THE HONG KONG POLYTECHNIC UNIVERSITY

Department of Mechanical Engineering

Full-time

Higher Diploma

in

Computer Aided Engineering Design

[Programme Code: 43093]

Definitive Programme Document

(For 2004 Cohort)

August 2004

TABLE OF CONTENTS

PART A GENERAL INFORMATION

PART B SYLLABUSES

Subjects offered by ME

Subjects offered by AMA, CLC, EIE, ELC, GEC, IC & SD

PART A GENERAL INFORMATION

1 PREAMBLE

With the opening of China, Hong Kong has migrated to become an engineering service centre of the region, responsible for upstream activities in engineering design, marketing, and project management. Any engineering firm that has a passion for excellence will have to keep abreast of the latest engineering design methodologies using computer and related technologies. Feedback from society shows that they would like to have a HD with emphasis on Design, Languages, and Computer Usage.

2. PROGRAMME AIMS AND OBJECTIVES

This HD programme is targeted for engineering design in the broad mechanical engineering field using computer and related technology, and aims to train students to become knowledge workers of the 21st century. It is a standalone qualification but students are expected to be a lifelong learner and the programme is not to be regarded a terminus of learning. Good computer knowledge and language skills are essential to life-long learning and the key to survive in a knowledge-based society. The programme thus places much emphasis on the languages and general education areas, computer usage, and analytical and experimental skills and knowledge related to design.

The programme is aimed to provide students with:

a) Fundamental knowledge and practical experience in the application of computer software for solving engineering design problems.
b) Ability to apply modern computer technologies in engineering design and process interfacing techniques such as virtual reality technology, rapid prototyping, creative use of ordinary and advanced materials, and intelligent system design.
c) Presentation skills through computer graphics and multi-media approaches.
d) Communication skill in both English and Chinese.
e) Ability to gather information from appropriate sources and extend their engineering design skills to solve new problems.
f) Creative thinking in engineering design and innovative approach/method in system/product development.

The programme would also provide sufficient good foundation for the graduates so that they can further their study for degree programmes in ME or other engineering departments.

3. PROGRAMME STRUCTURE

In the University credit-based system, all academic programmes fit in a common framework, in which subjects of standard size (3 credits) are used as far as possible. General structure of the programme and normal study pattern are described in this section.

3.1 General Structure

For a student to be eligible for the award of the Higher Diploma, the programme requires the student to obtain an average Grade Point Average of 2 or more in 65 credits of academic study and 6 credits of practical training. All subjects are standardized to be 3 credits except the General Education subject and the Integrated Engineering Design Project. The structure of the

programme is listed in Table 3.1

Table 3.1 Structure of the Programme

	Subjects	Credits
i	General Education and Language	11
ii	Mathematics	3
iii	Core Subjects	42
iv	Electives	3
v	Integrated Project	6
vi	IC Practical Training	6
	Total	71

3.2 Normal Study Pattern

The normal duration of study is two years if the specified progression pattern (SPP) is followed. Student could choose to deviate from the SPP subject to approval from the Department of Mechanical Engineering.

The specified progression pattern for full-time students is given in Table 3.2.

Table 3.2 Specified Progression Pattern[@] for the programme (Part I)

Subject Title		Formal Contact Hours per Semester	Credits	Assessment Weighting CW/EXAM
Stage 1 (Semester 1) Compulsory Subjects				
AMA203	Mathematics 1a	42	3	0.3/0.7
ELC205	English for Academic Purposes	42	3	1.0/0.0
IC230	Training on Engineering Software	Non block in Semester 1; 1 day/week for 12 weeks	3	1.0/0.0
ME206	Engineering Materials and Selection	42	3	0.6/0.4
ME207	Engineering Graphics and Multi-media Presentation**	42	3	1.0/0.0
ME285	Introduction to Computing a	42	3	1.0/0.0
Stage 1 (Semester 2) Compulsory Subjects				
EIE255	Basic Electronics	42	3	0.4/0.6
IC233	Industrial Centre Practical Training	Non block in Semester 2; 1 day/week for 12 weeks	3	1.0/0.0
ME208	Management and Environmental Issues in Engineering Design	42	3	0.6/0.4
ME209	Engineering Design Process	42	3	1.0/0.0
ME210	Mechanics and Design of Mechanical Components	42	3	0.6/0.4
SD2403	Cultural Issues and Product Semantics in Product Design	42	3	1.0/0.0

Table 3.2. Specified Progression Pattern[@] for the programme (Part II)

Subjects		Formal Contact Hours per Semester	Credits	Assessment Weighting
				CW/EXAM
Stage 2 (Semester 1) Compulsory Subjects				
CLC211	Elementary Putonghua	42	3	1.0/0.0
ME307	Computer-aided Design and Thermal Systems	42	3	0.6/0.4
ME308	Computer-aided Analysis and Flow Systems	42	3	0.6/0.4
ME309	Intelligent Systems and Products	42	3	1.0/0.0
ME310	Integrated Engineering Design Project*	42	--	1.0/0.0
ME311	CAD/CAE I	42	3	1.0/0.0
Stage 2 (Semester 2) Compulsory Subjects				
ELC305	English in the Workplace	42	3	1.0/0.0
ME310	Integrated Engineering Design Project*	42	6	1.0/0.0
ME312	Concurrent Product Design Process #	42	3	0.6/0.4
ME313	CAD/CAE II	42	3	0.6/0.4
Stage 2 (Semester 2) Elective Subjects (Students are required to choose one of the subjects listed below in Semester 2)				
ME314	Virtual Reality Technology and Engineering Design	42	3	1.0/0.0
ME316	Project Management for New Products	42	3	0.6/0.4

Note:

@ At least one 2-credit General Education (GE) subject under the category of "China Studies" is required to be compeleted by all HD students and students can take the GE subject in any semester of the HD programme. For an evenly-distributed workload, the student may consider taking the GE subject in the fourth semester.

* Total duration of the Integrated Engineering Design Project is 2 semesters. Assessment will be carried out at the end of the 4th Semester.

** This subject will be jointly taught by ME and SD staff.

\# This subject will be jointly taught by ME and IC staff.

4. ADMISSION, REGISTRATION AND ASSESSMENT

The admission, registration and assessment arrangements are in line with the University policies. Details of information listed in the following table can be found in the Student Handbook. Note that the last intake for this programme is 2005/2006 academic year.

• Registration and Add/Drop of Subjects
• Credit Transfer and Exemption
• Zero Subject Enrolment
• Re-assessment
• Appeal Against Assessment Results
• Progression and De-registration

4.1 Entrance Requirements

In addition to the University's General Minimum Entrance Requirements for Higher Diploma programmes, a candidate has to satisfy the following requirements:

(a) For Entry with HKALE Qualifications:

- D in HKCEE Mathematics or Additional Mathematics (only required for applicants without E in HKALE Applied Mathematics or Pure Mathematics, or HKALE (AS-Level) Applied Mathematics or Mathematics & Statistics); and

- E in HKCEE Physics or Engineering Science (only required for applicants without E in HKALE Physics or Engineering Science, or HKALE (AS-Level) Physics or Design & Technology); OR

(b) Alternative Entry Route:

Holders of Diploma, Higher Certificate or equivalent in relevant disciplines of recognized institutions.

4.2 Grades, GPA and Award Classifications

An assessment system based on a 0-4 Grade Point Average (GPA) system is used. A student's performance in a subject shall be designated by a letter grade. Each grade is assigned a numerical value as indicated in Table 4.1. In this system, 'F' is a subject failure grade and all others (from 'D' to 'A+') are subject pass grades.

At the end of each semester, the GPA will be computed, following the University's guidelines, to indicate the student's performance up to and including the last semester, inclusive of failed subjects. Exempted and ungraded subjects, subjects for which credit transfer has been approved without assigned a grade, and subjects which a student has been allowed to withdraw, will be excluded from the GPA calculation. 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.

Table 4.1 The Grade Point Average System

Letter Grade	Grade Point	Interpretation
A+ A	4.5 4.0	Excellent
B+ B	3.5 3.0	Good
C+ C	2.5 2.0	Satisfactory
D+ D	1.5 1.0	Marginal
F	0	Failure

The maximum GPA will be capped at 4.0 if the calculated value based on Table 4.1 is higher than 4.0. In order to graduate, a student must achieve at least a GPA of 2, in addition to satisfying the programme specific graduation requirements. The awards will be classified based upon the Award GPA. All credits are equally weighted in determining the classification of awards. Any subject passed after the graduation requirement has been met or subject taken on top of the prescribed credit requirements for award shall not be counted in the calculation of Award GPA. However, if a student passes more elective subjects (or optional subjects) than the requirement for graduation in or before the semester within which he 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 passed subjects with lower contribution will be excluded from the grade point calculation for award classification), irrespectively of when the excessive elective subjects (or optional subjects) are enrolled.

4.3 Subject Assessment

Assessment method varies from subject to subject. Please refer to the relevant subject syllabus for details. For failed subjects, re-assessment will be granted only under extenuating circumstances, which will be determined by the Subject Assessment Review Panel (SARP) case by case.

4.4 Retaking of Subjects

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

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 host department of the programme on which the student enrols.

The number of retakes of a failed subject is not restricted. If a subject is taken twice, both the original grade and the grade obtained after retaking the subject will be included in the calculation

of the GPA.

4.5 Checking for Eligibility for Graduation

The Department, with data provided by the Academic Secretariat, will monitor students' progress and will verify the eligibility of students for awards. The potential graduates identified will be brought to the attention of the Programme Leader for verification and will then be presented to the Board of Examiners (BoE) for award classification. Table 4.2 shows the guidelines for BoE's reference for award classification.

A student is required to graduate as soon as he/she satisfies all the requisite conditions for graduation. Subject to the maximum study load of 24 credits per semester, a student may take more credits than he needs to graduate up to a maximum of 9 credits on top of the prescribed credit requirements for his award in or before the semester within which he becomes eligible for award.

Table 4.2 Guidelines for Determining Award Classification

Higher Diploma	Guidelines
Distinction	The performance/attainment of the student is outstanding, and is judged to be exceptionally able in the field covered by the programme in question.
Credit	The student has reached a standard of performance/ attainment that is more than satisfactory but less than outstanding.
Pass	The student has reached a standard of performance/ attainment judged to be adequate/satisfactory.

4.6 Normal and Maximum Periods of Registration

The normal period of registration for Higher Diploma is two years if the normal study pattern is followed, and the maximum period is four years.

5. PROGRAMME OPERATION AND MANAGEMENT

5.1 Programme Committee

The Programme Committee is responsible for the overall academic operation and management of the programme. The Committee will have the following membership:

Chairman:	Programme Leader
Members:	Head of Department;
	Specialism Leaders;
	Subject Representatives;
	Student Representatives
Secretary:	Departmental Executive Officer

Student representatives are elected annually for appointment to the Committee. The Programme

Committee is directly responsible to the Departmental Learning and Teaching Committee (DLTC) of the ME Department for all matters related to teaching and learning development.

5.2 Programme Executive Group

The day-to-day operation of the programme will be carried out by the Programme Executive Group, which is consisting of the Programme Leader and two subject representatives. The Programme Leader will report the operation back to the Programme Committee.

5.3 Student-Staff Consultative Committee

The Student-Staff Consultative Committee consists of Student Representatives together with the Programme Leader. The Committee is normally chaired by the Programme Leader, and meets at least twice a year. Issues to be kept under consideration include: student work load, teaching methods, balance between subject areas, training matters and other areas of mutual concern.

5.4 Academic Tutors

Each student will be assigned an academic tutor from the academic staff of the ME Department. The role of an academic tutor shall include but is not limited to the following:

- Identify academic strengths and weaknesses of the student;
- Advise the student on electives and answer questions about the curriculum;
- Encourage the student at times of academic frustration;
- Report the general academic status of the student to the programme committee;
- Alert and consult the programme leader as soon as possible about any unexpected situation faced by the student that may affect the student's academic progression;
- Bring to the attention of the Student-Staff Consultative Committee any special situation concerning the student that may require special decision by the Committee;
- Encourage the student to give feedback on the programme and put forward his comments to the Departmental Learning and Teaching Committee.

PART B SYLLABUSES

SUBJECT DESCRIPTION FORM

Subject Title:

Engineering Materials and Selection — ME206 (3 credits) Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **0.4** x End of Subject Examination + **0.6** x Coursework

Coursework will include mini design projects with reports and presentations, assignments and short tests.

Objectives:

This subject intends to provide the students with:

1. Basic understanding in mechanical behaviour of engineering materials, which are essential foundations to perform engineering design.
2. Fundamental knowledge of commercial and smart materials and their applications.
3. Skills to select suitable materials during a design process, which are acquired through hands-on experience in real-life case studies and mini design projects.

Engineering Materials and Selection

Syllabus:

Mechanical behaviours of materials

Elastic and plastic deformations. Phase diagrams. Fracture. Fatigue. Creep. Corrosion. Thermal and electrical properties. Safety factors. Failure criteria. Strengthening processes.

Common commercial engineering materials

Engineering alloys. Ceramics. Polymers. Composite materials. Materials coding systems. Engineering standards. Materials selection for particular purposes.

Introduction to smart materials

Shape memory alloys and polymers. Piezoelectric materials. Intelligent structures.

Computer-aided materials selection in design process

Introduction of suitable computer software to aid the materials selection for design. Technical, environmental, cost and manufacture considerations.

Mini design projects:

Real-life mini design projects and case studies will be carried out for students to acquire hands-on experience in materials selection during the design process, with the aid of suitable computer software.

Indicative reading list:

1. Henkel, D. and Pense, A., Structures and Properties of Engineering Materials, 5th edition, McGraw-Hill, 2000.
2. Datsko, J., Materials Selection for Design and Manufacturing, Marcel Dekker, 1997.
3. Courtney, T., Mechanical Behaviour of Materials, 2nd edition, McGraw-Hill, 2000.
4. Mahmould, M. F., Materials Selection for Engineering Design, Prentice Hall, 1997.
5. Michael, F.A., Materials Selection in Mechanical Design, Butterworth-Heinemann, 1999.

SUBJECT DESCRIPTION FORM

Subject Title:

Engineering Graphics and Multi-media Presentation — ME207 (3 credits) Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **1.0** x Coursework

Coursework will include mini projects with reports and presentations, assignments and short tests.

Objectives:

This subject intends to provide the students with:

1. Basic skills in sketching and reading of technical drawings, and application of computer-aided drafting to present a design.
2. Fundamental multi-media skills to present a design.
3. Basic communication skills via main stream digital means.

Engineering Graphics and Multi-media Presentation

Syllabus:

Engineering Graphic Communication

Mechanical system drawings interpretation: schematic representation and appreciation. Standards and conventions: Symbols and abbreviations.

Engineering drawing and sketch

Technical sketching and drawing. Orthographic, sectional and developed views.

Computer-aided drafting

File commands. Draw, modify and construct commands. Inquiry and viewing commands. Multiview drawing. Sectional and auxiliary views. Dimensioning. Viewing and display.

Freehand visualisation

Introduction of various types of visualisation/drawing skills: observation, expressive and perspective. Application of various types of media: pencil, marker, transfer and printmaking.

Digital imaging

Basic theories of forming images by light. Operation of digital camera. Inputting and outputting images. Image manipulation.

Digital video production

Basic production procedures: scriptwriting, storyboarding, shooting, editing and sound effects.

Mini project practice:

Mini projects will be carried out for students to acquire basic skills in technical sketching and drawing, computer-aid drafting and video production through hands-on experience.

Indicative reading list:

1. Lockhard, S.D., and Johnson, C.M., Engineering Design Communication, Prentice Hall, 2000.
2. Bertoline, G.R. Technical Graphics Communication, Irwin, 1997.

SUBJECT DESCRIPTION FORM

Subject Title:

Management and Environmental Issues in Engineering Design — ME208 (3 credits) Compulsory

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Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **0.4** x End of Subject Examination + **0.6** x Coursework

Coursework will include design projects with reports and presentations, assignments and short tests.

Objectives:

This subject enables the students to develop:

1. Abilities of strategic thinking, planning and management in carrying out an engineering design project.

2. Fundamental knowledge of financial and quality management of an engineering design project.

3. Skills to analyse and integrate the impacts of environmental issues on the engineering design process.

Management and Environmental Issues in Engineering Design

Syllabus:

Project planning and management

Project management principles and practices. Project selection and approval. Planning and scheduling of a design project. Work standards. Resources analysis, allocation and smoothing. Programme evaluation, monitoring and review techniques.

Economic analysis and cost estimation

Benefit/cost ratio. Return on investment. Cost evaluation methods. Economic decision making.

Quality management and ISO standards

Concept, philosophy and system of quality management. Tools and methods of quality control. ISO 9000 and ISO 14000. Design for quality.

Types and natures of pollution

Natural cycles of environment. Industrial activities and pollution. Land, water, air and noise pollution. Transport of contaminants. Treatment and disposal methods.

Environmental protection and engineering design

Pollution and health problems caused by a poor design. Design for environment. Life-cycle assessment. Pollution prevention, planning and economics.

Impacts of environmental protection legislation on design

Environmental legislation and regulations. Risk, reliability and safety of a design project. Legal and ethical issues in design. Hazardous waste management.

Design project practice:

Real-life design projects will be carried out for students to acquire hands-on experience in planning, cost evaluation, quality control, management and consideration of environmental issues of a design project.

Indicative reading list:

1. Olson, D.L., Introduction to Information System Project Management, McGraw-Hill, 2000.
2. Woodside, G. and Kocurek, D., Environmental, Safety, and Health Engineering, John Wiley and Sons, 1997.
3. Bishop, P., Pollution Prevention, Fundamentals and Practice, McGraw-Hill, 2000.

SUBJECT DESCRIPTION FORM

Subject Title:

Engineering Design Process — ME209 (3 credits) Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **1.0** x Coursework

The course is built around a design project. Design project assessments will include an individual design notebooks and group product development file. Assignments and a short answer test will also be used.

Objectives:

This subject intends to provide the students with:

1. Fundamental knowledge in the philosophy, procedures and methods of design of engineering systems and products.

2. Understanding of the roles of design engineer and design team, and their relationships with the other industrial and commercial sectors.

3. Opportunities to exercise their creativity and innovative skills in solving real-life design problems.

Engineering Design Process

Syllabus:

Design, analysis and development of a new product

Market need. Product life cycle. Different types of mechanical design problems. Constraints, goals, and design decisions. The design process.

Design engineers and design team

Models of human information processing. Mental processes that occur during design. Creative designer. Engineering design teams. Relationships of design to other engineering and commercial functions.

Planning and development of design specifications

Problem identification and design consideration. Design plan. Requirements of client. Engineering specifications generation.

Concept generation and evaluation

Functional decomposition. Generating concepts from functions. Information representation in concept evaluation. Interchangeability. Computer-aided concept evaluation.

Product generation and evaluation

Goals and modelling for performance evaluation. Geo-metrics. Value engineering. Introduction to design optimisation. Launching of product.

Mini project practice:

Real-life design projects will be carried out for students to learn the entire design process through practice.

Indicative reading list:

1. Dym, C.L., Engineering Design: A Project-based Introduction, John Wiley, 2000.
2. Hurst, K., Engineering Design Principles, Arnold, 1999.

SUBJECT DESCRIPTION FORM

Subject Title:

Mechanics and Design of Mechanical Components — ME210 (3 credits) Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **0.4** x End of Subject Examination + **0.6** x Coursework

Continuous assessment will include design projects for machine elements and kinematic analysis of mechanism. Assignments and quizzes will also be used.

Objectives:

1. To provide a theoretical background of basic statics and dynamics.
2. To enable students to predict the mechanical behaviour of machine elements and mechanism.
3. To enable students to understand the working principles of CAD tools for the design of machine elements and mechanism.

Mechanics and Design of Mechanical Components

Syllabus:

Stress and Strain Systems in Design

Representing on a stress element. Direct stress: tension, compression, shear. Deformation under direct axial loading. Relationship between torque, power, and rotational speed. Torsional shear stress and deformation.

Computer-aided Static Analysis

Computer aided method for static analysis.
Internet-based experiments.

Computer-aided Shaft Design

Shaft design procedure. Design stress for shaft in torsion. Design examples.

Computer Modelling and Analysis of Machine Elements

Power screws. Fasteners. Performance of bolted joints. Rivet. Power transmission components.

Computer-aided Mechanism Design and Basic Dynamics

Computer aided mechanism design: kinematic analysis, mechanism design using kinematic principle.
Particle and Rigid body kinetics.

Example design practices:

Design for strength of mechanical structures/joining devices. Design for strength for power transmission system.

Indicative reading list:

1. Salter, G.R., Computer-aided Statics and Strength of Materials, Prentice Hall, 1999.
2. Benham, P.P., Crawford, R.J., and Armstrong, C.G., Mechanics of Engineering Materials, (Second Edition), Addison-Wesley, 1996.
3. Mott, R.L., Machine Elements in Mechanical Design (Third Edition), Prentice Hall, 1999.
4. Norton, R.L., Design of Machinery (New media version, Second Edition), McGraw-Hill, 2000.

SUBJECT DESCRIPTION FORM

Subject Title:

Introduction to Computing a — ME285 (3 credits) Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **1.0** x Coursework

Coursework will include mini projects, assignments and short tests.

Objectives:

This subject aims (i) to familiarise students with the fundamentals of computer hardware and software, and (ii) to equip the students with the essential skills of writing programs in a logical and structural way using a high-level programming language.

On completion of the subject, the students should be capable of solving relevant engineering problems using numerical methods. They should also develop a capability to solve more complex problems in their later stage of study.

Introduction to Computing a

Syllabus:

- Introduction to computers and computing
- Overview of different programming languages
- Programming design methods
- Software engineering
- High-level programming languages such as C and FORTRAN
- Software applications

Indicative reading list:

1. Haskell, R.E., Introduction to Computer Engineering, Prentice-Hall, 1993.
2. Hamacher, V.C., Vranesic, Z.G. and Zaky, S.G., Computer Organization, 4th edition, McGraw-Hill, 1996.

SUBJECT DESCRIPTION FORM

Subject Title:

Computer-aided Design and Thermal Systems — ME307 (3 credits) Compulsory

Pre-requisites: AMA203 Mathematics Ia

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **0.4** x End of Subject Examination + **0.6** x Coursework

Coursework will include design projects with reports and presentations, assignments and short tests.

Objectives:

This subject intends to provide the students with:

1. Fundamental understanding of the heat transfer processes in industrial products and systems, and their evaluation.
2. Knowledge to design thermal systems with the aid of computer technology.
3. Skills to carry out the design of thermal systems with the aid of suitable software, which are acquired through hands-on experience in real-life design problems.

Computer-aided Design and Thermal Systems

Syllabus:

Computer-aided design of thermal systems

Introduction of some common industrial thermal systems/products, their constructions and functions. Overheating problems and thermal design. Computer-aided evaluation of temperature and heat flux distributions.

Conduction, convection and radiation

Fourier's law of conduction. One-, two- and three-dimensional conduction. Steady-state and transient problems. Heat generation systems. Newton's law of cooling. Natural, forced and mixed convection. Heat transfer coefficient and flow condition. Non-dimensional parameters and equations. Radiation from real, black and grey bodies. Stefan-Boltzmann law of thermal radiation. Radiation exchange in a grey enclosure.

Working fluids and their properties

Common working fluids in thermal systems/products. Air, water and steam, refrigerants. Evaluation of fluid properties.

Use of software to perform thermal design

Introduction of suitable software for thermal design. Limitations, operation procedures and reliability of the software. Interpretation and presentation of the predictions.

Design project practice:

Real-life design projects will be carried out for students to acquire hands-on experience in computer-aided thermal design of engineering systems/products.

Indicative reading list:

1. Holman, J.P., Heat Transfer, 8th edition, McGraw-Hill, 1997.
2. Granet, I. and Bluestein, M., Thermodynamics and Heat Power, 6th edition, Prentice Hall, 2000.
3. Smith, E., Thermal Design of Heat Exchangers, John Wiley and Sons, 1997.
4. Jaluria, Y., Design and Optimization of Thermal Systems, McGraw-Hill, 1998.
5. Cengel, Y.A., Fundamentals of Thermal-Fluid Sciences, McGraw-Hill, 2000.

SUBJECT DESCRIPTION FORM

Subject Title:

Computer-aided Analysis and Flow Systems — ME308 (3 credits) Compulsory

Pre-requisites: AMA203 Mathematics Ia

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **0.4** x End of Subject Examination + **0.6** x Coursework

Coursework will include design projects with reports and presentations, assignments and short tests.

Objectives:

This subject intends to provide the students with:

1. Fundamental understanding of the fluid flow problems encountered in industrial products and systems, and their evaluation.

2. Knowledge to analyse and design flow systems with the aid of computer technology.

3. Skills to analyse flow problems in industrial products and systems with the aid of suitable software, which are acquired through hands-on experience in real-life design problems.

Computer-aided Analysis and Flow Systems

Syllabus:

Computer-aided analysis of a flow system

Introduction of some common industrial flow systems/products, their constructions and functions. Computer-aided evaluation of velocity and pressure distributions.

Working fluids and fluid mechanics

Common fluids encountered in industrial flow systems/products. Newtonian/non-Newtonian fluids. Fluid properties and pressure.

Fundamental of fluid flow

Steady/unsteady, incompressible/compressible, uniform/non-uniform, laminar/turbulent flow. Continuity, Euler, Bernoulli and Energy equations. Flow around bodies or in ducts. Friction and pressure drop in ducts.

Dimensional analysis and similarity

Dimensionless groups and their significance. Similarity and model testing.

Fluid Machinery

Pumps and fans. Performance characteristics and selection.

Use of software to analyse flow systems

Introduction of suitable software to analyse flow systems. Limitations, operation procedures and reliability of the software. Interpretation and presentation of the predictions.

Design project practice:

Real-life design projects will be carried out for students to acquire hands-on experience in computer-aided analysis of industrial flow systems/products.

Indicative reading list:

1. Streeter, V., Fluid Mechanics, 9th edition, McGraw-Hill, 1998.
2. Som, S.K. and Biswas, G., Introduction to Fluid Mechanics and Machinery, McGraw-Hill, 1998.
3. Cengel, Y.A., Fundamentals of Thermal-Fluid Sciences, McGraw-Hill, 2000.

SUBJECT DESCRIPTION FORM

Subject Title:

Intelligent Systems and Products — ME309 (3 credits) Compulsory

Pre-requisites: ME285 Introduction to Computing a; EIE255 Basic Electronics

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **1.0** x Coursework

Coursework will include laboratory exercises and mini-project.

Objectives:

1. To provide students with the skills and knowledge in designing simple intelligent systems and products.
2. To stimulate students' creativity in designing smart products of the future.

Intelligent Systems and Products

Syllabus:

Design factors of intelligent systems and products

Autonomy. Self-diagnosis. Self-repair. Self-learning. Interactivity. Machine Intelligence Quotient(MIQ).

Sensors and signal conditioning

Analogue and digital sensors. Signal conditioning. Interfacing sensors with controllers. Intelligent sensors.

Actuators and control

AC and DC motors, servo motors, stepping motors, linear motors, pneumatic and hydraulic actuators. Interfacing actuators with controllers. Intelligent manipulators.

Selection and assembly of mechanisms for intelligent machines

Linear-to-linear, linear-to-rotary, rotary-to-linear, rotary-to-rotary, reciprocating motion conversion mechanisms. Selection and design of mechanisms.

Selection and programming of controllers for intelligent systems and products

Programmable logic controllers. Microcontrollers. PC-based control. Network-based control. Behavior-based control. Real-time multitasking.

Integration of functional components to build intelligent systems

Subsumption architecture. Selection and design of sub-systems for intelligent behavior. Case studies.

Example design projects:

Design of a smart toy or a smart product.
Enhancement of a conventional machine by adding intelligent characteristics.

Indicative Reading list:

1. Histand, M.B., and Alciatore, D.G., Introduction to Mechatronics and Measurement Systems, McGraw-Hill, 1998.
2. Bradley, D.A., Mechatronics and the Development of Intelligent Machines and Systems, Stanley Thornes Pub Ltd, 2000.
3. Gabbert, U., Smart Mechanical Systems - Adaptronics, Society of Automotive Engineer, 1998.
4. Kin, S.H., and Kim, S.H., Designing Intelligence: A Framework for Smart Systems, World Bank, 1990.
5. Jones, J.L. *et al*., Mobile Robots: Inspiration to Implementation, A K Peters Ltd., 1998.
6. Everett, H.R., Sensors for Mobile Robots: Theory and Application, A K Peters Ltd., 1995.
7. Walsh, R.A., Electro-Mechanical Design Handbook, McGraw-Hill, 2000.
8. Frank, R., Understanding Smart Sensors, Artech House, 2000.

SUBJECT DESCRIPTION FORM

Subject Title:

Integrated Engineering Design Project — ME310 (6 credits) Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact Hours: 84

Assessment*:

Overall Assessment: **1.0** x Coursework.

Coursework will include the completion of a project work, e.g. development of an engineering system design or prototype of a product, a formal report and an oral examination (presentation).

Objectives:

The final year group (normally 3 students in a group) project provides the students an excellent opportunity to acquire hands-on experience in real-life design projects, a chance to experience teamwork, and integrate the knowledge obtained from various subjects in the programme. Students are expected to carry out the projects with a practical approach by going through the following stages:

1. Identification of design objective and specifications.
2. Information retrieval.
3. Evaluation of solution methods.
4. Integration of knowledge and application of software.
5. Conclusion and reflection of learning.
6. Written and oral presentation skills.

Integrated Engineering Design Project

Syllabus:

In-depth study of a substantial task in:

- System design
- Product design
- Product development

Suggested areas of design projects:

- Toy industry
- Electrical appliances
- Medical equipment
- Electronic systems
- Engineering services
- Plastic product
- Machinery components

Major assessment criteria:

- problem identification
- exploration of topics
- choice of method
- innovative thinking
- presentation technique
- written report and oral presentation
- project management skill
- self-assessment

* Assessment of the Design Project:

- **Progress (40%)** - General attitude, initiative, innovation and work accomplishment. It will be assessed by the Chief Supervisor.

- **Report (40%) -** Technical contents, presentation, English standard, demonstration of knowledge and skills to perform the design project

  The final report will be jointly assessed by the Chief Supervisor and the Second Assessor. Case of significant disagreement between them will be assessed by the Programme Leader.

- **Oral Presentation (20%) -** Knowledge of technical contents, presentation skills,answering skills, English standard, demonstration of knowledge and skills to perform the design project.

  The oral presentation will be assessed by a Panel chaired by the Programme Leader and subject leaders. The Panel will ensure the quality and uniformity in the assessment of projects.

SUBJECT DESCRIPTION FORM

Subject Title:

CAD/CAE I — ME311 (3 credits) Compulsory

Pre-requisites: ME207 Engineering Graphics and Multi-media Presentation; ME209 Engineering Design Process

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **1.0** x Coursework

Continuous assessment will include design projects with CAD/CAE focus. The design projects will be structured into modules, each requiring a specific modelling or analysis capability of CAD/CAE system. Assignments and quizzes will also be used.

Objectives:

1. To provide a theoretical and practical background of computer-aided engineering (CAE) concept.

2. To enable students to understand the working principles of CAE techniques as a tool in the engineering design environment.

CAD/CAE I

Syllabus:

Introduction to CAD/CAE Systems for Product Design

Overview. Use of CAD/CAE systems for product development. Geometric modelling. Parametric CAD. Feature-based modelling.

Computer Graphics for Mechanism Analysis

Geometric transformations. Concatenated transformations. Application of geometric transformation for kinematic analysis of mechanism.

Space Curves and Surface Modelling for Engineering Design

Wireframe models and entities. Definition and manipulation of space curves. Surface models and entities. Definition and manipulation of surface models. Application, evaluation and composition.

Product Modelling

Goals of solid modelling. Solid representation schemes. Parametric and variational models. Product models in design.

Feature-based Design and its Applications

Feature models: features and geometry, definition, features in engineering, composite features, feature taxonomies, applications of features.

Example design projects:

Design and analysis of stamping mechanism. Design and analysis of conveyor system. Design and analysis of electrical appliances casing.

Indicative reading list:

1. Lee, K., Principles of CAD/CAM/CAE Systems, Addison Wesley, 1999.
2. Hearn, D. Computer Graphics, C version, Prentice Hall, 1997.
3. Zecher, J.E., Computer Graphics for CAD/CAM Systems, Marcel Decker, 1994.

SUBJECT DESCRIPTION FORM

Subject Title:

Concurrent Product Design Process — ME312 (3 credits) Compulsory

Pre-requisites: ME311 CAD/CAE I

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **0.4** x End of Subject Examination + **0.6** x Coursework

Continuous assessment will include design projects with CAD/CAE focus. Assignments and quizzes will also be used.

Objectives:

1. To provide a theoretical and practical background of Design for X concepts.
2. To enable students to apply computer-aided Design for X tools in the engineering design environment.

Syllabus:

Concurrent Engineering

Introduction. Benefits of concurrent engineering. Characterization of the concurrent engineering environment. Schemes for concurrent engineering. Case studies.

Design for Manufacturability

Overview. Computer-aided DFM. Design for cost.

Design for Assembly

Assembly methods and processes. Product design factors. Computer-aided DFA method. Comparison of various DFA methods.

Computer-based Robust Design

Total quality concept. Six *vs* Three sigma paradigm. Taguchi method. Computer-based robust design. Case studies.

Rapid Prototyping and Manufacturing

Overview. Layered manufacturing. STL format. Applications of RP&M.

Example design practices:

Design for injection moulding. Design for tolerancing. Redesign from DFA perspective and/or robust design approach. Concept modeling.

Indicative reading list:

1. Molloy, O., Design for Manufacturing and Assembly: Concepts, Architectures and Implementation, Chapman & Hall, 1998.
2. Huang, G.Q.(Ed.), Design for X: Concurrent Engineering Imperatives, Chapman & Hall, 1996.
3. Taguchi, G., Robust Engineering, McGraw-Hill, 2000.
4. Chua, C.K., Rapid Prototyping: principles & applications in Manufacturing, John Wiley & Sons, 1997.
5. Jacobs, P.F., Stereolithography and other RP&M Technology, Society of Manufacturing Engineers, 1996.

SUBJECT DESCRIPTION FORM

Subject Title:

CAD/CAE II

ME313 (3 credits)
Compulsory

Pre-requisites: ME210 Mechanics and Design of Mechanical Components

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **0.4** x End of Subject Examination + **0.6** x Coursework

Coursework will include design projects with reports and presentations, assignments and short tests.

Objectives:

This subject intends to provide the students with:

1. Fundamental knowledge in stress/strain relationships, which are essential foundations to perform design and analysis of engineering structures.

2. Basic understanding in vibration and its influence on the operation of an engineering system.

3. Skills to carry out the design and analysis of engineering structures with the aid of suitable software, which are acquired through hands-on experience in mini design projects.

CAD/CAE II

Syllabus:

Structural Design

Stress and deformation analysis: flexural load. Flexural center for beams. Combined normal stress. Case studies.

Computer-aided stress and deformation analysis: slope and deflection of beams, bending and shear stresses. Stress concentrations.

Stress Analysis

Stress and strain transformation. Combined bending and torsion : shafts and cylinders.

Shaft design examples using computer-based tools.

Failure of structures : theories, case studies.

Introduction to vibration

Vibration of discrete system. Cause of vibration and its influence. Natural frequency. Resonance and damping.

Applications of computer software

Introduction of suitable software to carry out: the analysis of stress and deformation of an engineering structure, and the design of a vibration control system. Limitations, operation procedures and reliability of software. Interpretation and presentation of the predictions.

Mini design projects:

Real-life mini design projects will be carried out for students to acquire hands-on experience in computer-aided analysis and design of engineering structures and vibration control systems.

Indicative reading list:

1. Salter, G.R., Computer-aided Statics and Strength of Materials, Prentice Hall, 1999.
2. Kelly, S.G., Fundamentals of Mechanical Vibrations(Second Edition), McGraw-Hill, 2000.
3. Benham, P.P., Crawford, R.J., and Armstrong, C.G., Mechanics of Engineering Materials, (Second Edition), Addison-Wesley, 1996.
4. Inman, D.J., Engineering Vibration, (Second Edition), Prentice Hall, 2001.

SUBJECT DESCRIPTION FORM

Subject Title:

Virtual Reality Technology and Engineering Design — ME314 (3 credits) Elective

Pre-requisites: ME285 Introduction to Computing a

Co-requisites: Nil

Exclusions: Nil

Formal Contact:

Lecture	38 hours
Tutorial/Laboratory	4 hours
	42 hours

Assessment:

Overall Assessment: **1.0** x Coursework

Coursework will include laboratory exercises and mini-project.

Objectives:

1. To provide students with the skills and knowledge in utilizing virtual reality technology to design engineering systems and components.

2. To enable the students to work effectively in a collaborative design team using internet technology.

Virtual Reality Technology and Engineering Design

Syllabus:

Virtual reality(VR) technology for rapid modeling of engineering components and products

Key components of a virtual environment. Non-immersive *vs* immersive VR experiences. Virtual Reality Modeling Language(VRML) *vs* proprietary formats. Virtual shape design tools and features-based design tools.

Collaborative design in a virtual environment

Human perception: visual, auditory, tactile, and kinesthetic information. Generation of a virtual environment. Network-centric design data management. Collaboration tools and interface design. Virtual design team.

Computer simulation of product behavior and visualisation

Product visualisation. Product behavior simulation. Software tools for product behavior simulation. Case studies.

Interactive design and data visualisation of engineering systems and processes

Techniques for visualising process data and system parameters. Human-machine interface for interactive design and analysis.

Monitoring and control of machines and systems via the internet

Internet protocols for information sharing. Virtual instrumentation. Internet-controlled experiments. Case studies.

Example mini-projects:

Design of a virtual domestic appliance with simulated product behavior.
Collaborative design of a toy truck via the internet.

Indicative reading list:

1. Singhal, S., and Zyda, M., Networked Virtual Environments: Design and Implementation, Addison-Wesley, 1999.
2. Raskin, J., The Humane Interface: The New Directions for Designing Interactive Systems, Addison-Wesley, 2000.
3. Chen, C., Information Visualisation and Virtual Environments, Springer Verlag, 1999.
4. Rix, J., Haas, S., and Teixeira, J., Virtual Prototyping - Virtual environments and the product design process, Kluwer Academic Pub., 1995.
6. Gallagher, R.S.(Ed.), Computer Visualization: Graphics Techniques for Scientific and Engineering Analysis, CRC Press, 1995.
7. Travis, J., Internet Applications in LabVIEW, Prentice Hall, 2000.
8. Mills, A., Collaborative Engineering and the Internet: Linking Product Development Partners Via the Web, Society of Manufacturing Engineers, 1999.

SUBJECT DESCRIPTION FORM

Subject Title:

Project Management for New Products — ME316 (3 credits) Elective

Pre-requisites: ME208 Management and Environmental Issues in Engineering Design

Co-requisites: Nil

Exclusions: Nil

Formal Contact:		
	Lecture	38 hours
	Tutorial/Laboratory	4 hours
		42 hours

Assessment:

Overall Assessment: **0.4** x End of Subject Examination + **0.6** x Coursework

Coursework will include class discussions, group projects and presentations, and assignments.

Objectives:

This subject intends to provide the students with:

1. Basic understanding of the marketing system and the product life cycle.
2. Fundamental knowledge of industrial markets and marketing strategies.
3. Skills to launch new product through project management.

Project Management for New Products

Syllabus:

The Marketing System

Definition of marketing. A global concept. The marketing system. Role of marketing in the firm. Marketing and its environment.

Product Policy and Innovation

The complexity of customer needs. Selection of opportunities. Brands and branding. The changing environment and evolving needs. The product life-cycle. Invention, research and creativity. Basic forms of innovation. Screening and testing.

Industrial Markets

Characteristics of industrial markets. Industrial buyers and their expectations. The buying coalition. Tackling industrial markets.

Marketing Strategies

Segmentation and targeting. Differentiation and positioning. Market demand and trend analysis. Introduction to mass customisation through internet technologies.

Launching New Product through Project Management

The process of opportunity identification, concept evaluation, product development, test marketing, and launching of product. Evaluation of investment in new product development. Marketing cost analysis. Optimizing the product launching schedule.

Typical project:

Case studies, computer-aided marketing analysis and product launching projects will be provided to train students to translate concepts into context-specific operational decisions.

Indicative reading list:

1. Lilien, G.L. & A. Rangaswamy, Marketing Engineering: computer-assisted marketing analysis and planning. Addison-Wesley, 1998.

2. Cannon, T., Basic Marketing. 4th Edition, Cassell Publishers, 1996.

SUBJECT DESCRIPTION FORM

Subject Title:

Mathematics Ia — AMA203 (3 credits) Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact Hours: 42

Assessment:

Overall Assessment: **0.7** x End of Subject Examination + **0.3** x Continuous Assessment

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

Objectives:

To introduce the Higher Diploma students to the fundamentals of engineering mathematics. The emphasis will be on the application of mathematical methods to solve engineering problems.

Mathematics Ia

Syllabus:

Linear algebra:

Matrices and determinants, vector spaces, elementary algebra of matrices, eigenvalues and eigenvectors, normalization and orthogonality.

Ordinary differential equations:

First and second order linear ordinary differential equations, Laplace transforms, convolution theorem.

Calculus and functions of several variables:

Infinite series, power series, Fourier series, partial differentiation, maxima and minima, Lagrange multiplier, Taylor's theorem.

Indicative Reading List:

1. Anton, H., Elementary Linear Algebra, 8th edition, 2000.
2. Thomas, G.B., Finney, R.L., Weir, M.D. and Giordano, F.R., Thomas' Calculus, 10th edition, 2000.
3. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, 1999.

SUBJECT DESCRIPTION FORM

Subject Title:

Elementary Putonghua — CLC211 (3 credits) Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Formal Contact Hours: 42

Assessment:

Overall Assessment: 1.0 x Continuous Assessment (course work 60% and term-end test 40%).

Objectives:

This subject aims to acquaint students with basic communication skills in Putonghua.

Students are expected to:
1. have relevant knowledge in spoken Modern Standard Chinese;
2. be sensitive to major differences between Cantonese and Putonghua;
3. be familiar with the Pinyin system of Mandarin phoneticization;
4. be capable of understanding and expressing themselves in Putonghua for essential daily communication purposes.

Elementary Putonghua

Syllabus:

1. Phonology
   - 1.1 the syllabic structure of Putonghua
   - 1.2 the Pinyin system
   - 1.3 the pronunciation of phonetic symbols
   - 1.4 pronunciation difficulties of Cantonese learners
   - 1.5 tone variation, neutral tone and final retroflexion

2. Lexical and grammatical foundation
   - 2.1 building up of Putonghua lexicon
   - 2.2 Cantonese Putonghua comparison in terms of lexical differences
   - 2.3 Cantonese Putonghua comparison in terms of grammatical differences

3. Practical skills
   - 3.1 skills of listening to conversations that take place in different contexts, fulfilling different functions, at different speed.
   - 3.2 ways of expression fulfilling various functions including enquiry, apologizing, praising, responding, explaining and requesting.
   - 3.3 simple conversation on topics such as greeting, making appointment, buying things, making telephone calls, TV programmes, Hong Kong weather etc.
   - 3.4 short talks on topics such as transportation, catering business, housing problem and social welfare in Hong Kong, personal habits, hobbies, Chinese customs and festivals, fashions etc.

READING LIST

Text book

香港理工大學中文及雙語學系“通用普通話教程”編寫組編《通用普通話教程》第一、二冊，香港：星河教育出版社，1997。

Reference

中國社會科學院語言研究所詞典編輯室編《現代漢語詞典》(修訂本)，北京：商務印書館，1996。

SUBJECT DESCRIPTION FORM

Subject Title:

Basic Electronics — EIE255 (3 credits) Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact Hours: 42

Assessment:

Overall Assessment: **0.6** x End of Subject Examination + **0.4** x Coursework

Coursework will include assignments, tests and laboratory work.

To pass this subject, student must obtain grade D or above in **both** the course work and the examination.

Objectives:

This subject introduces students to fundamental concepts in modern electronic circuits. Simple analog and digital circuits will be used for illustration of basic principles. Subsequently, an overview of the applications of electronics in various aspects in modern society, such as communications and digital computers, will be discussed.

Basic Electronics

Syllabus:

DC Networks

Series and parallel networks, network theorems, simple circuit analysis techniques.

AC Networks

Average and rms values, impedance, phasors, simple ac networks.

Basic Electronic Devices and Circuits

I-V characteristics of diodes, AND and OR gates, rectifiers, I-V characteristics of transistors, simple BJT and FET amplifier circuits.

Ideal Operational Amplifiers and Applications

Ideal operational amplifiers, applications of simple operational amplifier circuits, e.g. summing circuits and integrator.

Applications of Electronic Circuits in Communications

Block diagram of a typical communication system, concepts of amplitude modulation, frequency modulation; examples of modulation and demodulation circuits.

Digital Electronics and Computers

Binary number system, simple logic gates, realisation of logical functions using simple digital circuits, flip flop and its applications; microprocessors, memories.

Indicative reading list:

1. Boylestad R.L. and Nashelsky L., "Electronics: A Survey of Electrical Engineering Principles", Prentice Hall, 1996
2. Patrick D.R. and Fardo S.W., "Electricity and Electronics: A Survey", Prentice Hall, 1999
3. Nilsson J.W. and Riedel S.A., "Electric Circuits", Reading: Addison-Wesley, 1996

SUBJECT DESCRIPTION FORM

Subject Title:

English for Academic Purposes (EAP) ELC205 (3 credits)
Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact Hours: 42

Assessment:

Overall Assessment: **1.0** x Coursework

Objectives:

1. In general, to help students study effectively in the University's English medium learning environment.

2. More specifically, to help students to improve and develop their English language proficiency within a framework of academic contexts.

In working towards the achievement of the two interrelated objectives, attention will be given to helping students develop the core competencies identified by the University as vital to the development of effective life-long learning strategies and skills.

Subject Description:

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 using English in these contexts. As far as possible, the subject will address the specific language needs of students' ability levels and subject specialisms.

The study method is primarily based on seminars and these will include interactive learning techniques such as discussions and role-plays. Use will also be made of video and tape recordings, relevant Web-based materials/activities and our Centre for Independent Language Learning. Students in need of additional help will be required to attend a supplementary English programme organised by the English Language Centre.

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.

To work towards the accomplishment of its objectives, the syllabus is specified under a single heading consisting of four interrelated strands.

English language development in academic contexts

Spoken academic communication: recognising the purposes of and differences between spoken and written communication in English in academic contexts; identifying and practising interactional and linguistic aspects of participation in seminar discussions; discussing issues requiring the development and application of creative and critical thinking; preparing and delivering oral presentations.

Written academic communication: identifying and writing functions common in written academic discourse; note-taking from reading and listening inputs; understanding and applying principles of academic text structure; developing paraphrasing, summarising and referencing skills; improving editing and proofreading skills; achieving appropriate tone and style in academic writing.

Reading and listening in academic contexts: understanding the content and structure of information delivered both orally and in print form; reading and listening for different purposes e.g. as input to tasks, and for developing specific reading or listening skills; using a dictionary to obtain lexical, phonological and orthographical information.

Language development: improving and extending relevant features of students' grammar, vocabulary and pronunciation.

Learning and Teaching Materials :

English for Academic Purposes published by the English Language Centre, the Hong Kong Polytechnic University and specially prepared material from the Centre will be used throughout the course. In addition, teachers will recommend additional reference materials as required.

Indicative reading list:

1. Spoken academic communication

a. Jay, Antony and Ros Jay (2000). *Effective presentations*. London: Prentice Hall.

b. Madden, Carolyn G. and Theresa N. Rohlck (1997). *Discussion and interaction in the academic community*. Ann Arbor, MI: University of Michigan Press.

2. Written academic communication

a. Gelfand, Harold (2001). *Mastering APA style: student's workbook and training guide*. American Psychological Association.

b. Leki, Ilona (1998). *Academic writing: exploring processes and strategies*. Cambridge: Cambridge University Press.

3. Reading and listening in academic contexts

a. Lebauer, Susan (1999). *Learn to listen, listen to learn: academic listening and note-taking*. New York: Pearson ESL.

b. Waters, Mary and Alan Waters (1995). *Study tasks in English*. Cambridge: Cambridge University Press.

4. Language development

a. Carter, Ronald, Rebecca Hughes and Michael McCarthy (2000). *Exploring grammar in context: upper-intermediate and advanced*. Cambridge: Cambridge University Press.

b. *Collins COBUILD English dictionary for advanced learners* (2001). Glasgow: Collins.

c. McCarthy, Michael and Felicity O'Dell (2001). *English vocabulary in use: upper-intermediate*. Cambridge: Cambridge University Press

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SUBJECT DESCRIPTION FORM

Subject Title:

English in the Workplace (EIW) — ELC305 (3 credits) Compulsory

Pre-requisites: ELC205 English for Academic Purposes

Co-requisites: Nil

Exclusions: Nil

Formal Contact Hours: 42

Assessment:

Overall Assessment: **1.0** x Coursework

Objectives:

To develop those English language skills required by the students to communicate effectively in their future professional careers.

Subject Description:

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

The study method is primarily based on seminars. These will include discussions, role-play, individual and group activities. Use will be made of video and tape recordings, library research, and our Centre for Independent Language Learning. Students in need of additional help will be required to attend a supplementary English programme organised by the English Language Centre.

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. **Language appropriacy**: introducing notions of context-sensitive language use in both spoken and written English; for example, writing e-mails and using the telephone.

2. **Seeking and supplying information**: practice in the oral skills required in fact-finding and job-seeking interviews, problem-solving negotiations, and conducting questionnaire surveys.

3. **Workplace writing**: selecting and using relevant content; appropriate style; acceptable format; structure and layout, in letters, memoranda, reports, notices for public display, proposals, presentation notes, forms and questionnaires.

4. **Language development**: improving and extending relevant features of students' grammar, vocabulary and pronunciation.

Learning and Teaching Materials

English in the Workplace published by the English Language Centre, the Hong Kong Polytechnic University and specially prepared material from the Centre will be used throughout the course. In addition, teachers will recommend additional reference materials as required.

Indicative reading list

General

Ashley, A. (1992) *A handbook of commercial correspondence.* 2nd ed. Oxford: Oxford University Press.

Baugh, L. S., Fryar, M. & Thomas, D. A. (1995). *How to write first-class business correspondence.* Illinois: NTC Publishing Group.

Bilbow, G. T. (1997). *Business writing for Hong Kong.* Hong Kong: Longman.

Guffey, M. E. (2001). *Essentials of business communication.* 5th ed. Australia: South-Western College Pub.

Lehman, C. M. (1999). *Business communication* 12th ed. Cincinnati, Ohio: South-Western College Pub.

Murphy, H. A. & Hilderbrandt, H. W. (1997). *Effective business communications.* 7th ed. New York: McGraw-Hill, Inc.

Grammar, vocabulary and style

Guffey, M. E. (1999). *Business English.* 6th ed. Cincinnati, Ohio: South-Western College.

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SUBJECT DESCRIPTION FORM

Subject Title:

Training on Engineering Software — IC230 (3 credits) Compulsory

Pre-requisites: Nil
Co-requisites: Nil
Exclusions: Nil

Formal Contact Hours: 90

Assessment:

Overall Assessment: **1.0** x Coursework

Coursework include assignments and quizzes

Objectives:

The training provides a comprehensive coverage for latest requirements in computer-aided engineering design. It complements theoretical learning by providing practical knowledge in applying latest computer technology throughout the design development process. On completion of the 90-hour course, students should be able to:

- Create interactive web page with common web authoring systems.
- Generate simple multi-media presentation with Real Systems and VRML.
- Process, interpret, and graphically represent data in basic scientific computing.
- Use latest computer technology in 3D geometric design, including solid modeling of 3D engineering products, 3D free-form surface objects, assemblies of 3D objects, and generation of associative engineering drawings with annotations.
- Appreciate the principles and develop practical ability in utilizing computer visualization systems and generating computer animations for evaluation and communication.

Training on Engineering Software

Syllabus:

Approach and techniques in web authoring including web page design with HTML, interactive graphic effects in Flash, 3D VRML, and Real Systems' multi-media presentations.

Approach and techniques in basic statistics and scientific computing with MatLab and MathCad including mathematic problem solving, data analysis and exploration, and creating plots and simulation.

Approach and techniques in surface modeling including use of point clouds and curves, constructing NURBS curves and surface, digitizing objects, and data conversion.

Approach and techniques in parametric 3D solid modeling including sketching, dimensional and geometric constraining techniques, construction with features, use of spreadsheet, adaptive solid features, flat pattern and sheet metal model, and derived solid model.

Approach and techniques in assembly modeling including top-down, bottom-up, and hybrid approach, applying 3D constraints, and developing engineering mechanism.

Approach and techniques in generating associative engineering drawing from parametric solid and assembly models and applying engineering annotation.

Approach and techniques in photo-realistic visualization and animation including importing and constructing 3D models, constructing scenic settings, lighting, and virtual cameras, applying virtual materials and texture with mapping, different shading and rendering techniques, and setting up animation with hierarchy, key frame, and track view.

Hands-on practice with selected industry leading computer applications such as Rhinoceros, Mechanical Desktop, Inventor, and 3D Studio Viz.

Projects:

1. Development of a typical business web site.
2. Solving mathematical problems by using MatLab & MathCad.
3. Computer modeling, assembly, and simulation of a design product with parts suitable for surface, solid, and assembly modeling.

Indicative Reading List:

1. Nelson, S. L. and Gerend, J., Effective Executive Guide to FrontPage Web Sites: Seven Steps for Designing, Building, and Maintaining Front Page 2000 Web Sites, Redmond Technology, Inc, 2000.
2. Emberton, D. J. and Scott, J., Flash 5 Magic: With ActionScript, New Riders Publishing, 2001.
3. Hanselman, D. and Littlefield, B. C., Mastering MATLAB 6, Prentice Hall, 2000.
4. Larsen, R. W., Introduction to MathCAD 2000, Prentice Hall, 2000.
5. Bill, F., 3D Modeling & Surfacing, San Diego, Calif.: AP Professional, 1999.
6. Hearn, D., Computer Graphics, Englewood Cliffs, N.J.: Prentice Hall, 1994.
7. Anand, V.B., Computer Graphics and Geometric Modeling for Engineers, J. Wiley, 1993.
8. Margaret, B. and Pascal G., Rhino NURBS 3D Modeling, New Riders Publishing, 1999.

SUBJECT DESCRIPTION FORM

Subject Title:

IC Practical Training — IC233 (3 credits) Compulsory

Pre-requisites: Nil
Co-requisites: Nil
Exclusions: Nil

Formal Contact Hours: 90

Assessment:

Overall Assessment: 1.0 x Coursework

Coursework will include continuous assignments and appreciation test on Industrial Safety.

Objectives:

This module aims at developing students' understanding on the principles and operation of common manufacturing processes, and properties and application of common materials through hands-on practical work. An integrated mini-project type of work will be employed to enable students to appreciate the processes and materials in a holistic approach. A safety training is also provided to students with Labour Department's recognition for issuing Green Card in construction industry and container handling industry.

IC Practical Training

Syllabus:

Working principles and operation of conventional and non-conventional metal cutting processes including lathe turning, milling, CNC machining, wire-cutting, electro-discharge machining, and laser processing.

Working principles and operation of common production processes for plastic parts including injection and compression moulding.

Working principles and operation of common production processes for metal parts including die-casting, spin casting, investment casting, and sand casting.

Working principles and operation of common production processes for sheet metal parts including blanking and forming, and photochemical machining.

Working principles, operation, and comparison of surface finishing processes including electro-plating, aluminium anodising, electro-phoretic coating, and vacuum ion plating.

Industrial safety appreciation and training including issues in safety management, safety law, occupational hygiene, safety technology, and typical case studies related to manufacturing processes.

Typical Projects:

Mini-lathe turning machine or equivalent – selective components production and assembly.

Typical Guided Learning / Process Demonstration:

Demonstration on various manufacturing processes.

Indicative Reading List:

Reading Materials published by Industrial Centre on:

- Metal Cutting
- CNC Machining
- Non-Conventional Machining
- Hot Metals Processing
- Plastics Processing
- Sheet Metal Processing
- Photo-chemical Machining
- Surface Finishing
- Industrial Safety for 21 hours Safety Training

SUBJECT DESCRIPTION FORM

Subject Title:

Cultural Issues and Product Semantics in Product Design — SD2403 (3 credits) Compulsory

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Formal Contact Hours: 42

Assessment:

Overall Assessment: **1.0** x Coursework

Coursework will include design project development (70%) and presentation (30%)

To pass this subject, students are required to obtain Grade D or above in the Coursework.

Objectives:

The subject allows students to explore the cultural issues and introduces the fundamental concept of semantics principles in product design, particularly related to the context of Hong Kong and Chinese mainland. Through investigation, seminars, group discussions and project assignments, students will be able to explore and identify why and how cultural factors, as well as social and environmental factors, should be considered. The students will also learn to appreciate why and how semantic principles should be applied.

Cultural Issues and Product Semantics in Product Design

Syllabus:

Cultural issues in product design
Spatial and temporal dimensions of cultures
Subcultures and cultural consumption
Semantics principles in product design
Semantics of materials, colour and textures in 3-D form design
Consideration of social and environmental factors
Design practice related to context of Hong Kong and Chinese mainland

Project:

There is a design exercise within this subject. Students are required to:

- investigate a current cultural, social and environmental issue related to context of Hong Kong and/or Chinese mainland;
- identify a need/opportunity, and fix project title;
- develop their ideas by using the knowledge obtained from the lectures and tutorials; and
- present their final solution(s)

Indicative reading list:

Books

1. Alasuutari, P. (1995). Researching culture: Qualitative method and cultural studies. London, Thousand Oaks, New Delhi: Sage Publications.
2. Bijker, W. E. (1995). Of bicycle, bakelites, and bulbs: Toward a theory of sociotechnical change. Cambridge, Mass., London: The MIT Press.
3. Dondis, D. A. (1973). A primer of visual literacy. Cambridge, Mass: MIT Press. c1973.
4. Forty, A. (1986). Objects of desire: Design and society. London: Thames and Hudson.
5. Grillo, P. J. (1960). What is design? New York: Dover Publications.
6. Hubel, V. (1984). Focus on designing. Toronto: McGraw-Hill Ryerson.
7. Mackenzie, D. (1997). Green design: Design for the environment (2nd ed.). London: Laurence King.
8. Norman, D. A. (1988). The psychology of everyday things. New York: Basic Books, Doubleday Currency.
9. Norman, D. A. (1998b). The design of everyday things. London: The MIT Press.
10. Osborne, H. (1970). Aesthetics and Art Theory: An Historical Introduction. Oxford. Product Semantic ’89: Proceedings from the Products Semantics '89 Conference (1990). Proceeding, 16-19 May 1989, University of Industrial Arts Helsinki UIAH. Helsinki: University of Industrial Arts.
11. Rowe, P. G. (1987). Design thinking. Cambridge, Mass.: The MIT Press.
12. Whiteley, N. (1993). Design for society. London: Reaktion Books.
13. Wong, W. (1977). Principles of three-dimensional design. New York: Van Nostrand Reinhold Co.

Journals

Design Issues, The Design Journal, IEE Review, Journal of Popular Culture, Popular Culture Review, Public Culture, Innovation: The quarterly journal of the Industrial Designers Society of America, AXIS, Interior View, Design Report.