Computers : Graphics and workstation architectures
   - 4.2 Input Devices: 3D Trackers, Navigation and Gesture Interface
   - 4.3 Output Devices: 3D Sound, Graphics; Haptic Displays
5. VR Software
   - 5.1 VR Software Features and Web-based VR
   - 5.2 Virtual Word and Virtual Environment
   - 5.3 Toolkits: World Toolkit, Java 3D
6. VR Applications
   - 6.1 Engineering and Industrial
   - 6.2 Training, Education and Simulators

6.3 Games and Entertainment
6.4 Medicine and Therapy

Laboratory Experiments:

1. VR related Hardware
2. VR related Programming Tools
3. Practical VR Systems

Case Studies:

1. Applications of VR/VE in Training
2. Applications of VR/VE in Entertainment
3. Applications of VR/VE in Manufacturing and Product Design
4. Applications of VR/VE in Therapy

Method of Assessment:

Continuous Assessment: 50% Examination: 50%

The continuous assessment consists of a number of short quizzes, assignments, the case study, laboratory reports and two tests.

Textbooks:

1. Grigore C Burdea and Philippe Coiffet, *Virtual Reality Technology*, 2nd Eds., Wiley Interscience, 2003.
2. John Vince, *Introduction in Virtual Reality*, Springer, 2004.

Reference Books:

1. IEEE Proceedings in the 2nd International Workshop on Haptic, Audio and Visual Environments and their Applications – HAVE 2003, Ottawa, Canada, 2003.
2. IEEE Proceedings in 2003 IEEE International Symposium on Virtual Environments, Human-Computer Interfaces and Measurement Systems, Lugano, Switzerland, 2003.
3. ACM Symposium on VR, VRST2004, Hong Kong, http://www.cs.cityu.edu.hk/~vrst2004/
4. R Earnshaw, R Guedj, A Dam, and J Vince (Eds), *Frontiers of Human-Centred Computing, Online Communities and Virtual Environments*, Springer, 2001.
5. M.L. McLaughlin, J.P. Hespanha, and G.S.(Eds.), *Touch in Virtual Environments*, IMSC, 2002.
6. John Vince, *Virtual Reality Systems*, 1st ed., Addison-Wesley, 1995.
7. MEDIA LAB at MIT, http://www.media.mit.edu/.
8. Electronic Visualization Laboratory at the University of Illinois in Chicago, http://www.evl.uic.edu/EVL/index.html.
9. Augmented Reality Links http://www.se.rit.edu/~jrv/research/ar/index.html.
10. Virtualized Reality at CMU http://www.cs.cmu.edu/~VirtualizedR/.
11. Augmented Reality & Computer Augmented Environments http://www.csl.sony.co.jp/project/ar/ref.html.
12. Virtual Reality, Augmented Reality, Tele-robotics, http://gypsy.rose.utoronto.ca/bookmarks.html#vr.
13. Virtual Reality in Medicine, http://www.psicologia.net/pages/links.htm.
14. WorldToolKit by Sense8, http://www.sense8.com/index.html.
15. Visualization and Virtual Reality for Manufacturing, http://ovrt.nist.org/
16. The VR Lab, Swiss Federal Institute of Technology, http://ligwww.epfl.ch/
17. Virtual Reality WWW Sites, pages and Compendiums, http://kb.hitl.washington.edu/projects/knowledge_base/inter.html
18. Hot VR Sites, http://www.itl.nist.gov/iaui/ovrt/hotvr.html
19. VR useful Links, http://www.caip.rutgers.edu/vrtechnology/links.html

Other References:

QA76.76.I59S88(2003)	Alistair Sutcliffe, Multimedia and VR
QA76.9.H85V54(1995)	Woodrow Barfield and Thomas Furness III, VE and Advanced Interface Design
QA76.9.H85J33(1994)	Linda Jacobson, Garage VR
QA76.9.H85G73(1994)	Joe Gradecki, The VR Construction Kit

QA76.9.H85(1994)	Joe Gardecki, The VR Programmer's Kit
QA76.9.H85V572(1995)	RA Earnshaw, JA Vince, H Jones, VR applications.
QA76.9.H85V535(2004)	Peter Anderson and Lars Qvortup, Virtual Applications
QA76.9.H85K38(1993)	Roy Kalawsky, The Science of VR and VE.
QA76.9.H85M42(2002)	Margaret McLaughlin, el at (Ed.), Touch in VE.
QA76.9.H85B8713(2003)	Burdea Coiffet (ed.), VR technology
QA76.9.H85V525(2004)	J Vince, Introduction to VR
QA76.9.H85V525(1998)	J Vince, Essential VR Fast
QA76.9.C65H349(2002)	Kay Stanney, Handbook of VEs
QA76.9.H85F76(2001)	Earnshaw, Guedj, van Dam and Vince (Eds.), Frontiers of Human-Centred Computing, Online Communities and VEs.
QA76.9.D5D427(2001)	Stephan Diehl, Disturbed V Words
QA76.9.H85I1428(2003)	IEEE Proceedings Int. workshop HAVE 2003
QA76.9.H85I1425(2003)	IEEE Int.. Symposium VECIM 2003.

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:	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:	Principles of Programming (COMP201) or 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) or Signal Processing Fundamentals (EIE327)	**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.

SUBJECT DESCRIPTION FORM

Subject Title:	Artificial Intelligence and Computer Vision	**Subject Code**:	EIE426
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial/ Seminar 39 hours Laboratory/ Demonstration 3 hours (Equivalent to 9 laboratory hours)

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

Objectives:

1. To introduce the student the major ideas, methods, and techniques of Artificial Intelligence (AI) and computer vision;
2. To develop an appreciation for various issues in the design of intelligent systems;
3. To provide the student with programming experience from implementing AI techniques, simple knowledge systems, and computer vision applications.

Student Learning Outcomes:

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

Category A: Professional/academic knowledge and skills

1. Understand the benefits and limitations of current AI techniques, its culture and society impacts, and possible future development.
2. Implement major game search techniques for simple computer games.
3. Apply machine learning techniques to information processing and data mining.
4. Develop simple expert systems for internet and engineering applications.
5. Explore robotics and computer vision techniques, and their applications to entertainment and engineering domains.

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. Introduction
   Definitions, the Foundations of AI, the History of AI, the State of the Art.

2. Intelligent Agents
   Agents and Environments, the Concept of Rationality, the Nature of Environments, the Structure of Agents, Applications.

3. Blind and Informed Search Methods
   Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Avoiding Repeated States, Searching with Partial Information, Informed (Heuristic) Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Online Search Agents and Unknown Environments.

4. Game Playing
   Games, Optimal Decisions in Games, Alpha-Beta Pruning, Imperfect Decisions, Games That Include an Element of Chance, State-of-the-Art Game Programs.

5. Knowledge Systems
   Rule-Based Deduction Systems, Rule-Based Reaction Systems, Forward and Backward Chaining,

the Knowledge Engineering Process, Analysis of Typical Knowledge Systems.

6. Machine Learning
   Forms of Learning, Inductive Learning, Learning Decision Trees, Computational Learning Theory, Machine Learning Techniques for Intelligent Information Processing and Data Mining.

7. Computer Vision
   Imaging and Representation, Image Preprocessing, Extracting 3-D Information, Object Recognition, Using Vision for Manipulation and Navigation, Concepts of Virtual Reality, Applications.

8. Robotics
   Robot Hardware, Robotic Perception, Planning to Move, Planning Uncertain Movements, Robotic Software Architectures, Entertainment Robots, Engineering Applications.

9. Culture and Society Impacts
   Understanding Intelligence: Issues and Directions, the Ethics and Risks of Developing Artificial Intelligence.

Method of Assessment:

Coursework: 45% Examination: 55%

Recommended Textbooks:

1. S. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach*, 2nd ed., Prentice-Hall, 2003.
2. L.G. Shapiro and G. Stockman, *Computer Vision*, Prentice-Hall, 2001.

Reference Books:

1. G.F. Luger and W.A. Stubbefield, *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*, 4th ed., Addison-Wesley Longman, 2002.
2. P.H. Winston, *Artificial Intelligence*, 3rd ed., Addison-Wesley, 1993.
3. T. Dean, J. Allen and Y. Aloimonos*, Artificial Intelligence: Theory and Practice,* Addison-Wesley Publishing, 1995.

SUBJECT DESCRIPTION FORM

Subject Title: Mobile and Pervasive Computing **Subject Code:** EIE427

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

Pre-requisite: Data and Computer Communications (EIE333) **Co-requisite:** nil **Exclusion:** nil

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Objectives:

To introduce fundamentals of mobile and pervasive computing and provide in-depth treatment on issues related to practical pervasive computing.

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 wireless network access technologies.
2. Possess a knowledge of contemporary mobile and pervasive computing device architectures.
3. Have an understanding of protocols and techniques used in networking and security that are related to pervasive computing.
4. Apply mobile and pervasive computing devices in designing simple practical ubiquitous computing systems.

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. Mobile computing:
   Network computing. Mobile computing mechanisms. Mobile middleware. Wireless Internet Protocols. Wireless local area networks and security issues. Mobility management.

2. Pervasive devices:
   Smart cards. Handheld computers. Palm OS-based devices. Smart labels. Embedded controls: sensors, actuators. Middleware: Java for mobile computing, XML. Human-computer interaction. Pervasive software systems.

3. Network architectures for pervasive computing:
   Ad hoc networks. Sensor networks. Wired and wireless grids. Wireless application protocol. Pervasive services discovery. Location mechanisms.

4. Wireless security:
   Cryptographic algorithms. Cryptographic tools. Security infrastructures. Secure socket layer. Practical techniques for security and user-authentication.

5. Case study:
   Pervasive computing systems.

Laboratory Experiments:

1. Interfacing pervasive devices, e.g. RFID or similar devices
2. Mobile middleware programming
3. Customized embedded OS for mobile devices

Method of Assessment:

Continuous Assessment: 50% Examination: 50%

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

Reference Books:

1. F. Adelstein, S.K.S. Gupta, G. Richard and L. Schwiebert*, Fundamentals of Mobile and Pervasive Computing,* McGraw-Hill*,* 2004.
2. U. Hansmann, L. Merk, M. Nicklous and T. Stober, *Pervasive Computing Handbook*，2nd ed., Springer, 2003.
3. J. Burkhardt, H. Henn, S. Hepper, K. Rindtorff and T. Schack, *Pervasive Computing: Technology and Architecture of Mobile Internet Applications*, Addison-Wesley, 2002.
4. M. McCullough, *Digital Ground: Architecture, Pervasive Computing, and Environmental Knowing*, MIT Press, 2004.

SUBJECT DESCRIPTION FORM

Subject Title: Multimedia Communications **Subject Code:** EIE428

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

Pre-requisite: Data and Computer Communications (EIE333) **Co-requisite:** nil **Exclusion:** nil

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Objectives:

To study the technical issues and system solutions for providing multimedia communications on the Internet.

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 current state-of-the-art developments in Internet technologies for multimedia communications.
2. Appreciate the principles used in designing multimedia protocols, and so understand why standard protocols are designed the way that they are.
3. Understand the system design principles of multimedia communications systems.
4. Solve problems and design simple networked multimedia systems.

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

Syllabus:

1. Network Layer Support for Multimedia Communications
   IP routing, forwarding and switching: IP addressing; Routing Information Protocol (RIP) and Open Shortest Path First (OSPF) protocol; Classless Interdomain Routing (CIDR); IP forwarding, Longest Prefix Match (LPM); Label Switching; Multiprotocol Label Switching (MPLS); IP Multicast, Internet Group Management Protocol (IGMP); IPv6
2. Transport Layer Support for Multimedia Communications
   Media transport protocols: Real Time Protocol (RTP) and Real Time Control Protocol (RTCP); Signaling Protocols: Session Initiation Protocol (SIP), Session Description Protocol (SDP)
3. Quality of Services (QoS)
   Integrated services (intserv): Architecture and Service Model, Resource Reservation Protocol (RSVP), Packet Scheduling Disciplines in the Internet
   Differentiated Services (diffserv): Framework and Concept, Assured and Expedited Services, Packet Classification, Routers Internals and Packet Dropping Techniques
4. Multimedia Streaming Systems
   Streaming architecture: Real-time Streaming and On-demand Streaming, Congestion Control and Error Control, Scalable Transmission, Streaming Server Design, Buffering and Scheduling Techniques, Data Sharing Techniques, Support of Interactive Operations, Case Studies on Real Networks and Interactive TV
5. Voice over IP (VoIP)
   Business model; VoIP Architecture, H.323 standards; Case Study on Enterprise VoIP applications

Laboratory Experiments:

1. Internet routing
2. Simulation study on congestion control
3. Multimedia streaming

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. K.R. Rao, Z.S. Bojkovic and D.A. Milovanovic*, Multimedia Communication Systems: Techniques, Standards, and Networks,* Prentice-Hall PTR, 2002.
2. F. Halsall, *Multimedia Communications: Applications, Networks, Protocols, and Standards*, Addison-Wesley, 2001.
3. Jon Crowcroft, Mark Handley and Ian Wakeman, *Internetworking Multimedia*, Morgan Kaufmann, 1999.
4. J. K. Kurose, *Computer Networking: A Top-down Approach Featuring the Internet*, 2nd ed., Addison-Wesley, 2003.
5. S. Vegesna, *IP Quality of Service*, Prentice-Hall PTR, 2001.
6. Colin Perkins, *RTP: Audio and Video for the Internet*, Addison-Wesley, 2003.
7. A. Dashti, S.H. Kim, C. Shahabi and R. Zimmermann, *Streaming Media Server Design*, Prentice-Hall PTR, 2002.
8. U. Black, *Voice Over IP*, 2/E, Prentice-Hall PTR, 2002.

SUBJECT DESCRIPTION FORM

Subject Title: Corporate Networking **Subject Code:** EIE429

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: Corporate Communication Networks (EIE439)

Objectives:

Telecommunication and computer networking technologies have been advancing rapidly in recent years. New technologies have been developed, and new economic orders have been built. Against this background, this subject is designed to:

1. Give a practical treatment on the design, implementation and management of multinational corporate networks.
2. Introduce the variety of facilities, technologies and communication systems to meet future needs of network services.
3. Discuss in details network planning, management, marketing, performance and security issues.
4. Evaluate critically the performance of existing and emerging global communication networking technologies and their impact on enterprise and world economy.

Student Learning Outcomes:

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

Category A: Professional/academic knowledge and skills

1. Describe the operational, marketing, functional attributes of different components of enterprise networks [1,2]
2. Evaluate critically the design, implementation, and performance of enterprise networks with regard to different criteria [1,3,4]
3. Design enterprise networking solutions by taking into account various constraints and requirements [1,2,3]

Category B: Attributes for all-roundedness

4. Develop a global outlook by recognizing the effect of advancement in communication technologies on business opportunity and world economic, social and cultural development [4]
5. Think and evaluate critically [3,4]
6. Take up new technology for life-long learning [2,4]
7. Present ideas and findings effectively [3]
8. Work in a team, and collaborate effectively with other members [4]

Syllabus:

1. Communication Networks and their Features
   Global networks, enterprise networks, private networks, network topology and optimization, network evolution strategy.
2. Protocols and Technologies
   WAN protocols, Virtual Local Area Network, IP Switching and MPLS, Metro Ethernet WAN, Voice over IP, Softswitch.
3. Network Security
   Cryptography, firewall, IP Security, Virtual Private Network (VPN).
4. Traffic Theory and Marketing
   Teletraffic theory, tariff and cost analysis, deregulations.

Laboratory Experiments:

1. Voice over IP experiment and softswitch.
2. Virtual Private Network and IP Security.
3. LAN switching management.

Method of Assessment:

Continuous Assessment: 50% Examination: 50%

Textbook:

1. V. Theoharakis, *Enterprise Networking: Multilayer Switching and Applications*, Idea Group Pub., 2002.

Reference Books:

1. Housel, Thomas J., *Global Telecommunications Revolution: The Business Perspective*, McGraw-Hill/Irwin, 2001.
2. R.R. Panko, *Corporate Computer and Network Security,* Prentice-Hall, 2004.
3. D. Cameron, *Global Network Security: Threats and Countermeasures*, Computer Technology Research Corp., 2000.
4. *Handbook of Telecommunications Economics*, Amsterdam; Boston, Mass. : Elsevier, 2002.
5. M. Mueller, *Telecom Policy and Digital Convergence,* City University of Hong Kong Press, 1997.
6. *Global Networks, Linked Cities*, Routledge, 2002.
7. Jean-Jacques, *Competition in Telecommunications*, MIT Press, 2000.
8. D. Minoli, *Enterprise Networking: Fractional T1 to SONET, Frame Relay to BISDN*, Artech House, 1993.

SUBJECT DESCRIPTION FORM

Subject Title:	Honours Project	**Subject Code:**	EIE430
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 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:	Digital Video Production and Broadcasting	**Subject Code:**	EIE431
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 35 hours Laboratory 7 hours (Equivalent to 21 laboratory hours)

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

Objectives:

This subject provides a fundamental knowledge both in principles and practices on digital video production, and an in-depth knowledge of some important topics in digital video broadcasting. After the completion of the subject, the student should be able

1. to work on small scale video productions, and
2. to appreciate a wide range of techniques adopted in the movie and video broadcasting industries.

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 video systems with emphasis on production and broadcasting.
2. Understand the production process and production techniques for small scale digital video production.
3. Work with digital video equipments in video shooting and video editing.
4. Design simple systems related to video broadcasting.
5. Apply theory to practice by doing projects on creating movies and configuring digital production and broadcasting equipments.
6. Facilitate students for further development in advanced digital video production and broadcasting.

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. Fundamental of Video Production:
   Production process, pre-production, production and post-production.
2. Pre-Production:
   Story and Script writing. Visualization and storyboarding. Production schedule and budgeting.
3. Production:
   Working with camera and lighting. Location sound production.
4. Post-Production:
   Digital video editing. Digital audio editing.
5. Introduction to Digital Video Broadcasting:
   Video broadcasting services in Hong Kong. Introduction to digital video broadcasting. Video broadcasting standards and current development.
6. Video Broadcasting Techniques:
   Analog video broadcasting techniques. Digital video broadcasting: MPEG-2 systems and multiplexing, programme specific information (PSI) and service information (SI), error control in digital video, digital modulation technique and conditional access for digital TV.

7. Implementation Issues on Digital Video Broadcasting:
   Video broadcasting equipments. Consumer products related to DVB: set-top design, dgital video cassette recorder, etc.

Laboratory Experiments:

1. Digital video production project
2. Case study on digital video broadcasting

Method of Assessment:

Continuous Assessment: 60% Examination: 40%

The continuous assessment will consist of one production project, laboratory reports, a number of short quizzes, assignments, the case study and two tests.

Reference Books:

1. U. Reimers, *DVB: The Family of International Standards for Digital Video Broadcasting*, Springer, 2005.
2. Richard Brice, *Newnes Guide to Digital TV*, Newnes, 2003.
3. Gerald Millerson, *Television Production*, Focal Press, 2001

SUBJECT DESCRIPTION FORM

Subject Title:	Web Systems and Technologies	**Subject Code:**	EIE432
Number of Credits:	3	**Hours Assigned:**	Lecture/Tutorial 36 hours Laboratory 6 hours (Equivalent to 18 laboratory hours)

Pre-requisite: Information Technology (ENG224) **Co-requisite:** nil **Exclusion:** nil

Objectives:

This subject will provide students with the principles and practical programming skills of developing Internet and Web applications. It enables students to master the development skill for both client-side and server-side programming, especially for database applications. Students will have opportunity to put into practice the concepts through programming exercises based on various components of client/server web programming.

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 Internet and Web database applications.
2. Understand the different components for developing client/server applications.
3. Apply the techniques and features of the client/server development languages to construct a database application based on Internet.
4. Develop the web database applications through programming exercises.

Category B: Attributes for all-roundedness
5. Present ideas and findings effectively.
6. Think critically.
7. Learn independently.

Syllabus:

1. Introduction to Client/Server Computing
   - 1.1 The basic principles of client/server computing; Distinguished characteristics of client/server systems and application areas; Comparison of 2 tier versus three tier client/server solutions; Web programming model; Interactive web.
2. Web Programming
   - 2.1 Client Side Web Programming: Benefits and limitation of client-side web programming; Byte code versus scripting. Basic concepts and development based on Java applet, Java script & dynamic HTML (DHTML).
   - 2.2 Server Side Web Programming: Approaches to server-side programming based on PHP, Java servlet technologies, Active Server pages (ASP) and/or Java Server Pages (JSP). Benefits and limitations of server-side web programming. Development framework for server-side programming based on PHP/servlet/JSP
   - 2.3 Web application development. Development of a web application based on client-side and server-side side programming.
3. Web Database
   - 3.1 Introduction to Database: File and database processing systems; Definition of database; DBMS examples.
   - 3.2 Data Modelling: Entity relationship model; Elements of the E.R. model.
   - 3.3 Database Design and Implementation: Relation model; Mapping an ER model to table model; Mapping entities and attributes; Normalization; Foundations of relational implementation; Defining relational data; Relational data manipulation; Relational algebra; Structured query language; Restricting and sorting data; Displaying data from multiple tables.
   - 3.4 Multi-user Database Processing: Database administration; Concurrency control; Security issues; Data dictionary; Database backup and recovery; Case study of a contemporary database server.
   - 3.5 Web Database Applications: Multi-tier architecture; Principle of web database applications: store,

manage and retrieve data.

4. Security on the Web
   4.1 Access control and passwords; cryptography; public key encryption; authentication with digital signature; packet filtering; firewalls.

Laboratory Experiments:

Practical Works:
1. Client-side web application programming.
2. Server-side web application programming.
3. Database driven web design.
4. Evaluation of commercially available database management systems.
5. Creating and managing a database.
6. Web database Applications.

Method of Assessment:

Coursework: 40% Examination: 60%

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

Text Books:

1. M. Hall, *Core Web Programming*, Prentice, 2003.
2. D.M. Kroenke, *Database Processing Fundamentals, Design and Implementation*, 8/e., Prentice-Hall, 2001.

Reference Books:

1. F.J. Cooper et al., *Implementing Internet Security*, New Riders, 1995.
2. Peter Rossbach and Hendrik Schreiber, *Java Server and Servlets*, Addison-Wesley, 2000.
3. Jason Hunter and William Crawford, *Java Servlet Programming*, 2nd ed., O'Reilly, 2001.
4. Susan Boardman, Melanie Caffrey, Solomon Morse and Benjamin Rosenzweig, *Oracle Web Application Programming for PL/SQL Developers*, Prentice-Hall, 2003.
5. Michael V. Mannino, *Database, Design, Applications Development, & Administration*, 2nd ed., McGraw-Hill, 2004.