THE HONG KONG POLYTECHNIC UNIVERSITY

Department of Mechanical Engineering

Part-time

BEng (Hons) in Product Analysis and Engineering Design

[Self-financed, Programme Code: 43461]

Definitive Programme Document

(For 2016 Cohort)

August 2016

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

Programme Scheme

Part 1: General Information

1.1 Programme Title and Programme Code

BEng (Hons) in Product Analysis and Engineering Design [Programme Code: 43461]

1.2 Host Department

Department of Mechanical Engineering

(This programme is offered through the School of Professional Education and Executive Development (SPEED) of PolyU which is responsible for the provision of general teaching venues, general administrative support and teaching of General University Requirement (GUR) subjects.)

1.3 Award Title

BEng (Hons) in Product Analysis and Engineering Design

1.4 Mode of Attendance

Part-time

1.5 Normal and Maximum Periods of Registration

Mode of Study	Normal Duration of Study	Maximum Period of Registration
Part-time	4 Years	8 Years

1.6 Total Credit Requirements for Graduation

There are 64 academic credits required for graduation.

Students who are identified to have insufficient backgrounds in Engineering Mechanics and/or Mathematics will be required to take additional remedial subjects ME23001 “Engineering Mechanics” (3-credit) and/or ME2001 “Mathematics” (non-credit bearing) as a necessary foundation in Stage One Semester One.

1.7 Entrance Requirements

- Higher Diploma / Associate Degree in relevant engineering disciplines.
- Higher Diploma / Associate Degree in relevant product design disciplines.
- Higher Diploma / Associate Degree in applied physics.
- Academic qualifications equivalent to the above.

Part 2: Curriculum Design

2.1 Preamble

In order to remain the competitiveness and cutting-edge in the export-oriented market place in Hong Kong, the local industries need to shift their product development paradigm from a low cost Original Equipment Manufacturer (OEM) to a high value-added Original Design Manufacturer (ODM), and then to an Original Brand Manufacturer (OBM) to maximize their profit margin. It is thus important for them to have their own brands of quality products, much like the OBMs in some well-developed countries, to maintain a strong competitiveness in the international market. To achieve these goals, an emphasis should be placed on the value-added product design and development. Therefore, there is an increasingly need for inter-disciplinary expertise in high-end product design and development. The Mechanical Engineering (ME) Department thus offers the full-time BEng (Hons) in Product Analysis and Engineering Design Programme (PAED) to produce all-round graduates in product design and development arena.

In order to provide an excellent on-job continuous professional development to the mid-level practitioners in the discipline of product design and development, ME Department offers a replica of the full-time PAED in the part-time mode.

As all admitted part-time PAED students have sufficient industrial experience and obtained academic training in their tertiary study, some fundamental subjects and practical training are not required for them. The number of credits required for the students compared with the full-time PAED programme is thus reduced from 124 down to 64.

2.2 University Mission of PolyU

The Hong Kong Polytechnic University aspires to become a leading university that excels in professional education, applied research and partnership for the betterment of Hong Kong, the nation and the world. The PolyU's mission is stated as below:

I. To nurture graduates who are critical thinkers, effective communicators, innovative problem solvers, lifelong learners and ethical leaders.
II. To advance knowledge and the frontiers of technology to meet the changing needs of society.
III. To support a University community in which all members can excel through education and scholarship.

2.3 Programme Aims and Intended Learning Outcomes (ILO)

The programme objectives and intended learning outcomes (ILO) developed by the programme are aiming to fully satisfy the IPD scheme's aims, which are aligned with the PolyU's mission.

2.3.1 Programme Aims

In order to support the PolyU's mission and to fulfill the IPD Scheme (full-time programme) aims, the PAED Programme is developed to achieve the following objectives:

1. To synergize technology with design and business and to fulfill the University's strategic development of product design.

2. To provide graduates with excellent integration of knowledge, skills and hands-on experience in developing new products with superior quality including engineering design, industrial design, engineering sciences, simulation and analysis, prototyping and manufacture, management and marketing, via a coherent and well-balanced curriculum developed through collaboration between departments involved.

3. To produce preferred all-rounded graduates, who have developed all-roundedness knowledge and skills including self-learning, communication, team-playing, management, information search and global outlook, such that they are found immediately useful by the industry, and at the same time, will be able to develop themselves to play important roles in leading the local manufacturers to design and develop high-value-added new products with superior quality, in order to maintain the prosperity of Hong Kong.

4. To help graduates develop the ability to engage in life-long-learning and professional development and to acquire professional recognition from professional bodies including the Hong Kong Institution of Engineers.

5. To produce graduates who are aware of the global, societal, ethical and professional issues in the practice of product design and development.

The Programme Aims of the PAED programme are designed to support the PolyU's mission as shown in Table 2-1.

Table 2-1 Matching the PAED Programme Aims with PolyU Mission

		UNIVERSITY MISSION		
		I	**II**	**III**
AIMS of PAED AWARD	**1**	X	X	
	2	X	X	
	3	X	X	X
	4	X		X
	5	X		X

2.3.2 Institutional Learning Outcomes

It is PolyU's educational mission to nurture competent professionals who are also critical thinkers, effective communicators, innovative problem solvers, lifelong learners, and ethical leaders. The institutional learning outcomes for these attributes are provided as follows:

I. **Competent professional:** Graduates should be able to integrate and apply in practice the fundamental knowledge and skills required for functioning effectively as entry-level professionals.

II. **Critical thinker:** Graduates should be able to examine and critique the validity of information, arguments, and different viewpoints, and reach a sound judgment on the basis of credible evidence and logical reasoning.

III. **Effective communicator:** Graduates should be able to comprehend and communicate effectively in English and Chinese, orally and in writing, in professional and daily contexts.

IV. **Innovative problem solver:** Graduates should be able to identify and define problems in professional and daily contexts, and produce creative and workable solutions to the problems.

V. **Lifelong learner:** Graduates should recognise the need for continual learning and self-development, and be able to plan, manage and improve their own learning in pursuit of self-determined development goals.

VI. **Ethical leader:** Graduates should have an understanding of leadership and be prepared to lead a team, and should acknowledge their responsibilities as professionals and citizens to society and their own nation, and be able to demonstrate ethical reasoning in professional and daily contexts.

2.3.3 Programme Intended Learning Outcomes

Graduates will be expected to achieve the following twelve intended learning outcomes of the PAED programme upon completing the programme satisfactorily. These intended learning outcomes can be classified into two groups and are presented as below:

(I) Professional/academic knowledge and skills (PAK)

(a) An ability to evaluate consumers' needs and market situation for a new product, and to identify and formulate a design problem by developing design specifications to achieve the planned goals.

(b) An ability to generate, evaluate and select design concepts with creative design thinking, awareness of business consideration and efficient information search.

(c) An ability to apply knowledge of arts, mathematics, sciences and engineering, via analytical, computational or experimental approaches, to analyze or predict the performance of a design in the life cycle of product development.

(d) An ability to assess the impacts of human factors, materials, manufacturing processes, environmental issues, product safety and quality in the design and development of quality products.

(e) An ability to apply state-of-the-art technology and computer/IT tools related to product development.

(f) An ability to appreciate the concept and trend in industrial design, and to identify market opportunity, and to understand the approach in generating new design concepts to meet the existing as well as potential market needs.

(g) An ability to apply project management technique to ensure successful completion of a product development process.

(II) Professional outlook and workplace skills (POW)

(a) A knowledge of contemporary issues and the broad education necessary to understand the impact of engineering design in a global and societal context.

(b) An ability to function professionally in a multidisciplinary design team as a or team member.

(c) An awareness of professional ethics and social responsibilities and the drive to achieve the quality.

(d) An ability to communicate effectively and present fluently in English, Chinese and multi-media.

(e) Recognition of the need for and an ability to engage in life-long learning.

The PAED programme outcomes are supporting its five aims as indicated in Table 2-2.

Table 2-2 Matching the PAED Programme Outcomes with its Programme Objectives

Programme Objectives	Programme Outcomes											
	PAKa	PAKb	PAKc	PAKd	PAKe	PAKf	PAKg	POWa	POWb	POWc	POWd	POWe
1	X	X	X	X	X	X		X				
2	X	X	X	X	X	X	X	X	X		X	
3		X		X	X		X	X	X		X	
4					X			X		X		X
5	X	X		X		X			X	X		

A matching between the desired programme outcomes of an engineering degree proposed by the Hong Kong Institution of Engineers (Reference: Professional Accreditation Handbook (Engineering Degrees): Revised by Authority of the Accreditation Board of the HKIE, April 2011) and the PAED programme outcomes is given in Table 2-3.

Table 2-3 Matching the PAED Programme Outcomes with the Criteria Proposed by the HKIE for an Engineering Degree

General Criteria	Definition of Desired Programme Outcomes of an Engineering Degree Proposed by the HKIE	PAED Programme Outcomes
1	An ability to apply knowledge of mathematics, science, and engineering appropriate to the degree discipline.	PAKc
2	An ability to design and conduct experiments, as well as to analyze and interpret data.	PAKc
3	An ability to design a system, component, or process, to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.	PAKa
4	An ability to function on multi-disciplinary teams.	POWb
5	An ability to identify, formulate, and solve engineering problems.	PAKa; PAKb
6	An ability to understand professional and ethical responsibility.	POWc
7	An ability to communicate effectively.	POWd
8	An ability to understand the impact of engineering solutions in a global and societal context, especially the importance of health, safety and environmental considerations to both workers and the general public.	PAKd; POWa
9	An ability to stay abreast of contemporary issues.	POWa
10	An ability to recognize the need for, and to engage in life-long learning.	POWe
11	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice appropriate to the degree discipline.	PAKe
12	An ability to use the computer/IT tools relevant to the discipline with an understanding of their processes and limitations.	PAKe

In addition to the desired programme outcomes proposed by the HKIE, the PAED programme proposes three additional outcomes as shown in Table 2-4.

Table 2-4 PAED Programme Outcomes exceeding Those of the HKIE

Additional Programme Outcomes	Description of the Additional Programme Outcomes
PAKf	An ability to appreciate the concept and trend in industrial design, and to identify market opportunity, and to understand the approach in generating new design concepts to meet the existing as well as potential market needs
PAKg	An ability to apply project management technique to ensure successful completion of a product development process

Table 2-5 Correlation between the PAED Programme Learning Outcomes and the Institutional Learning Outcomes

		Institutional Learning Outcomes					
		I	**II**	**III**	**IV**	**V**	**VI**
Programme Learning Outcomes	**PAKa**	X	X				
	PAKb	X	X		X		
	PAKc		X		X	X	
	PAKd		X			X	X
	PAKe	X		X		X	
	PAKf		X		X	X	X
	PAKg				X	X	
	POWa	X	X		X		
	POWb			X		X	X
	POWc						X
	POWd			X			
	POWe					X	

2.4 General Approach to Teaching, Learning and Assessment

The specific learning outcomes expected to be achieved by a subject should be spelt out explicitly in its syllabus. The students are able to know the purpose of every subject before learning. The students can conduct a self-assessment to evaluate whether the specific learning outcomes of the subject have been achieved after the teaching. Some of the specific learning outcomes as specified in Sections 2.3.3 can be used directly or further expanded into more details to meet the particular nature of a subject.

The approaches used to achieve the specific learning outcomes, for example, lecture, tutorial, seminar, laboratory work, practical work, project work and case study should be described clearly in the syllabus of a subject. Function and justification of every approach adopted should also be explained.

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. Every teaching and learning approach should be assessed with the most appropriate method.

Assessment should fulfill two major functions. It is used to evaluate whether the specific learning outcomes of a subject have been achieved by the students, and distinguish their performance in achieving them. The criteria-referenced assessment approach should be applied. Students' performance in a subject will be assessed by "how much" and "how good" that the specific criteria as specified in its syllabus can be achieved. Assessment should not be made on a relative basis**.**

In case of group activity, both the overall performance of the group as well as individual effort/contribution of each team member should normally be clearly assessed.

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

Students' performance in a subject shall be assessed by coursework or examination and coursework as deemed appropriate. Where both methods are used, the weighting of each in the overall subject grade will be clearly stated in the definitive programme document. Coursework may include tests, assignments, project report and presentation, laboratory work and other forms of classroom participation.

2.5 Programme Structure

In the University credit-based system, all academic programmes fit within a common framework, in which subjects of standard size (3 credits) are used as far as possible. In general, a three-credit subject consists 39 contact hours in PolyU. The programme general structure and normal study patterns are articulated as this section.

2.5.1 Programme General Structure

For the part-time PAED programme, the number of credits required for graduation is 64. Students are expected to be employed in a relevant industry cluster. Application of credit transfer/exemption will be considered based on the student's previous study according to the pertinent University policy. Students enter the programme as graduates of AD/HD programme will normally not be consider for credit transfer of any subject. In addition, students not meeting the equivalent standard of the Undergraduate Degree Language and Communication Requirements (LCR) will be required to take degree LCR subjects (up to 9 credits).

The 64 academic credits consist of 9 mandatory credits of General University Requirements (GUR) and 55 credits of Discipline-Specific Requirements (DSR). Details of GUR and DSR are presented in Table 2.6 and Table 2.7.

Table 2-6 General University Requirements (GUR)

Areas	Credits
Cluster Areas Requirement (CAR) ■ 6 credits from any **two** of the following 4 cluster areas ○ Human Nature, Relations and Development ○ Community, Organization and Globalization ○ History, Cultures and World Views ○ Science, Technology and Environment and of which ■ Students need to fulfill the English and Chinese reading and writing requirements and 3 credits of China Studies requirement (CSR).	6
Service-Learning*	3
Language and Communication Requirements (LCR) **	up to 9 credits
Total GUR credits	**9 - 18**

* Prior to its full implementation, students may take a 3-credit free elective to be offered by SPEED in lieu of the Service Learning requirement.

** This is normally not required. Only those students not meeting the equivalent standard of the Undergraduate Degree LCR (based on their previous studies in AD/HD programmes and their academic performance) will be required to take degree LCR subjects on top of the normal curriculum requirement.

Table 2-7 Discipline-specific Requirements (DSR)

Subjects		Credits
I) Core		49
CBS3241P	Professional Communication in Chinese	(2)
ELC3521	Professional Communication in English	(2)
ENG3003	Engineering Management	(3)
ENG3004	Society and the Engineer	(3)
ISE 386	Integrated Design for Manufacture	(3)
ME31003	System Dynamics	(3)
ME33001	Mechanics of Materials	(3)
ME34003	Thermofluid Mechanics	(3)
ME41004	Mechatronics and control	(3)
ME42005	CAD/CAE technologies for product development	(3)
ME42006	Product Modeling and prototyping	(3)
ME42007	Design for product Safety and Reliability	(3)
ME46001	Numerical Predictive Product Analysis	(3)
ME49005	Capstone Project	(6)
SD3401	Designing for Humanities	(3)
SD348	Introduction to Industrial Design	(3)
II) Elective Students are required to complete two 3-credit elective subjects from the elective pool as shown in section 2.5.2.		6
Total DSR credits		**55**

2.5.2 Normal Progression Pattern

Students are normally expected to follow the specified progression pattern. Any deviation will require approval from the Programme Leader.

This section outlines the normal 4-year study pattern for the programme.

Year 1: (15 Credits)	
For students not required to take any remedial subject	
Semester 1	**Semester 2**
SD348 Introduction to Industrial Design (3)	ENG3004 Society and the Engineer (3)
ME33001 Mechanics of Materials (3)	ISE386 Integrated Design for Manufacture (3)
CAR I* (3)	
For students required to take remedial subject(s)	
Semester 1	**Semester 2**
SD348 Introduction to Industrial Design (3)	ENG3004 Society and the Engineer (3)
ME2001 Mathematics ** (non-credit bearing)	ISE386 Integrated Design for Manufacture (3)
ME23001 Engineering Mechanics** (3)	ME33001 Mechanics of Materials (3)
CAR I* (3) (or in Year 2 summer term)	
Year 2: (17 Credits)	
Semester 1	**Semester 2**
ME34003 Thermofluid Mechanics (3)	ELC3521 Professional Communication in English (2)
ME31003 System Dynamics (3)	ENG3003 Engineering Management (3)
CAR II* (3)	Servicing Learning*[@] (3)
Year 3: (17 Credits)	
Semester 1	**Semester 2**
SD3401 Designing for Humanities (3)	CBS3241P Professional Communication in Chinese (2)
ME42005 CAD/CAE Technologies for Product Development (3)	ME42006 Product Modeling and Prototyping (3)
ME41004 Mechatronics and Control (3)	ME46001 Numerical Predictive Product Analysis (3)
Year 4: (15 Credits)	
Semester 1	**Semester 2**
ME42007 Design for Product Safety and Reliability (3)	Elective Subject II [#] (3)
Elective Subject I [#] (3)	
ME49005 Capstone Project (6)	
Total Credits: 64	

Notes:

* The study pattern for GUR subjects to be offered by SPEED is indicative only. Students will be advised of further details by SPEED in due course.

** Remedial subject

[@] Prior to its full implementation, students may take a 3-credit free elective to be offered by SPEED in lieu of the

Service Learning requirement.

Every student is required to study **two** elective subjects, **of which at least 1 should normally be ME subject.** All electives are constantly updated and developed to capture the technical trend to ensure the best future career of our students. The elective subjects currently offered are listed as follows:

ME42001	Artificial Intelligence in Products
ME42004	Development of Green Products
ME43003	Product Testing Technology
ME44001	Air Conditioning for Indoor Thermal and Environmental Quality
SD4041	Design in Business for Engineering
SD4414	Design of Home and Personal Electronic Products

There are subjects which are designed to fulfil the credit requirement of different types of subject. Students passing these subjects will be regarded as having fulfilled the credit requirements of the particular types of subject concerned. Nevertheless, the subject passed will only be counted once in fulfilling the credit requirements of the award, and the students will be required to take another subject in order to meet the total credit requirement of the programme concerned.

Remedial subjects are designed for new students who are in need of additional preparations in a particular subject area, and only identified students of a programme are required to take these subjects. These subjects should therefore be counted outside the regular credit requirement for award.

2.6 Curriculum Map

A curriculum map is provided in Table 2-8. The intended learning outcomes achieved by every subject of the programme are listed clearly, such that all the intended learning outcomes as specified in Section 2.3 can be shown to be fully fulfilled by the curriculum built upon a combination of most suitable subjects.

Table 2-8 Curriculum map that we Teach (T), Give Students Practice (P) and Measure (M) the Intended Learning Outcomes

Subject	Programme Learning Outcomes											
	PAK							POW				
	a	b	c	d	e	f	g	a	b	c	d	e
Core												
CBS3241P											TPM	
ELC3521											TPM	
ENG3003					T		TPM	T	T	T	T	
ENG3004							TP	TPM	T	TPM	T	T
ISE386	T	TP	TP	P	P	TP		T	T		P	P
ME31003		TP	TPM								T	
ME33001			TPM	TP								
ME34003	TP	TP	TPM		TP			TP			TP	
ME41004		TP	TP		PM						P	
ME42005		TP	TP	TP	TPM	TP	TP					TPM
ME42006		TPM	TP	TP	TP	TPM	TP					
ME42007	TP		TP	TPM	TP	TP	TP	TPM	TPM	TPM	P	

Subject	Programme Learning Outcomes											
	PAK							POW				
	a	b	c	d	e	f	g	a	b	c	d	e
Core												
ME46001			TP	TP	TP						P	
ME49005	TPM	TPM	TP	TPM	TP	TPM	TP	TP	TPM	TP	TPM	TPM
SD3401					P	TP		TP				
SD348	T	TP	TP	TP	P	TP	TP	TP	TP		TP	
Elective												
ME42001		TP	TP		TP						P	
ME42004	TP		TP	P		TP					P	
ME43003		TP	TP		TP				TP			TP
ME44001	T	T	TP	TP				T		T		
SD4041	TP	TP				T		TP			TP	
SD4414	TP	TP	T	T				T			TP	T

Remarks: GUR subjects are not included in this table.

2.7 Academic Regulations and Assessment

The academic regulations described below are based on the information known as of July 2016. They are subject to review and changes from time to time. Students will be informed of the changes as and when appropriate. Important information relating to students' study is also published in the Student Handbook.

2.7.1 Subject registration and withdrawal

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 may apply for withdrawal of their registration on a subject after the add/drop period if they have a genuine need to do so. The application should be made to the relevant programme offering Department and will require the approval of both the subject lecturer and the host Department Programme Leader concerned (or an alternate academic staff authorised by the programme offering Department). Applications submitted after the commencement of the examination period will not be considered. For approved applications of subject withdrawal, the tuition fee paid for the subject will be forfeited and the withdrawal status of the subject will be shown in the assessment result notification and transcript of studies, but will not be counted in the calculation of the GPA.

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.

Subject to the maximum study load of 21 credits 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 they become eligible for graduation. For students of part-time programmes, they can only take additional subjects from the curriculum of the programme which they have enrolled.

2.7.2 Study Load

For students following the progression pattern specified for their programme, they have to take the number of credits, as specified in the Definitive Programme Document, for each semester.

Students are not allowed to take zero subject in any semester, including the mandatory summer term as required by some programmes, unless they have obtained prior approval from the programme offering Department; 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

Students who have obtained approval to pace their studies and students on programmes without any specified progression pattern who wish to take more than the normal load in a semester should seek advice from the Department concerned before the selection of subjects.

To help improve the academic performance of students on academic probation, these students will be required to take a reduced study load. The maximum number of credits to be taken by the students varies according to the policies of individual Departments and will be subject to the approval of the authorities concerned. (Normally the Department will not approve part-time students who are on academic probation to take more than 9 credits in a semester.)

2.7.3 Subject exemption

Students may be exempted from taking any specified subjects, including mandatory General University Requirements (GUR) 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. If students are exempted from taking a specified subject, the credits associated with the exempted subject will not be counted towards meeting the award requirements. It will therefore be necessary for the students to consult the programme offering Department and take another subject in order to satisfy the credit requirement for the award.

2.7.4 Credit transfer

No further credit transfer will be given unless the student is admitted on qualification more advanced than Associate Degree/Higher Diploma and has also completed comparable components in their earlier studies.

2.7.5 Deferment of study

Students may apply for deferment of study if they have a genuine need to do so such as illness or posting to work outside Hong Kong. Approval from the Department offering the programme is required. The deferment period will not be counted towards the maximum period of registration.

Where the period of deferment of study begins during a stage for which fees have been paid, no refund of such fees will be made.

Students who have been approved for deferment are not entitled to enjoy any campus facilities during the deferment period.

2.7.6 General Assessment Regulations

Students progress by credit accumulation, i.e. credits earned by passing individual subjects can be accumulated and counted towards the final award.

A 'level' in a programme indicates the intellectual demand placed upon students and may characterise each subject with respect to its recommended sequencing within that programme. Upper level subjects should normally build on lower level subjects. Pre-requisite requirements, if any, must therefore be spelt out on a subject basis.

A 'subject' is defined as a discrete section of the programme which is assigned a separate assessment. A list of subjects, together with their level and weightings, shall be published in the definitive programme document.

The language of assessment for all programmes/subjects shall be English, unless approval is given for it to be otherwise. Such approval shall normally be granted at the stage of validation.

2.7.7 Principles of Assessment

Assessment of learning and assessment for learning are both important for assuring the quality of student learning. Assessment of learning is to evaluate whether students have achieved the intended learning outcomes of the subjects that they have taken and have attained the overall learning outcomes of the academic programme at the end of their study at a standard appropriate to the award. Appropriate methods of assessment that align with the intended learning outcomes should be designed for this purpose. The assessment methods will also enable the teacher to differentiate students' different levels of performance within the subject. Assessment for learning is to engage students in productive learning activities through purposefully designed assessment tasks.

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

The ultimate authority in the University for the confirmation of academic decisions is the Senate, but for practical reasons, the Senate has delegated to the Faculty/School Boards the authority to confirm the decisions of Boards of Examiners provided these are made within the framework of the General Assessment Regulations. Recommendations from Board of Examiners which fall outside these Regulations shall be ratified by the Academic Regulations Committee (ARC) and reported to the Senate.

2.7.8 Assessment Methods

Students' performance in a subject can be assessed by continuous assessment and/or examinations, at the discretion of the individual subject offering Department. Where both continuous assessment and examinations are used, the weighting of each in the overall subject grade shall be clearly stated in the definitive programme document. The subject offering Department can decide whether students are required to pass both the continuous assessment

and examination components, or either component only, in order to obtain a subject pass, but this requirement (to pass both, or either, components) shall be specified in the Definitive Programme Document. Learning outcome should be assessed by continuous assessment and/or examination appropriately, in line with the outcome-based approach.

Continuous assessment may include tests, assignments, projects, laboratory work, field exercises, presentations and other forms of classroom participation. Continuous Assessment assignments which involve group work should nevertheless include some individual components therein. The contribution made by each student in continuous assessment involving a group effort shall be determined and assessed separately, and this can result in different grades being awarded to students in the same group.

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

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.

2.7.9 Progression, Academic Probation and Deregistration

The Board of Examiners (BoE) 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:

1. Eligible for progression towards an award; or

2. Eligible for an award; or

3. Required to be deregistered from the programme.

When a student has a Grade Point Average (GPA) lower than 2.0, he will be put on academic probation in the following semester. If a student is able to pull his GPA up to 2.0 or above at the end of the 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.

A student will have “progressing” status unless he falls within any one of the following categories which shall be regarded as grounds for deregistration from the programme:

1. The student has exceeded the maximum period of registration as specified in the definitive programme document; or

2. The student’s GPA is lower than 2.0 for two consecutive semesters, and his/her Semester GPA in the second semester is also lower than 2.0; or

3. The student’s GPA is lower than 2.0 for three consecutive semesters.

When a student falls within the categories as stipulated above, the Board of Examiners shall de-register the student from the programme without exception.

The progression of students to the following academic year will not be affected by the

GPA obtained in the Summer Term, unless Summer Term study is mandatory for all students of the programme and constitutes a requirement for graduation, and is so specified in the Definite Programme Document.

A student may be deregistered from the programme enrolled before the time frame specified in the above conditions 2 or 3 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.

If the student is not satisfied with the de-registration decision of the Board of Examiners, he can lodge an appeal. All such appeal cases will be referred directly to Academic Appeals Committee (AAC) for final decision. Views of Faculties/Schools/Departments will be sought and made available to AAC for reference.

2.7.10 Retaking of Subjects

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

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

In cases where a student takes another subject to replace a failed elective subject, the fail grade will be taken into account in the calculation of the GPA, despite the passing of the replacement subject. Likewise, students who fail a Cluster Area Reuirement (CAR) subject may need to take another subject from the same Cluster Area in order to fulfill this part of the GUR, since the original CAR subject may not be offered, in such cases, the fail grade for the first CAR subject will be taken into account in the calculation of the GPA, despite the passing of the second CAR subject.[1]

2.7.11 Exceptional circumstances

Absence from an assessment component

If a student is unable to complete all the assessment components of a subject, due to illness or other circumstances which are beyond his control and considered by the subject

[1] In these circumstances when students do not have a choice to retake a failed subject, such as when the failed subject has been phased out, a 'tie-subject' arrangement can be made with the approval of the Faculty/School Board. Under the arrangement, another appropriate subject can be taken as equivalent to the subject which is not offered. Upon passing the equivalent subject, the fail grade of the original subject will be replaced by the latest grade of the retake subject and the failure grade of the original subject will not be taken into account into account in the calculation of the GPA.

offering Department as legitimate, the Department will determine whether the student will have to complete a late assessment and, if so, by what means. This late assessment shall take place at the earliest opportunity, and before the commencement of the following academic year (except that for Summer Term, which may take place within 3 weeks after the finalisation of Summer Term results). If the late assessment cannot be completed before the commencement of the following academic year, the Faculty/School Board Chairman shall decide on an appropriate time for completion of the late assessment.

The student concerned is required to submit his application for late assessment in writing to the Head of Department offering the subject, within five working days from the date of the examination, together with any supporting documents. Approval of applications for late assessment and the means for such late assessments shall be given by the Head of Department offering the subject or the Subject Lecturer concerned, in consultation with the Programme Leader.

Aegrotat award

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.

A student who has been offered an aegrotat award shall have the right to opt either to accept such an award, or request to be assessed on another occasion to be stipulated by the Board of Examiners; the student's exercise of this option shall be irrevocable.

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

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

Other particular circumstances

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

2.7.12 Grading

Assessment grades shall be awarded on a criterion-referenced basis. A student’s overall performance in a subject shall be graded as shown in Table 2-9.

Table 2-9 Assessment Grades if a Subject

Subject grade	***Short Description***	***Elaboration on subject grading description***
A+	Exceptionally Outstanding	The student’s work is exceptionally outstanding. It exceeds the intended subject learning outcomes in all regards.
A	Outstanding	The student’s work is outstanding. It exceeds the intended subject learning outcomes in nearly all regards.

Subject grade	*Short Description*	*Elaboration on subject grading description*
B+	Very Good	The student's work is very good. It exceeds the intended subject learning outcomes in most regards.
B	Good	The student's work is good. It exceeds the intended subject learning outcomes in some regards.
C+	Wholly Satisfactory	The student's work is wholly satisfactory. It fully meets the intended subject learning outcomes.
C	Satisfactory	The student's work is satisfactory. It largely meets the intended subject learning outcomes.
D+	Barely Satisfactory	The student's work is barely satisfactory. It marginally meets the intended subject learning outcomes.
D	Barely Adequate	The student's work is barely adequate. It meets the intended subject learning outcomes only in some regards.
F	Inadequate	The student's work is inadequate. It fails to meet 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. A numeral grade point is assigned to each grade, as shown Table 2-10.

Table 2-10 Conversion between Grade and Grade Point

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

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

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

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 point obtained in the final attempt will be included in the GPA calculation

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

1. Exempted subjects
2. Ungraded subjects
3. Incomplete subjects
4. Subjects for which credit transfer has been approved, but without any grade assigned
5. Subjects from which a student has been allowed to withdraw (i.e. those with the grade 'W')

Subject which has been given an 'S' code, i.e. absent from assessment, 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 point of time. GPA is an indicator of overall performance, and is capped at 4.0.

Different Types of GPA's

GPA's will be calculated for each Semester including the Summer Term. This Semester GPA will be used to determine students' eligibility to progress to the next Semester alongside with the 'cumulative GPA'. However, the Semester GPA calculated for the Summer Term will not be used for this purpose, unless the Summer Term study is mandatory for all students of the programme concerned and constitutes part of the graduation requirements.

The GPA calculated after the second Semester of the students' study is therefore a "cumulative" GPA of all the subjects taken so far by students, and without applying any level weighting.

Along with the "cumulative" GPA, a weighted GPA will also be calculated, to give an indication to the Board of Examiners on the award classification which a student will likely get if he makes steady progress on his academic studies. GUR subjects will be included in the calculation of weighted GPA for all programmes.

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 Wi = weighting to be assigned according to the level of the subject
n = number of all subjects counted in GPA calculation, except any subjects passed after the graduation requirement has been met.

For calculating the weighted GPA (and award GPA) to determine the Honours classification of students who satisfy the graduation requirements of Bachelor's degree awards, a University-wide standard weighting will be applied to all subjects of the same level, with a weighting of 2 for Level 1 and 2 subjects, a weighting of 3 for Level 3, 4 and 5 subjects. Same as for GPA, Weighted GPA is capped at 4.0.

When a student has satisfied the requirements for award, an award GPA will be calculated to determine his award classification. GUR subjects will be included in the calculation of award GPA for all programmes.

2.7.13 University Graduation Requirements

To be eligible for a Bachelor's Degree award a student must satisfy all the conditions listed below:

1. Complete successfully 64 academic credits as defined in section 2.5.
2. Earn a cumulative GPA of 2.0 or above at graduation.
3. Satisfaction of all remedial subjects as specified when he is admitted.
4. Satisfy the residential requirement i.e. at least one-third of the normal credit requirement for the award he is currently enrolled, unless the professional bodies concerned stipulate otherwise.
5. Satisfy the following GUR requirements:

(a) Service Learning or Free elective *	3 credits
(b) Cluster Areas Requirement (CAR)	6 credits
(c) China Studies Requirement	(3 of the 6 CAR credits)
	Total = 9 credits

* Prior to its full implementation, student may take a 3-credit free elective in lieu of service learning requirement.

(a) Service-Learning

All students must successfully complete one 3-credit subject designated to meet the service-learning requirement, in which they are required to (1) participate in substantial community service or civic engagement activities that will benefit the service users or the community at large in a meaningful way, (2) apply the knowledge and skills acquired from their Major or other learning experiences at the University to the community service activities, and (3) reflect on their service learning experience in order to link theory with practice for the development of a stronger sense of ethical, social and national responsibility. However, service learning is not yet in full implementation for programmes offered through SPEED. Students can choose a free elective subject offered by SPEED as a replacement.

(b) Cluster Areas Requirement (CAR)

To expand students' intellectual capacity beyond their disciplinary domain and to enable them to tackle professional and global issues from a multidisciplinary perspective, students are required to successfully complete two 3-credit subjects in any two of the following four Cluster Areas:

- Human Nature, Relations and Development
- Community, Organisation and Globalisation
- History, Culture and World Views
- Science, Technology and Environment

Students should not take more than 3 credits from the same cluster area.

Reading and Writing Requirements

All students must, among the CAR subjects they take, pass one subject that includes the requirement for the reading of an extensive text and a substantial piece of writing in English and one subject with the requirement for the reading of an extensive text and a substantial piece of writing in Chinese.

(c) China Studies Requirement

Of the 6 credits of CAR described in (b) above, students are required to successfully complete a minimum of 3 credits on CAR subjects designated as "China-related". The purpose is to enable students to gain an increased understanding of China (e.g., its history, culture and society, as well as emerging issues or challenges).

A student is required to graduate as soon as he satisfies the graduation requirements as stipulated above.

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 those required for graduation in or before the semester in which he becomes eligible for award, the elective subjects (or optional subjects) with a higher grade/contribution shall be included in the grade point calculation (i.e. the excessive subjects attempted with a lower grade/contribution, including failed subjects, will be excluded).

The following Table 2-11 may be used by BoE as reference in determining award classifications.

Table 2-11 Criteria for Award

Honours degrees	**Guidelines**
1st	The student's performance/attainment is outstanding, and identifies him as exceptionally able in the field covered by the programme in question.
2:i	The student has reached a standard of performance/ attainment which is more than satisfactory but less than outstanding.
2: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.

Under exceptional circumstances, a student who has completed an Honours degree programme, but has not attained Honours standard, may be awarded a Pass-without-Honours degree. A Pass-without-Honours degree award will be recommended, 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. A Pass-without-Honours is an unclassified award, but the award parchment will not include this specification.

Students who have committed academic dishonesty will be subject to the penalty of the lowering of award classification by one level. For undergraduate students who should be awarded a Third class Honours degree, they will be downgraded to a Pass-without-Honours. The minimum of downgraded overall result will be kept at a Pass.

2.7.14 Recording of Disciplinary Actions in Students' Records

With effect from Semester One of 2015/16, disciplinary actions against students' misconducts will be recorded in students' records.

Students who are found guilty of academic dishonesty will be subject to the penalty of having the subject result concerned disqualified and be given a failure grade with a remark denoting 'Disqualification of result due to academic dishonesty'. The remark will be shown in the students' record as well as the assessment result notification and transcript of studies, until their leaving the University.

Students who have committed disciplinary offences (covering both academic and non-academic related matters) will be put on 'disciplinary probation'. The status of 'disciplinary probation' will be shown in the students' record as well as the assessment result notification, transcript of studies and testimonial during the probation period, until their leaving the University. The disciplinary probation is normally one year unless otherwise decided by the Student Discipline Committee.

The University reserves the right to without the issuance of any certificate of study to a student who has unsettled matters with the University, or subject to disciplinary action.

Part 3: Programme Operation and Management

3.1 Departmental Undergraduate Programme Committee

The Departmental Undergraduate Programme Committee will exercise the overall academic and operational responsibility for the programme.

3.2 Programme Executive Group

The day-to-day operation of the scheme, including admission, will be carried out by the Programme Executive Group, which consists of the Programme Leader and the Deputy Programme Leaders. The Group will report the operation back to the Departmental Undergraduate Programme Committee.

3.3 Student-Staff Consultative Committee

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

3.4 Academic Tutors

Every student will be assigned an Academic Tutor from ME. The role of an Academic Tutor will include, but is not limited to, the following:

- Identify academic strength and weakness of the student.
- Advise the student on choice of 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 BoE.
- Alert and consult the Programme Leader/Deputy Programme Leader as soon as possible any unexpected situation faced by the student that may affect his/her academic progression.
- Bring to the attention of the Student-Staff Consultative Committee any special situations concerning the student that may require special decision by the Committee.
- Encourage the student to provide feedbacks on the programme and put forward his/her comments to the Departmental Learning and Teaching Committee.

Part 4: Subject Descriptions

4.1 Contents of Subject Description Form

The Subject Description Forms for all the subjects as specified in Section 2 are provided. Each of them contains the following items related to the subject:

- Title and code
- Number of credits obtained after satisfactory completion
- Offering department(s)
- Subject category (compulsory or elective)
- Level
- Hours assigned for different teaching and learning activities
- Pre-requisites, co-requisites and/or exclusions
- Objectives
- Learning-outcomes achieved after satisfactory completion of the subject
- Teaching and learning approaches aligned with the Outcome-Based-Approach, as well as their arrangement and justification
- Assessment methods aligned with the Outcome-Based-Approach, as well as their weighting and justification
- Syllabus.
- Textbooks/References/Reading list.

4.2 Detailed Subject Description Forms

The detailed Subject Description Forms are presented in the following section.

Syllabus

The Hong Kong Polytechnic University

Subject Description Form

Subject Code	CBS3241P
Subject Title	Professional Communication in Chinese
Credit Value	2
Level	3
Pre-requisite / Co-requisite	Chinese LCR subjects
Objectives	This subject aims to develop the language competence for professional communication in Chinese required by students to communicate effectively with various parties and stakeholders in regard to engineering-related project proposals and reports.
Intended Learning Outcomes	Upon completion of the subject, and in relation to effective communication with a variety of intended readers/audiences in Chinese, students will be able to a. plan, organise and produce professionally acceptable project proposals and reports with appropriate text structures and language for different intended readers b. plan, organise and deliver effective project-related oral presentations with appropriate interactive strategies and language for different intended audiences c. adjust the style of expression and interactive strategies in writing and speaking in accordance with different intended readers/audiences
Subject Synopsis/ Indicative Syllabus	1. Project proposals and reports in Chinese • Planning and organising project proposals and reports • Explaining the background, rationale, objectives, scope and significance of a project • Referring to the literature to substantiate project proposals • Describing the methods of study • Describing and discussing project results, including anticipated results and results of pilot study • Presenting the budget, schedule and/or method of evaluation • Writing executive summaries./abstracts 2. Oral presentations of projects • Selecting content for audience-focused presentations • Choosing language and style appropriate to the intended audience • Using appropriate transitions and maintaining coherence in team

<table>
<tr><td></td><td>presentations
• Using effective verbal and non-verbal interactive strategies</td></tr>
<tr><td>Teaching/Learning Methodology</td><td><u>Learning and teaching approach</u>

The subject is designed to develop the students' Chinese language skills, both oral and written, that students need to communicate effectively and professionally with a variety of stakeholders of engineering-related projects. It builds upon the language and communication skills covered in GUR language training subjects.

The study approach is primarily seminar-based. Seminar activities include instructor input as well as individual and group work, involving drafting and evaluating texts, mini-presentations, discussions and simulations.

The learning and teaching activities in the subject will focus on a course-long project which will engage students in proposing and reporting on an engineering-related project to different intended readers/audiences. During the course, students will be involved in:
- planning and researching the project
- writing project-related documents such as project proposals and reports
- giving oral presentations to intended stakeholders of the project
The study plan outlining the allocation of contact hours is attached.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td></td><td></td><td></td></tr>
<tr><td>1. Project proposal in Chinese</td><td>60%</td><td>✓</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>2. Oral presentation of project proposal</td><td>40%</td><td></td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
</table>

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

The assessments will arise from the course-long engineering-related project.
• Students will be assessed on written documents and oral presentations targeted at different intended readers/audiences. This facilitates assessment of students' ability to select content and use language and style appropriate to the purposes and intended readers/audiences.

• Students will collaborate in groups in planning, researching,</td></tr>
</table>

	discussing and giving oral presentations on the project. The written proposals will be individual work to ensure that students will be rigorously engaged in the application of language skills for the entire document.	
Student Study Effort Expected	Class contact:	
	▪ Seminars	26 Hrs.
	Other student study effort:	
	▪ Researching, planning, writing, and preparing the project	44 Hrs.
	Total student study effort	70 Hrs.
Reading List and References	a) 路德慶 主編 (1982)《寫作教程》，華東師範大學出版社。 b) 司有和 (1984) 《科技寫作簡明教程》，安徽教育出版社。 c) 葉聖陶 呂叔湘 朱德熙 林燾 (1992) 《文章講評》 語文出版社。 d) 邢福義 汪國勝 主編 (2003)《現代漢語》，華中師範大學出版社。 e) 于成鯤主編（2003）《現代應用文》，復旦大學出版社。	

The Hong Kong Polytechnic University

Subject Description Form

Subject Code	ELC3521
Subject Title	Professional Communication in English
Credit Value	2
Level	3
Pre-requisite / Co-requisite	English LCR subjects
Objectives	This subject aims to develop the language competence for professional communication in English required by students to communicate effectively with various parties and stakeholders in regard to engineering-related project proposals.
Intended Learning Outcomes	Upon completion of the subject, and in relation to effective communication with a variety of intended readers/audiences in English, students will be able to: a. plan, organise and produce professionally acceptable project proposals with appropriate text structures and language for different intended readers b. plan, organise and deliver effective project-related oral presentations with appropriate interactive strategies and language for different intended audiences c. adjust the style of expression and interactive strategies in writing and speaking in accordance with different intended readers/audiences
Subject Synopsis/ Indicative Syllabus	1. Project proposals in English • Planning and organising project proposals • Explaining the background, rationale, objectives, scope and significance of a project • Referring to the literature to substantiate project proposals • Describing the methods of study • Describing and discussing project results, including anticipated results and results of pilot study • Presenting the budget, schedule and/or method of evaluation • Writing executive summaries/abstracts 2. Oral presentations of projects in English • Selecting content for audience-focused presentations • Choosing language and style appropriate to the intended audience • Using appropriate transitions and maintaining coherence in team presentations • Using effective verbal and non-verbal interactive strategies
Teaching/Learning Methodology	<u>Learning and teaching approach</u> The subject is designed to develop the English language skills, both oral and written, that students need to use to communicate effectively and professionally with a variety of stakeholders of engineering-related projects. It builds upon the language and communication skills covered in GUR language training subjects.

The study approach is primarily seminar-based. Seminar activities include instructor input as well as individual and group work, involving drafting and evaluating texts, mini-presentations, discussions and simulations.

The learning and teaching activities in the subject will focus on a course-long project which will engage students in proposing and reporting on an engineering-related project to different intended readers/audiences. During the course, students will be involved in:

- planning and researching the project
- writing project-related documents such as project proposals
- giving oral presentations to intended stakeholders of the project

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c			
1. Project proposal in English	60%	✓		✓			
2. Oral presentation of project proposal in English	40%		✓	✓			
Total	100 %						

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

The assessments will arise from a course-long engineering-related project.

- Students will be assessed on written documents and oral presentations targeted at different intended readers/audiences. This facilitates assessment of students' ability to select content and use language and style appropriate to the purposes and intended readers/audiences.
- Students will collaborate in groups in planning, researching, discussing and giving oral presentations on the project. The written proposals will be individual work to ensure that students will be rigorously engaged in the application of language skills for the entire document.

Assessment type	Intended readers/audience	Timing
Written project proposal - a proposal of 1200-1500 words to be written individually	Mainly engineering experts	Week 8
Oral presentation of project proposal - a speech of around 30 minutes to be delivered in teams of 4 - simulating a presentation of the final proposal	Mainly non-experts	Weeks 12-13

Student Study Effort Expected

Class contact:	
• Seminars	26 Hrs.
Other student study effort:	

	• Researching, planning and writing the project • Rehearsing the presentation	52 Hrs.
	Total student study effort:	78 Hrs.
Reading List and References	1. D.F. Beer, (Ed.), *Writing and speaking in the technology professions: A practical guide*, 2nd ed., Hoboken, NJ: Wiley, 2003. 2. R. Johnson-Sheehan, *Writing proposals*, 2nd ed., New York: Pearson/Longman, 2008. 3. S. Kuiper, *Contemporary business report writing*, 3rd ed., Cincinnati, OH: Thomson/South-Western, 2007. 4. M.S. Lawrence, *Writing as a thinking process: Teacher's manual*. Ann Arbor, Mich: University of Michigan Press, 1975. 5. D.C. Reep, *Technical writing: Principles, strategies and readings*, 6th ed., Pearson, Longman, 2006.	

Subject Description Form

Subject Code	ENG3003
Subject Title	Engineering Management
Credit Value	3
Level	3
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	This subject provides students with: 1. A practical introduction to management and a comprehensive guide to the tools and techniques used in managing people and other resources. 2. Opportunities to trace the historical development and describe the functions of management, from planning, and decision making to organizing, staffing, leading, motivating, and controlling. It also includes a discussion on engineering ethics. 3. Opportunities to explore the core business strategy, technology, and innovation, and examine how these functions intertwine to play a central role in structural design, as well as supporting an organization's overall success.
Intended Learning Outcomes	Upon completion of the subject, students will be able to a. perform tasks in an organization related to organizing, planning, leading and controlling project and process activities; b. select appropriate management techniques for improving organizational structures, work procedures, and quality performance of operational tasks; c. analyze the factors that affect changes in the work environment, and be aware of the approaches in implementing change in an organization; d. be aware of the imperatives of ethical and business behaviors in engineering organizations in a fast-changing business environment.
Subject Synopsis/Indicative Syllabus	1. <u>Introduction</u> General management concepts in organizations; Functions and types of industrial organizations; Organizational structures; Corporate objectives, strategy, and policy 2. <u>Industrial Management</u> Roles of managers: Process of management, leadership, planning, organizing, motivating, and control of social and engineering activities; Quality management: Related tools and techniques

3. Project Management

Project scope and objectives; Network analysis; Tools that support engineering operations and task scheduling

4. Management of Change

Change leadership; Organizational change; Phases of planned change; Stress management; Factors that affect the execution of change

5. Effects of Environmental Factors

The effects of extraneous factors on the operations of engineering organizations, such as ethics and corporate social responsibilities issues

Teaching/Learning Methodology

A mixture of lectures, tutorial exercises, and case studies are used to deliver various topics in this subject. Some topics are covered by problem-based format whenever applicable in enhancing the learning objectives. Other topics are covered by directed study so as to develop students' "life-long learning" ability.

The case studies, largely based on real experience, are designed to integrate the topics covered in the subject and to illustrate the ways various techniques are inter-related and applied in real life situations.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d		
1. Coursework • Group learning activities (10%) • Presentation (individual) (30%)	40%	✓	✓	✓	✓		
2. Final examination	60%	✓	✓	✓	✓		
Total	100%						

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

The coursework of this subject involves students working in groups to study cases that reflect the realities of management situations in an engineering setting. Through such exercises, students' ability to apply and synthesize acquired knowledge can be assessed on the basis of their performance in group discussion, oral presentations, and the quality of their written reports on these case studies. A written final examination is also designed to assess the intended learning outcomes.

Student Study Effort Expected	Class contact:	
	▪ Lectures and review	27 Hrs.
	▪ Tutorials and presentations	12 Hrs.
	Other student study effort:	
	▪ Research and preparation	30 Hrs.
	▪ Report writing	10 Hrs.
	▪ Preparation for oral presentation and examination	37 Hrs.
	Total student study effort	116 Hrs.
Reading List and References	1. John R. Schermerhorn, Jr., 2013, Introduction to Management, 12th Ed., John Wiley 2. Robbins, S P, DeCenzo, D A, and Coulter, M, 2013, Fundamentals of Management Essential Concepts and Applications, 8th Ed., Pearson 3. Morse, L C and Babcock, D L, 2010, Managing Engineering and Technology: an Introduction to Management for Engineers, 5th Ed., Prentice Hall 4. White, M A and Bruton, G D, 2011, The Management of Technology and Innovation: A Strategic Approach, 2nd Ed., South-Western Cengage Learning	

(revised) July 2015

Subject Description Form

Subject Code	ENG3004
Subject Title	Society and the Engineer
Credit Value	3
Level	3
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	This subject is designed for engineering students as a complementary subject on the role of the professional engineer in practice and their responsibilities toward the profession, colleagues, employers, clients, and the public. The objectives of the subject are to enable students to 1. appreciate the historical context of modern technology and the nature of the process whereby technology develops and its relationship between technology and the environment, as well as the implied social costs and benefits; 2. understand the social, political, legal, and economic responsibilities and accountability of the engineering profession and the organizational activities of professional engineering institutions; 3. be aware of the short-term and long-term effects related to safety and health of technology applications; 4. observe the professional conduct as well as the legal and other applicable constraints related to various engineering issues.
Intended Learning Outcomes	Upon completion of the subject, students will be able to a. identify and evaluate the effects of technology applications in the social, cultural, economic, legal, health, safety, environment, and dimensions of the society; b. explain the importance of local and international professional training, professional conduct, ethics, and responsibilities in various engineering disciplines, particularly the Washington Accord; c. evaluate in a team setting the implications of a specific project in the eight dimensions of project issues related to engineers, and present the findings to laymen and peers.
Subject Synopsis/ Indicative Syllabus	1. <u>Impact of Technology on Society</u> Innovation and creativity; History and trends of technology on social and cultural developments of society 2. <u>Environmental Protection and Related Issues</u>

	Roles of the engineer in energy conservation, ecological balance, and sustainable development 3. <u>Outlook of Hong Kong's Industry</u> Support organizations and impacts on economic development in Greater China and the Pacific Rim 4. <u>Industrial Health and Safety</u> The Labour Department and the Occupational Health and Safety Council; Legal dimensions such as contract law and industrial legislation 5. <u>Professional Institutions</u> Local and overseas professional institutions; Washington Accord and the qualifications and criteria of professional engineers 6. <u>Professional Ethics</u> Prevention of bribery and corruption; The work of the Independent Commission Against Corruption (ICAC); Social responsibilities of engineers
Teaching/Learning Methodology	Class comprises short lectures to provide essential knowledge and information on the relationships between society and the engineer under a range of dimensions. Other methods include discussions, case studies, and seminars to develop student's in-depth analysis of the relationship. Students form groups; throughout the course, they will work on engineering cases by completing the following learning activities: 1. Case analysis where students provide weekly summary reports on the relationships between society and the engineering issues of a project under specific dimensions; 2. The final report as a case portfolio which includes i. Presentation slides ii. Feedback critique iii. Weekly summary report iv. Reflection 3. Final presentation
Assessment Methods in Alignment with Intended Learning Outcomes	

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c			
1. Continuous assessment	60%						

	• Group weekly learning activities • Individual final presentation • Group report, individual reflection report	(24%) (18%) (18%)	✓ ✓ ✓	✓ ✓	✓ ✓			
	2. Examination	40%	✓	✓				
	Total	100%						

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

The coursework requires students to work in groups to study cases from the perspectives of the eight dimensions in an engineering setting. Through these exercises, students' ability to apply and synthesize acquired knowledge can be assessed on the basis of their performance in group discussion, oral presentations, and the quality of their portfolio reports on the case studies.

The open-book examination is used to assess students' critical thinking and problem-solving skills when working on their own.

Student Study Effort Expected		
	Class contact:	
	▪ Lectures and review	27 Hrs.
	▪ Tutorial and presentation	12 Hrs.
	Other student study efforts:	
	▪ Research and preparation	63 Hrs.
	▪ Report writing	14 Hrs.
	Total student study effort	116 Hrs.

Reading List and References

Reference Books & Articles:

1. Education for Sustainable Development - An Expert Review of Processes and Learning, UNESCO, 2011
2. Engineering-Issues, Challenges and Opportunities for Development, USECO, 2010
3. Engineering for Sustainable Development: Guiding Principles, Royal Academy of Engineering, 2005
4. Securing the future: delivering UK sustainable development strategy, 2005
5. Johnston, F S, Gostelow, J P, and King, W J, 2000, *Engineering and Society Challenges of Professional Practice*, Upper Saddle River, N.J.: Prentice Hall
6. Hjorth, L, Eichler, B, and Khan, A, 2003, *Technology and Society A Bridge to the 21st Century*, Upper Saddle River, N.J.:Prentice Hall

	7. The Council for Sustainable Development in Hong Kong, http://www.susdev.gov.hk/html/en/council/ 8. Poverty alleviation: the role of the engineer, http://www.arup.com/_assets/_download/download67.pdf **Reading materials:** Engineering journals: - Engineers by The Hong Kong Institution of Engineers - Engineering and Technology by The Institution of Engineers and Technology Magazines: Time, Far East Economic Review Current newspapers: South China Morning Post, China Daily, Ming Pao Daily

(revised) February 2014

Subject Description Form

Subject Code	ISE386
Subject Title	Integrated Design for Manufacture
Credit Value	3
Level	3
Pre-requisite/Co-requisite/Exclusion	Exclusion : ISE3003 Design for Manufacture and Sustainability
Objectives	This subject provides students with 1. fundamental knowledge on approaches and methods of design for manufacturing; 2. the ability to realize how a design affects various product life cycle activities; 3. fundamental knowledge in designing parts and products to meet manufacturing requirements.
Intended Learning Outcomes	Upon completion of the subject, students will be able to a. understand how product life cycle issues affect the design of a product; b. understand the concept of value engineering; c. analyze a part design for manufacturability; d. apply appropriate methods in considering quality in a design stage; e. analyze a product for ease of assembly, disassembly and service.
Subject Synopsis/ Indicative Syllabus	1. <u>Introduction to Design for Product Life Cycle</u> Design for manufacture and assembly, Design for quality, Design to cost, Design for service and maintenance, Design for recycling 2. <u>Value Engineering</u> Concept of value, Value analysis, Product improvement 3. <u>Quality in Design</u> Quality function deployment, Robust design 4. <u>Design for Assembly</u> Design guidelines, DFA methodology

<table>
<tr><td></td><td>5. <u>Design for Manufacturability</u>

Part design for injection molding and sheet metal operations, Process simulation

6. <u>Design for Service and Recycling</u>

Design for disassembly and service, Design for recycling</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>A mixture of lectures, tutorial exercises, case studies, a group project, and laboratory exercises are used to deliver various topics on the subject. Some topics are covered in a problem-based format wherein learning objectives are enhanced, others are covered by directed studies to enhance students' "learning to learn" ability.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td></td></tr>
<tr><td>1. Assignments</td><td>55%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>2. Tests</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>3. Group project</td><td>15%</td><td>✓</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>Total</td><td>100%</td><td colspan="6"></td></tr>
</table>
The tests and the assignments are all aimed at assessing students with respect to all the intended learning outcomes. The group project is aimed at assessing students with respect to the intended learning outcomes a and e.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>22 Hrs.</td></tr>
<tr><td>▪ Tutorials and case studies</td><td>9 Hrs.</td></tr>
<tr><td>▪ Laboratory exercises</td><td>8 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Take-home assignments</td><td>58 Hrs.</td></tr>
<tr><td>▪ Preparation for tests</td><td>25 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>122 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>1. Boothroyd, G., Dewhurst, P. and Knight, W.A. 2002, Product Design for Manufacture and Assembly, Marcel Dekker, N.Y.

2. Ficalora, J.P. and Cohen, L. 2010, Quality Function Deployment and Six</td></tr>
</table>

	Sigma, Prentice Hall 3. Wu, Y. and Wu, A. 2000, *Taguchi Methods for Robust Design*, ASME Press 4. Otto, K. and Wood, K. 2001, *Product Design*, Prentice Hall

Subject Description Form

Subject Code	ME31003
Subject Title	System Dynamics
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME23001 Engineering Mechanics
Objectives	To provide students the knowledge in modeling and solving different dynamic systems including plane kinematics and kinetics of rigid bodies through theoretical and mathematical principles.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Construct and analyze the dynamic models of different physical systems by applying knowledge of physical laws and mathematical techniques. b. Formulate and analyze the mechanical translational and rotational systems by applying knowledge of rigid body dynamics. c. Complete a given task in modeling and analysis of dynamic systems such as an assignment or a project by applying concepts and knowledge in system dynamics, mathematical and simulation tools. d. Present effectively in completing written reports of a given task.
Subject Synopsis/ Indicative Syllabus	***Dynamics*** **-** *Plane kinematics of rigid bodies*, rotation, absolute motion, relative velocity, instantaneous centre of zero velocity, relative acceleration, motion relative to rotating axes. *Plane kinetics of rigid bodies*, force, mass and acceleration, general equation of motion, applications, e.g., four-bar linkage and slider-crank mechanisms, principles of work, energy, impulse and momentum. ***Modelling of Linear Systems*** **–** Dynamic equations of multi-degrees-of-freedom spring-mass-damper systems, liquid level systems, temperature systems and some hybrid systems; introduction to Laplace transform and analysis of vibration systems; block diagram construction and simplification; Transfer functions; Characteristic equations, Zeros and poles; Transient responses of 1^{st} and 2^{nd} order systems.
Teaching/Learning Methodology	Lectures aim at providing students with an integrated knowledge required for understanding and analyzing the dynamics of rigid bodies and systems. (Outcomes a to c) Tutorials aim at enhancing the analytical skills of the students. Examples will be provided to teach students the skill of modelling dynamic systems and determining their response. Students will be able to solve real-world problems using the knowledge they acquired in the class. (Outcomes a to c) The task aims to integrate the sciences of different physical systems to the analysis of a dynamic system, which provides opportunity to apply knowledge of system dynamics, mathematical and simulation tools to design a real-life product or system. (Outcomes a to d)

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√	√	
Tutorial	√	√	√	
Task (Assignment/Project)	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Class test	30%	√	√		
2. Homework/Task	20%	√	√	√	√
3. Examination	50%	√	√		
Total	100%				

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

Overall Assessment:

$0.50 \times$ End of Subject Examination + $0.50 \times$ Continuous Assessment

The continuous assessment includes two components: three closed-book short tests (30%) and three assignments or task (20%). The closed-book tests aim at assessing the interim knowledge gained by the student. The assignments aim at assisting the students in preparation for the tests and checking the progress of their study.

The examination will be used to assess the knowledge acquired by the students for understanding and analyzing the problems, critically and individually, related to modeling and analysis of linear dynamic systems.

Student Study Effort Expected

Class contact:	
▪ Lecture	32 Hrs.
▪ Tutorial	7 Hrs.
Other student study effort:	
▪ Reading and review	42 Hrs.
▪ Homework assignment and task	24 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. F.P. Beer and E.R. Johnson, Mechanics for Engineers: Dynamics, McGraw-Hill, latest edition.
2. J.L. Meriam and L.G. Kraige, Engineering Mechanics, John Wiley, latest edition.
3. N.S. Nise, Control Systems Engineering, Wiley, latest edition.
4. K. Ogata, Modern Control Engineering, Prentice Hall, latest edition.

Revised July 2014

Subject Description Form

Subject Code	ME33001
Subject Title	Mechanics of Materials
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME23001 Engineering Mechanics; and ENG2001Fundamentals of Materials Science and Engineering
Objectives	To introduce the fundamental mechanics knowledge of solid materials under basic loading conditions. And to introduce practical approaches to solve for the stress and strain/deformation of solid materials under external mechanical loadings.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Solve for external forces and moments applied on a structure and determine the distribution of internal forces and moments in the structure by using free body diagrams and the laws of equilibrium. b. Recognize the crucial material and geometrical properties for a structural component under different types of loading, and solve for stress and deformation in a structural component due to axial loading, torsion, and bending acting individually or in combination. c. Evaluate the principal stresses in structural components subjected to a combined state of loading. d. Formulate and solve problems involving tension, compression, torsion or bending for statically indeterminate structural components.
Subject Synopsis/ Indicative Syllabus	***Fundamentals*** **-** Free Body Diagram; Equilibrium of a deformable body; General state of stress; Strain; Mechanical properties of materials. ***Axial Load*** **-** Saint-Venant's Principle; Axial elastic deformation; Principle of superposition; Statically indeterminate axially loaded member; Thermal stress. ***Torsion*** **-** Torsional deformation; Torsional Stress; Angle of twist; Statically indeterminate torque-loaded members. ***Bending*** **-** Equilibrium of beams; Shear force and bending moments; Flexural stresses; Beam deflection; Slope and deflection by method of superposition; Statically indeterminate systems. ***Combined Loading*** **-** Transformation of stresses; Principle stresses and maximum shear stress; Mohr's circle. Thin walled pressure vessels; Cylinders and spheres under internal and external pressures; Compounded cylinder; Stress distribution in beams; Stresses due to combined loads.

Laboratory Experiment
There are two 2-hour laboratory sessions.
Typical Experiments:
1. Torsion test
2. Deflection of beam

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to the topics as described in the section subject synopsis (Outcomes a to d).

Tutorials are used to illustrate the application of fundamental knowledge to practical situations (Outcomes a to d).

Experiments are used to relate the concepts to practical applications and students are exposed to hand-on experience, proper use of equipment and application of analytical skills on interpreting experimental results (Outcomes a and d).

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√	√	√
Tutorial	√	√	√	√
Experiment	√			√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Assignment	25%	√	√	√	√
2. Laboratory report	5%	√			√
3. Test	10%	√	√	√	√
4. Examination	60%	√	√	√	√
Total	100%				

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

Overall Assessment:

$0.60 \times$ End of Subject Examination + $0.40 \times$ Continuous Assessment

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the tests, assignments and laboratory reports which provide timely feedbacks to both lecturers and students on various topics of the syllabus.

Student Study Effort ExpectedExpected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial/Laboratory	6 Hrs.
	Other student study effort:	
	▪ Course work	23 Hrs.
	▪ Self-study	42 Hrs.
	Total student study effort	104 Hrs.
Reading List and References	1. R.C. Hibbeler, Mechanics of Materials, Pearson Prentice Hall, latest edition. 2. F.P. Beer, E.R. Johnston and Jr. J.T. DeWolf, Mechanics of Materials, McGraw-Hill, latest edition. 3. A.C. Ugural, A.C. and S.K. Fenster, Advanced Strength and Applied Elasticity, Prentice Hall, latest edition.	

Revised August 2014

Subject Description Form

Subject Code	ME34003
Subject Title	Thermofluid Mechanics
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: AP10005 Physics I
Objectives	1. To provide fundamental concepts and knowledge of fluid mechanics, acoustics and heat transfer. 2. To provide fundamental concepts and knowledge of internal and external flow systems, pump and fan systems, heating and cooling systems and their applications to product design.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate and solve fluid-mechanic/heat-transfer/acoustic problems by applying knowledge of thermofluids, heat transfer, acoustics and mathematics. b. Complete a design project of a thermofluid system by applying knowledge acquired in the subject with the aid of computer technology. c. Analyze and interpret data obtained from experiments in fluid mechanics, acoustics and heat transfer. d. Search for updated technology in thermofluid engineering in completing a design project of a thermofluid system. e. Communicate effectively in completing written reports of laboratory work and design project.
Subject Synopsis/ Indicative Syllabus	***Fluid Mechanics –*** Basic concepts. Fluid pressure and manometers. Bernoulli, energy and momentum equations. Pitot tubes. Laminar and turbulent flow in pipes. Moody chart, frictional and minor losses. Design for pipes in parallel and in series. Pump matching in pipe flow system. Parallel flow over flat plates, flow over cylinders and spheres. Dimensional Analysis. Buckingham π theorem. Flow similarity and modeling. ***Flow Generation –*** Conservation of angular momentum and working principles of fluid machinery. Performance characteristics of fans, pumps and blowers and their design selections. Engineering estimates of the working point of the fluid machines in products. ***Heat Transfer –*** Revision: basic heat transfer modes; one-dimensional steady state heat conduction in plane walls and cylinders; electrical analogy method. Thermal insulation. Critical thickness of insulation. Fins. Natural convection over surfaces. Forced convection over flat plates and in pipes. Heat exchangers. Thermal, blackbody and gray body radiations. View factors. Radiative exchange between surfaces in enclosures.

<table>
<tr><td></td><td>Noise – Sound pressure and sound power levels. Point source models. Common noise source mechanisms involving flow and vibration and their sound power laws. Simple noise control design.

Experimental Work
There are two 2-hour laboratory sessions with the following typical experiments:
1. Flow pattern at exit of a hair dryer
2. Heat transfer via a heat sink
3. Natural convection and radiation heat transfer
4. Noise control technique</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The subject intends to lay a solid scientific foundation for the design and analysis of a product in which thermofluid sciences play a crucial role. Systematic lectures are required to achieve such foundation building coupled with assignments (outcomes a, and b).
2. Tutorials are used to illustrate the applications of fundamental knowledge to practical situations (outcomes a, b, and d).
3. Laboratory works are essential for students to have hands-on experience of the thermofluid systems to be learned (outcomes c and e).
4. The design project aims to integrate the thermofluid sciences to engineering design of a thermofluid system, and this design task provides opportunity to apply knowledge of mathematics, thermofluid sciences and acoustics to design a real-life product (outcomes a, b, d and e).

It is intended to make use of these teaching/learning methodologies to achieve the intended subject learning outcomes as indicated in the following table:

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="5">Outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td>Lecture</td><td>√</td><td>√</td><td></td><td></td><td></td></tr>
<tr><td>Tutorial</td><td>√</td><td>√</td><td></td><td>√</td><td></td></tr>
<tr><td>Experimental Work/Report</td><td></td><td></td><td>√</td><td></td><td>√</td></tr>
<tr><td>Design Project/Report</td><td>√</td><td>√</td><td></td><td>√</td><td>√</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Examination	50%	√	√			
2. Test	25%	√	√			
3. Assignments	7.5%	√			√	
3. Design Project/Report	10%	√	√		√	√
4. Laboratory Work/Report	7.5%			√		√
Total	100%					

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

Overall Assessment:

0.5 × End of Subject Examination + 0.5 × Continuous Assessment

Examination is adopted to assess students on their overall understanding and ability in applying the concepts and knowledge of thermofluid mechanics. It is supplemented by homework assignments, design project/report and laboratory works/reports. The mid-term test which covers the first half of the course materials provides useful timely feedback to both lecturer and the students on the topics.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Tutorial/laboratory	6 Hrs.
Other student study effort:	
▪ Coursework (Assignments, Design Project/ Laboratory Works and Reports)	39 Hrs.
▪ Self Study	39 Hrs.
Total student study effort	117 Hrs.

Reading List and References

1. Cengel Y.A., Turner R. H. and Cimbala J. M., Fundamentals of thermal-fluid sciences. McGraw Hill, latest edition.
2. Holman J. P., Heat Transfer, McGraw Hill, latest edition.
3. Wright T., Fluid machinery: performance, analysis, and design, CRC Press, latest edition.
4. Munson B. R., Young D. F., Okiishi T. H., Huebsch W. W., Fundamentals of Fluid Mechanics, John Wiley, latest edition.
5. Barron, R. F., Industrial Noise Control and Acoustics, Marcel Dekker Inc., latest edition.

Revised July 2014

Subject Description Form

Subject Code	ME41004
Subject Title	Mechatronics and Control
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME31003 System Dynamics
Objectives	To provide students the knowledge in designing mechatronic systems for product development which integrate mechanical, electrical and control systems engineering.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate and solve problems relating to modeling of linear mechanical systems, analysis of system relative stabilities; determining specifications for mechantronic products, designing controllers for mechanical products, or analyzing mechatronic products. b. Complete a given task such as a project in product design and/or improvement by applying knowledge acquired in the subject and information obtained through literature search. c. Analyze and interpret data obtained from experiments in system modeling, stability analysis or frequency-domain analysis of mechanical products. d. Present effectively in completing written reports of laboratory work and the given task.
Subject Synopsis/ Indicative Syllabus	***Sensors and Actuators*** **-** Instrumentation and measurement principles; frequency response characteristics; sensors for motion and position measurement; force, pressure and acceleration sensors, *etc*; actuators such as direct current motors, stepper motors, piezoelectric actuators, *etc*. ***Signal Conditioning and Transmission*** **-** Concepts and principles; analogue electronics with operational amplifier; conversion between analog and digital signals, multiplexing; data acquisition principles, signal filtering. ***Digital Logic Controller and PLC*** **-** Logic; controller design in mechatronic system integration, combinational and sequential control, minimization of logic equations; ladder logic diagrams; introduction to microcontrollers and programmable logic controllers (PLC). ***Introduction to Feedback Control –*** Analysis of open-loop and closed-loop systems; transfer functions and block diagrams, time-domain specifications such as overshoot, settling time, steady-state error etc. ***Feedback Control Systems –*** Automatic controllers, basic P, PD, PI, PID controllers, Routh-Hurwitz stability criterion, controller design to satisfy the design specifications.

Laboratory Experiment
There are two 2-hour laboratory sessions.
Typical Experiments:
1. Speed Measurement
2. Sequential control using programmable logic controller (PLC)
3. DC servomechanism
4. Water level control

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to sensors and actuators, signal conditionings, digital logic controllers, feedback control systems and stability analysis (Outcomes a and b).

Tutorials are used to illustrate the application of fundamental knowledge to practical situation (Outcomes a and b).

Experiments are used to relate the concepts to practical applications and students are exposed to hand-on experience, proper use of equipment and application of analytical skills on interpreting experimental results (Outcomes c and d).

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√		
Tutorial	√	√		
Experiment			√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Class Test	25%	√	√		
2. Homework	15%	√	√		
3. Laboratory Report	10%	√	√	√	√
4. Examination	50%	√	√	√	√
Total	100%				

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

Overall Assessment:
0.50 x End of Subject Examination + 0.50 x Continuous Assessment.

Assignments, laboratory reports, and tests are adopted in continuous assessment on students' timely feedback to and on-going understanding of the course. Students' overall understanding of the course and ability in applying the delivered knowledge are further assessed through a formal examination.

Student Study

Class contact:

Effort Expected	▪ Lecture	33 Hrs.
	▪ Laboratory / Tutorial	6 Hrs.
	Other student study effort:	
	▪ Self-study	45 Hrs.
	▪ Homework assignment	15 Hrs.
	▪ Laboratory report	6 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	1. Shetty, D. and Kolk, R. A., *Mechatronic System Design*, PWS Publishing Company, latest edition. 2. Alciatore, D. G. and Histand, M. B., *Introduction to Mechatronics and Measurement Systems*, McGraw Hill, latest edition. 3. Bolton, W., *Mechatronics: Electronic Control Systems in Mechanical Engineering*, Prentice Hall, latest edition. 4. Ogata, K., *Modern Control Engineering*, Prentice Hall, latest edition. 5. Gopal, M., *Control Systems Principles and Design*, Tata McGraw-Hill, latest edition. 6. Nise, N.S., *Control Systems Engineering*, John Wiley, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME42005
Subject Title	CAD/CAE Technologies for Product Development
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AMA2111 Mathematics I
Objectives	To provide students with computer-aided design (CAD) and computer-aided engineering (CAE) technologies and the ability in using CAD and CAE software for product design and development.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Use CAD and CAE technologies to support product design activities, including geometry modeling, design solution modeling, analysis and evaluation, in different design process of the whole product design and development cycle. b. Understand data exchange standards and practices between CAD and CAE models and systems and their interoperability and associativity. c. Use CAD and CAE commercial software systems for product design and development in terms of geometry modeling, kinetics simulation, design solution analysis and evaluation. d. Optimize design solutions with the aid of CAD and CAE technologies.
Subject Synopsis/ Indicative Syllabus	***Computer-aided Design*** - Geometric Models of Products • Wireframe model • Surface model • Solid Model - Geometry modeling technologies • Curve Modeling • Surface Modeling • Solid Modeling - Product kinetics modeling and simulation ***Design Analysis and Evaluation*** - Finite Element Modeling and Analysis • Basic concept of finite element method • Modeling techniques • Mesh types • Boundary constraints • Material and Properties • Symmetry in modeling and analysis - Mechanical and thermal stress analyses - Dynamic response - Product optimization in terms of product size, shape and material - Non-linear stress analysis

CAD/CAE Integration

- Data exchange standards: STL, STEP and IGES
- Interoperability and associativity between CAD and CAE
- Model defect and repairing

Case Studies

- CAD case studies
- CAE case studies
- CAD and CAE integration

Teaching/Learning Methodology

Lectures will be given to explain the theories behind CAD and CAE and their applications. (Outcomes b, c and d)

Tutorials will be used to teach the students on how to conduct product design, analysis and evaluation using state-of-the-art CAD and CAE software commercial software systems. Students will be given various assignments to learn how to represent and model the products from geometry perspective, how evaluate and analyze the design solutions from thermal, mechanical and physical perspectives and how to optimize the design solutions in terms of product size, shape and material. (Outcomes a, c and d)

A mini-project will be given to students so that they will go through all the design phases in using computer-aided technologies to achieve design objectives. (Outcomes a to d)

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture		√	√	√
Tutorial	√		√	√
Case study			√	
Mini-project	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Class test	20%	√	√	√	√
2. Written/computer assignment	10%	√	√	√	√
3. Case study	10%			√	
4. Mini-project report/presentation	10%	√	√	√	√
5. Examination	50%	√		√	√
Total	100%				

	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: Overall Assessment: 0.50 × End of Subject Examination + 0.50 × Continuous Assessment	
	Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the tests, written and computer assignments which provide timely feedbacks to both lecturers and students on various topics of the syllabus. Written reports on various case studies and mini-project are used to assess the students' knowledge in the application of state-of-the-art CAD/CAE software to facilitate the product design and analysis process. Mini-project report and presentation assess the students' ability to assimilate the learnt knowledge for solving a more realistic, open-ended design problem systematically.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	30 Hrs.
	▪ Tutorial	3 Hrs.
	▪ Guided study of CAD/CAE	6 Hrs.
	Other student study effort:	
	▪ Performing CAD/CAE in design (tutorial problems)	20 Hrs.
	▪ Performing modeling of design problems (case studies and mini-project)	24 Hrs.
	▪ Literature search and private study	23 Hrs.
	Total student study effort	106 Hrs.
Reading List and References	1. Michael E. Mortenson, Geometric Modeling, John Wiley & Sons, latest edition. 2. Kunwoo Lee, Principles of CAD/CAM/CAE System, Addison-Wesley Longman, latest edition. 3. Vince Adams and Abraham Askenazi, Building Better Products with Finite Element Analysis, Onword Press, latest edition. 4. J.Y.H. Fuh, Y.F. Zhang, A.Y.C. Nee, M.W. Fu, Computer-aided injection mold design and manufacture, Marcel Dekker, Inc, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME42006
Subject Title	Product Modeling and Prototyping
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME42005 CAD/CAE Technologies for Product Development
Objectives	To teach students the virtual prototyping, product data management (PDM), reverse engineering (RE) and rapid prototyping (RP) technologies and their applications in product development.
Intended Learning Outcomes	Upon completion of the subject, students will be: a. Provided with the principle and knowledge of product structure modeling and its application in product design and development. b. Able to employ the computer-aided design (CAD) and computer-aided engineering (CAE) related technologies for virtual prototyping of design concepts. c. Equipped with the basic concepts and knowledge of PDM and familiar with at least one commercial PDM software system. d. Able to use the techniques of reverse engineering and apply them in new product development, including product creation, revision and how to use it in rapid modeling. e. Able to use the rapid prototyping techniques for development of product prototypes for function, fit and form testing in product design and development.
Subject Synopsis/ Indicative Syllabus	***Product Structure Modeling*** - Product structure concepts. - The modeling process. - Process date model - Plastic Processing. - case studies ***Product Data Management*** - Background and basic concepts - PDM systems - Applications and case studies ***Virtual Prototyping*** - Background ground, business drivers and basic concepts. - Enabling technologies - Applications and case studies.

Reverse Engineering
- Background ground, business drivers and basic concepts.
- Enabling technologies
- Applications (Application filed and prospect of RE, steps in RE, technologies applied in RE, 3D scanning and digitizing).

Rapid Prototyping Technology
- Rapid Prototyping Processes and Interfacing.
- Rapid Tooling.
- Safety and Environmental Control in RP.

Laboratory Experiment:
Using RP technology to make real parts

Tutorials:
Using related software systems to illustrate the applications of the related technologies.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge related to advanced manufacturing processes and rapid prototyping technology. (Outcomes a to c)

Tutorials and case studies are used to illustrate the application of fundamental knowledge to practical situations. (Outcomes a to d)

Experiments are used to relate the concepts to practical applications and students are exposed to hand-on experience, proper use of equipment and application of analytical skills on interpreting experimental results. (Outcomes d and e)

Mini-project/study report is used to enhance the understanding and use of the learned knowledge. (Outcomes a to e)

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lecture	√	√	√		
Tutorials and case study	√	√	√	√	
Experiment				√	√
Mini-project / study report	√	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
1. Test	20%	√	√	√	√	√
2. Homework/assignment	20%	√	√	√	√	√
3. Laboratory report	10%				√	√
4. Examination	50%	√	√	√	√	√
Total	100%					

	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: Overall Assessment: 0.50 × End of Subject Examination + 0.50 × Continuous Assessment Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the tests, assignments and laboratory reports which provide timely feedbacks to both lecturers and students on various topics of the syllabus.	
Student Study Effort Expected	Class contact:	
	▪ Lecture and seminar	30 Hrs.
	▪ Tutorial	7 Hrs.
	▪ Laboratory work and workshop	2 Hrs.
	Other student study effort:	
	▪ Performing mini-project/study report	20 Hrs.
	▪ Course work	23 Hrs.
	▪ Literature search and private study	22 Hrs.
	Total student study effort	104 Hrs.
Reading List and References	1. R. Budde, Prototyping: An Approach to Evolutionary System Development, Springer-Verlag, Berlin, New York, latest edition. 2. Rapid Prototyping, CK Chua, KF Leung, SC Lim, World Scientific, latest edition. 3. B. Benhabib, Manufacturing: Design, Production, Automation and Integration, Marcel Dekker, latest edition. 4. P.N. Rao, CAD/CAM Principles and Applications, McGraw Hill, latest edition. 5. S. Kalpakjian, S. Schmid, Manufacturing engineering and technology, Prentice Hall, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME42007
Subject Title	Design for Product Safety and Reliability
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME22002 Integrated Product Development Fundamentals
Objectives	To provide students an overview of the product liability and legal aspects in launching of new consumer products and develop their understanding of the management strategy in achieving product safety.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Identify problems related to liability, safety and reliability for an existing product design and apply their knowledge in reliability engineering to devise a technically and economically feasible solution. b. Apply knowledge of mathematics and engineering sciences via analytical and computational approaches to assess the risks of a product design and development project, and to assess the impacts of various key elements in achieving product safety. c. Develop systematically a safer and more reliable design for an existing product via a group project and present in a professional manner their ideas using multimedia and written reports.
Subject Synopsis/ Indicative Syllabus	***Product Reliability –*** Definition of product reliability, reliability programme plan, reliability requirements, parameters, modeling, prediction, test requirement, and design for reliability. ***Product Liability*** **-** Meaning of product liability. Definition of defective product. Product liability in Hong Kong. Product liability law in Hong Kong. Product liability law in other Jurisdictions. ***The Management of Design Risks*** **-** Management strategy in product safety. Reducing product design risks through design reviewing systems. Personal and environmental risk identification of the whole product life from manufacturing to end of services disposal. ***Product Safety Standards*** **-** The consumer Product Safety Acts. The safety standards used in different countries such as Underwriters Laboratories Inc. (UL) in USA, British Standards in United Kingdom and International Electro-technical Commission (IEC) in Europe. Overview of the application and testing procedures in obtaining product safety markings for new products. Planning, implementation and control in product test and assurance.

Product Risk Identification Methods **-** Fault Tree Analysis (FTA). Failure Mode and Effect Analysis(FMEA). Hazard and Operability Study (HAZOP) and Hazard Analysis Critical Control Point (HACCP). The use of quantitative and statistical methods in assessing product risks and design optimisation.

Product Risk Management **-** Product Risk transfer through insurance and contract conditions.

Teaching/Learning Methodology

1. Lectures give coverage and exposure and arouse interest. (Outcomes a to c)
2. Group discussions and tutorials help students consolidate lecture materials. (Outcomes a to c)
3. Assignments, through which students learn to compile, assimilate, assess and analyze. (Outcomes a to c)
4. Through thematic projects students would keep abreast of current product liability law and strategies for management of design risks. The presentation of reports allows students develop communication skills. (Outcomes a to c)

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lecture	√	√	√
Tutorial	√	√	√
Assignment	√	√	√
Project	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)		
		a	b	c
1. Group project	15%	√	√	√
2. Individual report	25%	√	√	√
3. Class presentation	10%	√		
4. Examination	50%	√	√	√
Total	100%			

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

Overall Assessment:

0.50 x End of Subject Examination + 0.50 x Continuous Assessment.

1. For continuous assessment evaluation, each student is required to submit a minimum of three reports. One of these reports is group-based and the other two are individual assignments. Besides assessing all the written assignments, students will be required to present the group and/or individual projects in class.

	Class presentation and participation in discussions will be assessed. 2. To achieve the intended learning outcomes, it is considered that more emphasis on formative assessment would be appropriate as students' performance will be improved via written and verbal feedback. 3. Marked assignments provide feedback and reinforcement on learning key concepts and outcomes. 4. Through presentations/discussions, students will learn how to: i. Work effectively with diverse group of people; ii. Persuasively explain in both oral and written form their product safety concepts; iii. Tackle diverse and unstructured questions; iv. Tell thoughts, feelings, ideas so that others may understand; v. Supports and leads others in discussion. 5. The examination will be used to assess the knowledge acquired by the students to deal with product design risks in a strategic manner. It provides a reference of standards with which the learning outcomes are measured.	
Student Study Effort Expected	Class contact:	
	▪ Lecture and seminar	33 Hrs.
	▪ Tutorial and group discussion	6 Hrs.
	Other student study effort:	
	▪ Performing group project	25 Hrs.
	▪ Conducting case study and assignment	23 Hrs.
	▪ Literature search and private study	18 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	1. Abbot, Howard: Safer by design: a guide to the management and law of designing for product safety, Gower, latest edition. 2. Hammer, Willie: Product Safety management and engineering, American Society for Safety Engineers, latest edition. 3. The Law Reform Commission of Hong Kong: Report on Civil Liability for Unsafe Products, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME46001
Subject Title	Numerical Predictive Product Analysis
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME31003 System Dynamics
Objectives	To equip students with necessary knowledge in numerical and computer-aided predictive analysis tools so that they can effectively contribute in enhancing the quality and performance of products.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Apply knowledge of mathematics and engineering sciences via analytical and computational approaches to analyze and predict the performance of a product. b. Use related software tools to perform mathematical analysis effectively. c. Select and use appropriate computer-aided analysis techniques to predict performance of a product and optimize its functions, resource usage, environmental performance, etc. d. Formulate, execute and systematically manage a product analysis project using limited resources and communicate the project outcomes effectively.
Subject Synopsis/ Indicative Syllabus	***Introduction to Numerical Methods for Product Analysis*** – Mathematical modeling of engineering problems. Taylor's theorem with remainders. Series expansion for elementary functions. Major sources of errors involved in numerical methods. Use of software tools for numerical analysis: MATLAB fundamentals, programming with MATLAB. ***Optimization*** - Introduction to optimization. Development of objective functions and associated constraints and variables. Constrained optimization: Linear and non-linear programming problems. Case studies using MATLAB. ***Curve Fitting and Regression*** – Introduction to curve fitting, interpolation and extrapolation. Linear regression and non-linear regression. Use of software tools (MATLAB and Excel) to solve related problems. ***Computer-aided Predictive Analysis*** - Motion simulation, drop test, fatigue analysis, frequency analysis, computational flow dynamics analysis, thermal analysis, environmental performance analysis, optimization studies.

Teaching/Learning Methodology

1. Students will develop the intended learning outcomes mainly by undertaking a design analysis group project using CAE technologies and mathematical analysis software tools. Design analysis will be done for a new product developed by the students or for a selected existing product. The product should consist of several components made of different materials and some moving link mechanisms (example products: Lock pliers, garden scissors, stapler machine, bearing puller, children's toy, link mechanisms in machinery, linkage driven exercising units, etc.)
2. The lectures are aimed at providing students with necessary background knowledge in related mathematical principles, and computer-aided tools for product analysis. (Outcomes a to c)
3. The tutorials are aimed at enhancing the students' skills in effectively using computer-aided tools for product analysis and to provide them with guidance & timely feedback for mini-project activities. (Outcomes a to c)
4. The mini-project is aimed at providing them with an opportunity to apply the knowledge acquired from the course to solve real world product analysis problems. It is also expected that the students will enhance their team-working skills, written and oral communication skills by effectively participating in project learning and assessment activities. (Outcomes a to d)
5. The assignments are to get students engaged with learning activities continuously and to provide them with self-assessment opportunities on their progress of learning. (Outcomes a to c)

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture/Tutorial	√	√	√	
Mini-project report & presentation	√	√	√	√
Homework assignments/ In-class exercises	√	√	√	

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignments/ In-class exercises	10%	√	√	√	
2. Test	15%	√	√	√	
3. Mini-project report & presentation	25%	√	√	√	√
4. End-of-semester Examination	50%	√	√	√	
Total	100%				

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

Overall Assessment: 0.5 × Continuous Assessment + 0.5 x Examination.

	1. Homework assignments & in-class exercises are aimed at evaluating the progress of students study and assisting them in fulfilling the respective subject learning outcomes. 2. Test and examination will be used to assess the degree of achieving the subject learning outcomes by individual student. Their understanding of mathematical and design principles and ability to apply them to critically analyze related problems will be tested. 3. The mini-project is to assess students learning outcomes while providing them with opportunities to apply their learnt knowledge, enhance written & oral communication skills and team-working spirit.	
Student Study Effort Expected	Class contact:	
	▪ Lectures	26 Hrs.
	▪ Tutorials/Mini-project discussions & presentation	13 Hrs.
	Other student study effort:	
	▪ Self study/assignments	39 Hrs.
	▪ Mini-project report preparation and presentation	39 Hrs.
	Total student study effort	117 Hrs.
Reading List and References	1. S.C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill, latest edition 2. S.C. Chapra and R.R. Canale, Numerical Methods for Engineers, McGraw-Hill, latest edition 3. S.S. Rao, applied Numerical Methods for Engineers and Scientists, Prentice-Hall, latest edition 4. Robert L. Norton, Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines, McGraw-Hill, latest edition	

Revised July 2015

Subject Description Form

Subject Code	ME49005
Subject Title	Capstone Project
Credit Value	6
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME31003 System Dynamics ISE386 Integrated Design for Manufacture ME33001 Mechanics of Materials ME34003 Thermofluid Mechanics
Objectives	To provide students an opportunity to utilize and integrate their knowledge of engineering, design and marketing in completing a real-life product design engineering project.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate a design problem addressing certain market needs and to develop design specifications with due consideration of industrial design. b. Generate alternative design concepts, and then evaluate each of these concepts by considering the impacts of various important factors including human factors, materials used, manufacturing processes, quality and environmental issues, health and safety on product design and development. c. Apply arts, mathematics, information technology and engineering sciences via analytical, computational and experimental approaches to realize a selected design concept. d. Work effectively and make contributions independently in a multi-disciplinary design project team, and apply project management technique to ensure successful competition of the design project.) e. Understand the importance of life-long learning and perform literature search to upkeep with the state-of-the-art product design technology. f. Present a design project via oral presentation and written report.
Subject Synopsis/ Indicative Syllabus	***In-depth Study of Substantial Design Tasks*** **-** Marketing survey; Alternative conceptual design; Engineering design and analysis; Product safety and reliability; Product testing techniques; Prototyping and development technologies. ***Areas of Design Project*** **-** Toys; Home appliances; Electronic and electrical appliances; Bio-medical equipment; Plastic and metallic products; Green products; Health products; Computer-aided technology for product development; Products for specialists. ***Knowledge and Skills Required for Performing Design Project*** **-** Problem identification; Literature review; Methodology for data analysis; Engineering design and analysis; Design concept generation; Safety and risk analysis; Prototyping technology; Project management; Report writing and presentation skill.

Teaching/Learning Methodology

1. Guidance will be given to students during the whole design project. (Outcomes a to d)
2. Regular group discussions with the supervisor (and the industrial supervisor for an industrial-based project) to ensure the correct direction and focus of the project. (Outcomes a to e)
3. The interim report aims at ensuring the proper progress of the project.
4. The final report aims at examining the completeness, quality, workability, practicability and engineering content of the product being designed and developed.
5. Prototype and/or computer-aided simulation will be conducted to show the functionality and safety of the product being designed and developed. (Outcomes a to f)
6. Oral examination will be conducted to examine the presentation skill, ability to provide prompt response to a question and understanding of the whole design project.

Teaching/Learning Methodology	Outcomes					
	a	b	c	d	e	f
Tutorial	√	√	√	√		
Group Discussion	√	√	√	√	√	
Project	√	√	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	f
1. Continuous monitoring	15%	√	√	√	√	√	
2. Interim report	10%	√	√	√			√
3. Final report	50%	√	√	√	√	√	√
4. Oral presentation	25%	√	√	√	√	√	√
Total	100%						

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

Overall Assessment:
1.0 x Continuous Assessment.

1. Performance of each student should be assessed individually together with the team's overall performance by the supervisor, an independent assessor, the peers and an examination panel consisting of at least four academic staff (both FT and PT programmes usually use the same panel). The following criteria should normally be used for performance assessment:
    i. Innovative approaches in generating alternative design concepts to meet market need;
    ii. Functionality, workability, practicability and engineering content of the final design;
    iii. General attitude, initiative and effectiveness in making progress;
    iv. Engineering design and analysis, and work accomplishment;
    v. Quality of the interim and the final report;
    vi. Performance during the oral examination.
2. The continuous monitoring of a project group as a whole and that of each group member on an individual basis are conducted by the supervisor. The interim report is assessed by the independent assessor. The final report is assessed by both the supervisor and the independent assessor. As part of the assessment process, each group member is required to specify his/her own contribution in completing the project when compared to his/her team mates (peer assessment). In case of an industrial-based project, comments will be invited from the industrial supervisor but he/she will not be required to perform the formal assessment.
3. The supervisor monitors and assesses the overall and individual progresses through regular meetings. The interim report should be submitted to the independent assessor around week 8 of the first semester. The final report submitted before the end-of-year examination is assessed by both the supervisor and the independent assessor. Deal consideration of each student's individual contribution and performance will be taken into account.
4. During the oral examination, every group member is required to present the project especially on his/her significant contribution to the whole project, and respond to the questions addressed to him/her by the examination panel. Marks for oral examination are awarded to individual student by taking into account the group's overall performance.
5. The assessment system is summarized as shown in the following table:

Assessor	**Assessment Component (% of the total)**				
	Continuous Monitoring (15)	**Interim Report (10)**	**Final Report (25)**	**Final Report (25)**	**Oral Examination (25)**
Supervisor	√		√		
Independent Assessor		√		√	
Examination Panel					√

Student Study Effort Expected	Class contact:	
	▪ Guided study	26 Hrs.
	Other student study effort:	
	▪ Conducting project	154 Hrs.
	▪ Literature search and private study	72 Hrs.
	Total student study effort	252 Hrs.
	Students will be guided to search relevant references by the supervisor.	
Reading List and References	To be advised by supervisor.	

Revised July 2014

Subject Description Form

Subject Code	SD3401
Subject Title	Designing for Humanities
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	There are three sections in the subject: Human Factors in Design, Designing for Disabilities, and the introduction of "Universal Design". 1. To introduce to students the fundamentals of human requirements that are essential to the success of user-related design. Well-designed visuals, products, systems and environments involve the appreciation and thorough consideration of the human aspects of design. Such aspects include the physiological, psychological and sociological factors. 2. Students will devise more appropriate solutions to design problems in the acknowledgement of the people they design for. 3. This subject intensifies at a later stage. It guides students to the appreciation of higher levels and more complex human requirements that relate to the success of user-interface design. 4. The subject addresses particularly the interface issues, which will contribute to future design studies (projects). The issue of designing for special group of users such as the disabled and the ageing populations will be investigated. The "Universal Design" principles will be discussed.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate a design problem addressing to certain market needs and by fully considering impacts of human factors, product safety and environmental issues. b. Fully consider the physiological, psychological, cultural and sociological factors in generating and evaluating alternative design concepts in product design. c. Present a design project via oral presentation and/or written report.
Subject Synopsis/ Indicative Syllabus	*Human Factors in Design* - 1. Understanding people's activities at work, rest & in play. The basic principles of human factors are introduced. The significance and relevance of the subject to design tasks are explained. 2. The appreciation and application of data in the physiological, psychological cultural and sociological aspects of people are presented. This section will start with anthropometry (body measurements). 3. The evaluation of designs for people use: This includes people's abilities and limitations in relation to the tasks & environments, and thereby the designs. Methods of approaching human aspects for design projects are discussed.

	Students are expected to be able to identify user-interface issues, plan and carry out related tests and experiments needed to support design works, and to evaluate the design results. 4. The goal is to enhance *effectiveness, efficiency, comfort and safety* by improving the user/design interface. *User-related Design and Designing for Disabilities -* 1. User in normal conditions and environments. 2. User in extreme conditions and environments. 3. Designing for the elderly and the disability. 4. User testing methods: Heuristic evaluation (quick and inexpensive method made in early phases of design to evaluate the most significant usability problems); Pluralistic usability (evaluation performed by user interface specialists, designers and real users). 5. Usability test: A design evaluation in the usability that can be performed during the development of a product or system to reveal problems. This may result in re-design or modification, or for product/system comparison (compared against competitor's design). 6. Universal Design Principles.
Teaching/Learning Methodology	The teaching and learning approaches as stated in Section E are justified as below: 1. The teaching and learning methods include lectures, tutorials, case studies, seminars, and assignment (design exercise). 2. The lectures are aimed at providing students with an integrated knowledge required for understanding and analyzing Human Factors and related issues in Design. 3. The design exercise is aimed at allowing hands-on experience in team-work to appreciate the lectures. The students are required to participate in the mini-project through literature survey, information search, discussions, report writing and presentation of results. Innovative thinking is encouraged. 4. The tutorials are aimed at helping students to go through the exercise smoothly, and to guide the students to solve real-world problems using the knowledge they acquired in the class. 5. Case studies are there to reinforce the lectures and to encourage discussions.
Assessment Methods in Alignment with Intended Learning Outcomes	

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	
Design exercise assignment, presentation	90	v	v				
Motivation (participation in team, attendance)	10			v			
Total	100 %						

	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: *The assessment methods are justified as below:* 1. The Design Exercise assessment is in an "open-book" format to encourage continuous effort throughout the whole period of assignment. 2. The presentation allows student to learn about and experiencing in presenting one's view, opinion and argument in open critique, by thorough preparation. 3. The grade for motivation encourages students to work postively, energetically, in private and in group. It can be checked also by class-attendance. Minimum condition to consider a grade, would require the student to satisfactorily complete and submit the assignment, and present it as indicated. A pass grade or above will depend on how well the student has achieved in the learning outcomes. In addition, the following points should be taken into consideration: 1. A minimum grade "D" should be obtained in assignment. 2. Assignment may require both "group effort" and "individual effort". 3. Copy right must be strictly respected. If a copy is detected, a zero score will be assigned regardless of whom/which group did the assignment. 4. Attendance of class is very important. If a student anticipates being absent from class for any reason, please notify the course instructor ahead of time. In the event of absence, it is the student's responsibility to catch up on any work missed.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	6 Hrs.
	▪ Tutorial, Seminar	16 Hrs.
	▪ Case Studies and Design Exercise	17 Hrs
	Other student study effort:	
	▪ Research, preparation of design exercise and presentation	41 Hrs.
	Total student study effort	80 Hrs.
Reading List and References	1. Barbacetto, G. *Design interface: How man and machine communicate.* Arcadia Edizioni, 1992. 2. Chan, L. H.. *Successful aging: from the perspective of Hong Kong elderly: a qualitative approach.* Hong Kong: School of Nursing, The Hong Kong Polytechnic University. 2003. 3. Cox, K., Walker, D. User interface design. New York: Prentice Hall, 1993. 4. Dul, J. et al. *Ergonomics for beginners - A quick reference guide.* London: Taylor & Francis,.1993 5. Fernandes, T. Global Interface Design: A guide to Designing International User Interfaces. Boston: AP Professional, 1995. 6. Gary, D. et al. *Designing and using assistive technology: The human perspective.* London: Paul H. Brookes, 1998. 7. Grandjean, E. Fitting the task to the man. London: Taylor & Francis, 1998. 8. Kroemer, K. Ergonomics: How to design for ease and efficiency. Englewood Cliffs, N.J.: Prentice Hall, 1994. 9. Kroemer, K. Fitting the task to the human: A textbook of occupational ergonomics. London: Taylor & Francis, 1997.	

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19. *Trans-generational design: Products for an aging population.* New York: Van Nostrand Reinhold, 1994.

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http://www.baddesigns.com/ *(Examples of bad Human Factors in design)*
http://gemma.apple.com/ngs/lpp/adrpub/docs/dev/techsupport/insidemac/HIGuidelines/HIGuidelines-251.html *(Human Factors Society)*
http://www.usernomics.com/hf.html *(Human factors & ergonomics)*
http://www.iat.unc.edu/guides/irg-05.html *(User interface design: Bibliography)*

Subject Description Form

Subject Code	SD348
Subject Title	Introduction to Industrial Design
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject gives an introduction to the field of industrial design as a creative discipline, a discipline which synthesises knowledge from fields as diverse as arts, 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. The subject aims to equip students with 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 identification, solving and innovation, and to realise the importance of a user centred approach to the creation of new products and services. The subject is project-oriented that the students are expected to learn through a design project. The subject does not include any engineering skill, such as software application. The students are expected to apply the technological and engineering knowledge, skills and experience obtained from other subjects to tackle the project.
Intended Learning Outcomes	Upon completion of the subject, students will be able to basic knowledge to: a. Appreciate the industrial/product design profession, relate to its practitioners in different work situations. b. Employ the design process appropriately for problem solving and innovation. c. Realise the importance of a user centered approach to the creation of new products and services. d. Apply visualisation skill in project presentation. e. Understand objectives of industrial/product design, and apply knowledge and experience in other related subjects and future career.
Subject Synopsis/ Indicative Syllabus	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

Teaching/Learning Methodology

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

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	
1. Design project: Understanding design process	10	✓	✓	✓	✓	✓	
2. Design project: investigation and application in design	30		✓	✓		✓	
3. Design project: development of design ideas	45	✓	✓	✓	✓	✓	
4. Design project: presentation of design ideas	15				✓	✓	
Total	100 %						

Project and continuous assessment approaches are adopted in the subject.

Student Study Effort Required

Class contact:	
▪ Lectures and seminars	26 Hrs.

	▪ Tutorials and exercises	13 Hrs.
	Other student study effort:	
	▪ Research and design	31 Hrs.
	▪ Preparation of presentation	10 Hrs.
	Total student study effort	80 Hrs.
Reading List and References	1. *Design Issues. The MIT Press. (Journal)* 2. *Design Management Journal. The Design Management Institute. (Journal)* 3. *Design Studies. Elsevier Science. (Journal)* 4. *International Journal of Design (Journal)* 5. *The Design Journal (Journal)* 6. *Fung, A., Lo, A., & Rao, M. N. (2005). Creative tools. Hong Kong: School of Design, The Hong Kong Polytechnic University.* 7. *Graedel, T. E. (2003). Industrial ecology (2nd ed.). Upper Saddle River, NJ: Prentice Hall.* 8. *Jordan, P. W. (1997). Putting the pleasure into products. IEE Review, Nov. 1997, 249-252.* 9. *Leung, T. P. (Ed.) (2004). Hong Kong: Better by design. Hong Kong: The Hong Kong Polytechnic University.* 10. *Mackenzie, D. (1997). Green design: Design for the environment (2nd ed.). London: Laurence King.* 11. *Norman, D. A. (1998). 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.* 12. *Norman, D. A. (1998). The design of everyday things. London: The MIT Press.* 13. *Roqueta, H. (2002). Product design. London: Te Neues.* 14. *Rowe, P. G. (1987). Design thinking. Cambridge, Mass.: The MIT Press.* 15. *Siu, K. W. M. (Ed.) (2009). New era of product design: Theory and practice (Chinese ed.) Beijing: Beijing Institute of Technology Press. 邵健偉 編著（2009）：《產品設計新紀元：理論與實踐》。北京：北京理工大學出版社。* 16. *Stanton, N. (Ed.) (1998). Human factors in consumer products. London: Taylor & Francis.* 17. *Ulrich, K. T. (2004). Product design and development (3rd ed.). New York, NY: McGraw-Hill/Irwin.* 18. *Wang, S. Z. (1995). A history of modern design 1864-1996. Guangzhou: Xin Shi Ji Chu Ban She.* 19. *Whiteley, N. (1993). Design for society. London: Reaktion Books.*	

Subject Description Form

Subject Code	ME42001
Subject Title	Artificial Intelligence in Products
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME31002 Linear Systems and Control ; or ME41004 Mechatronics and Control
Objectives	To provide students with basic knowledge on expert and fuzzy inference systems for product design and development.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Apply knowledge of mathematics, expert systems and fuzzy inference systems to analyze a product design via analytical and computational approaches. b. Understand the applications of AI in high-tech product design and development. c. Work effectively as a member to tackle a multi-disciplinary design project involving the application of AI. d. Appreciate the state-of-the-art applications of AI in product design and present a design project via written report.
Subject Synopsis/ Indicative Syllabus	***Expert Systems for Products*** **-** Principles of expert systems; Knowledge representations; Knowledge acquisition; Inference mechanisms; Learning and heuristics; Application of expert systems to product design and product data management; Understanding expert system shells, such as Prolog or Lisp; Building expert systems using Prolog or available software packages. [Case study 1: Apply expert system in product design] ***Fuzzy Inference Systems in Product Design and Development*** **-** Fuzzy sets and crisp sets; Membership functions; Properties of fuzzy sets; Operations on fuzzy sets; Operations on fuzzy relations; Fuzzy if-then statements; Inference rules; Developing fuzzy inference systems using Matlab or available software packages. [Case study 2: Apply fuzzy inference Systems in product design]

Teaching/Learning Methodology

1. The lectures are aimed at providing fundamental knowledge on product expert system and fuzzy inference systems for product design and development. (Outcomes a and b)
2. The tutorials are aimed at enhancing applicable skills of the students. Examples on the expert systems and fuzzy inference systems in commercial products will be involved. (Outcomes a and b)
3. The project is aimed at integrating the knowledge that will be applied through a team project on product design and development with expert systems and fuzzy inference systems. (Outcomes a - d)

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√		
Tutorial	√	√		
Project	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Class Test	25%	√	√		
2. Homework	10%	√	√		
3. Group Project	15%	√	√	√	√
4. Examination	50%	√	√		
Total	100%				

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

Overall Assessment:

0.50 x End of Subject Examination + 0.50 x Continuous Assessment.

The weighting of 50% on continuous assessment is meant to allow students to consolidate their learning through continuous effort such as assignments and project work. The group project will be assigned to students at early stage of the subject study which enables students to link the knowledge they learnt with the project step by step. Report and the presentation will be major outcomes of the project work that will show how the students are able to design expert systems and fuzzy inference systems for products. The examination is used to assess the knowledge acquired by the students for understanding expert systems and fuzzy inference systems of the products.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Laboratory / project / tutorial	6 Hrs.
	Other student study effort:	
	▪ Reading and review	20 Hrs.
	▪ Homework assignment	28 Hrs.
	▪ Project / Laboratory report	18 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	1. Luger, G.F., and Stubblefield, W.A., Artificial Intelligence and the Design of Expert Systems, The Benjamin/Cummings Publishing Co., latest edition. 2. Clocksin, W. F., Programming in Prolog, Berlin; New York: Springer-Verlag, latest edition. 3. Boca Raton, FL, A first course in fuzzy and neural control**,** Chapman & Hall/CRC Press, latest edition. 4. Ross, Timothy J., Fuzzy logic with engineering applications, Chichester; Hoboken, NJ: Wiley, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME42004
Subject Title	Development of Green Products
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: CEE370 Environmental Science I; or ME22002 Integrated Product Development Fundamentals; or ME32001 Manufacturing Fundamentals; or ME32003 Design and Manufacturing; or ISE386 Integrated Design for Manufacture
Objectives	To enhance students' awareness of environmental issues and provide them with necessary knowledge in green product development.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Appreciate the environmental impact of product manufacturing, distribution, use and disposal. b. Critically evaluate the environmental impacts of products during their life cycle and suggest appropriate actions to minimize/mitigate the impacts. c. Apply green design concepts in designing/re-designing products to fulfill the needs of green product market. d. Evaluate existing products/processes/technologies in terms of their environmental performance, and present the findings via oral presentation and written report.
Subject Synopsis/ Indicative Syllabus	***Environmental Issues of Concern*** - Depletion and degradation of natural resources, environmental pollution and history of responses to pollution, waste and waste disposal issues, global warming, ozone layer depletion, acid rains, desertification, climate change, consumerism and its effect on global environment , individual and social preference for green living. ***Environmental Impact of Products*** - Life-cycle of a product, environmental impact of products over its life-cycle, environmental impact of packaging, strategies for minimizing environmental impact, drivers for green product design ***Green and Sustainable Product Development Process*** - Concept of green and sustainable product development: product design, planning and innovation for environment, concept of eco-design, eco-labelling and energy-labelling, international environmental management standards. ***Material Selection and Procurement for Green Product Development –*** Material selection for green design: Material selection process steps for green design, material selection methods, and material assessments. Green Procurement: Benefits of green procurement, green procurement process steps, evaluation of suppliers, green procurement programmes.

	Environmental Assessment of Green Products **-** Criteria on the global warming, stratospheric ozone depletion, photochemical ozone formation, acidification, nutrient enrichment, ecotoxicity, human toxicity, resource consumption and working environment. Normalisation and weighting in the environmental assessment of products, life-cycle impact assessment (LCA) of products. ***The Green Future*** **-** Green consumerism, opportunities from green technologies, green taxes and their effect on product development and marketing.
Teaching/Learning Methodology	1. The lectures are aimed at providing students with an integrated knowledge required for understanding the need for a green design approach, developing green products, assessing environmental impact of products and highlighting the opportunities arising from green consumerism. They provide a necessary framework for subsequent self-learning and group-learning activities. (Outcomes a to c) 2. The tutorials are aimed at enhancing the students' skills necessary for analyzing the environmental impact of existing products and packaging solutions using various tools and develop solution strategies to minimize impact. Therefore, students will be able to solve real-world problems using the knowledge they acquired in the class. (Outcomes a to c) 3. The mini-project is aimed at enhancing the written and oral communication skills and teamwork spirit of the students. The students are expected to utilize the knowledge acquired in class to analyze the environmental impact of a selected existing product and systematically redesign it to enhance its green attributes in order to strategically place the product in rapidly developing green market. (Outcomes c and d) 4. The assignments and case studies are aimed at providing students with learning opportunities to study the practical implementations of green product and process assessments and developments. (Outcomes a, b and d)

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture/Tutorial	√	√	√	
Mini-project report & presentation			√	√
Homework assignments/Case studies	√	√		√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignments/ Case studies	10%	√	√		√
2. Test	20%	√	√	√	
3. Mini-project report & presentation	20%			√	√
4. Examination	50%	√	√	√	
Total	100%				

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

Overall Assessment:

$0.50 \times$ End of Subject Examination + $0.50 \times$ Continuous Assessment.

1. The continuous assessment will comprise three components: homework assignments & case studies (10%), test (20%) and mini-project report & presentation (20%). The homework assignments and test are aimed at evaluating the progress of students study and assisting them in fulfilling the respective subject learning outcomes. The mini-project and case studies are to assess students learning outcomes while providing them with opportunities to apply their learnt knowledge, enhance written & oral communication skills and team-work spirit.

2. The examination (50%) will be used to assess the knowledge acquired by students independently in understanding and analysing related problems critically and to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Tutorial/Mini-project discussion & presentation	6 Hrs.
Other student study effort:	
▪ Self study/coursework	43 Hrs.
▪ Mini-project report preparation and presentation	24 Hrs.
Total student study effort	106 Hrs.

Reading List and References

1. Azapagic A., Perdan S., Clift R. and Surrey G., Sustainable Development in Practice, John Wiley & Sons, Ltd., latest edition.
2. Burall P., Product Development and the Environment, The Design Council, latest edition.
3. Fuad-Luke A., EcoDesign: The Sourcebook, Chronicle Books, latest edition.
4. Ottman J.A. Green Marketing, NTC Business Books, latest edition.
5. William McDonough & Michael Braungart, Cradle to Cradle: Remaking the Way We Make Things, latest edition.
6. Ulrich, K.T. and Eppinger, S.D., Product Design and Development, McGraw-Hill, latest edition.

Revised July 2016

Subject Description Form

Subject Code	ME43003
Subject Title	Product Testing Technology
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME33001Mechanics of Materials
Objectives	To equip students with basic knowledge and universal standards of common product testing and examination technologies.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Apply knowledge of mathematics, engineering sciences and computing simulation to analyze and test a product design via analytical, experimental and computational approaches. b. Understand and explain the effects of various important factors including materials, manufacturing processes, environmental and health issues, reliability and safety issues on product design and development. c. Work effectively as a member and apply project management technique in the capacity of a team leader to complete a multi-disciplinary product testing project. d. Appreciate the state-of-the-art product testing technologies and present a design project via written report. e. Recognize the need to develop the ability of life-long learning.
Subject Synopsis/ Indicative Syllabus	***Purpose and Classification of Product Testing and Examination*** **-** Damage and degradation of products, environmental attack, crack initiation, aging, fault in manufacturing process; classification of testing and examination methods. ***Destructive Testing*** **-** Tensile and shear strength tests; Drop tests for home appliances and toys; Impact and fracture toughness tests for plastics and metallic materials; Scratch and wear tests of surface coatings; Harness test; Creep and durability tests for static and dynamic products. ***Non-destructive Testing (NDT)*** **-** Damage detection in products; embedded sensor technology; Wireless sensing technique; Ultrasonic spectroscopy and detection technique; Vibration and acoustic emission technique; Acousto-ultrasonic reproducibility; C-scan of composite products; Thermal wave imaging and full-field NDE; Microwave evaluation; Eddy current and Magnetic flux techniques. ***Product Examination Techniques*** **-** Surface morphology examination using optical technique, scanning electron microscopy (SEM) and atomic force microscopy (AFM); Chemical analysis using EDX and XRF; Structure examination using XRD. ***Standards and Data Handling*** **-** Design for inspection; Testing codes and standards; Data collection and analysis techniques. ***Virtual Testing*** **-** Product drop test simulations using CAE technique.

Teaching/Learning Methodology

1. The lectures are aimed at providing students with an integrated knowledge required for understanding and analyzing product testing technology and methodology. (Outcomes a and b).
2. The tutorials are aimed at enhancing the analytical skills of the students. Examples on the analysis of testing methods and testing results will be involved. So the students will be able to solve real-world problems using the knowledge they acquired in the class. (Outcomes a, b and e).
3. The experiments will provide the students with hands-on experience on the instrumentation and measurement. It also trains students in the analysis and presentation of experimental data. (Outcomes a and b).
4. The mini-project is aimed at enhancing the written and oral communication skills and team-work spirit of the students. The students are expected to apply the knowledge learnt in product testing technologies. The students are required to participate in the mini-project through literature survey, information search, discussions, report writing and presentation of results. Innovative thinking is encouraged. (Outcomes a, b, c, d and e).

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lecture	√	√			
Tutorial	√	√			√
Experiment	√	√			
Mini-project	√	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Test	20%	√	√			
2. Assignment	10%	√	√			√
3. Project	20%	√	√	√	√	√
4. Examination	50%	√	√			
Total	100%					

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

Overall Assessment:
0.50 x End of Subject Examination + 0.50 x Continuous Assessment.

	1. The continuous assessment will comprise of four components: one test (20%), assignments (10%), project reports (10%) and oral presentation (10%). The test is aimed at assessing the interim knowledge gained by the student. The assignments are aimed at assisting the students in preparation for the tests and checking the progress of their study. The project report is aimed at assessing the capability of the student in analyzing and reporting experimental data, self-learning and problem-solving skills, and English writing capability. The oral presentation is aimed at assessing the student's communication and presentation skills. 2. The examination will be used to assess the knowledge acquired by the students for understanding and analyzing the product problems related to property testing and defect/motion detecting technologies.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	30 Hrs.
	▪ Laboratory / Tutorial	9 Hrs.
	Other student study effort:	
	▪ Reviewing and Reading	26 Hrs.
	▪ Assignment / Laboratory Report	40 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	1. Mechanical Testing, ASM International, ASM Handbook Volume 8, latest edition. 2. Sampling and analysis, Upper Saddle River, N.J.: Prentice Hall, latest edition. 3. Nondestructive testing of materials, Amsterdam; Washington, D.C.: IOS Press; Tokyo: Ohmsa, latest edition. 4. Practical non-destructive testing, Raj Baldev, New Delhi: Narosa Pub. House; Materials Park, Ohio: Distribution in North America only by ASM International, latest edition. 5. Encyclopedia of Materials Characterization, TA418.7.B73, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME44001
Subject Title	Air Conditioning for Indoor Thermal and Environmental Quality
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics or ME34003 Thermofluid Mechanics
Objectives	To provide students with the fundamental knowledge of air conditioning for indoor thermal and environmental quality.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Appreciate and understand the concepts and components of air conditioning and refrigeration systems and applications. b. Applied the general knowledge of indoor thermal comfort and environmental health. c. Applied the knowledge of moist air properties and conditioning processes. d. Apply the knowledge of heating and cooling load required for a building. e. Applied the knowledge of refrigeration systems and cycles.
Subject Synopsis/ Indicative Syllabus	***Introduction of Air Conditioning and Refrigeration Systems and Applications*** **-** Basic components of air conditioning and refrigeration systems. The complete air conditioning system. Central mechanical equipment. All-air systems, air-and-water systems, all-water systems. Unitary air conditioners. Heat pumps. Heat recovery systems. Thermal storage. ***Moist Air Properties and Conditioning Processes*** **-** Moist air and standard atmosphere. Fundamental parameters. Adiabatic saturation. Wet bulb temperature and the Psychrometric chart. Space air conditioning- design and off-design conditions. ***Space Heating and Cooling Loads*** **-** Outdoor and Indoor design conditions. Heat transmission in building structures. Infiltration. Heat losses from air ducts. Auxiliary heat sources. Supply air for space heating. Source media for space heating. Heat gain, cooling load and heat extraction rate. Solar radiation. Outside and interior surface heat balance. Zone air heat balance. Implementation of the heat balance method. ***Refrigeration*** **-** Refrigerants. Mechanical vapour-compression refrigeration cycles. Modifications to basic cycles. Reciprocating compressors. Cooling towers. ***Indoor Thermal Comfort*** **-** Physiological considerations. Thermal comfort indices and conditions. Hot and humid, and extreme cold environments. ***Indoor Environmental Health*** **-** Terminology and standards. Health sciences. The basic concerns of indoor air quality (IAQ). Prediction of indoor air quality model. Physical agents. Methods to control contaminants. Gas and particulate removal applications.

Teaching/Learning Methodology

1. The subject intends to equip students with fundamental knowledge of air conditioning for indoor thermal and environmental quality. Systematic lectures are required to achieve such foundation building coupled with assignments (outcomes a, b, c, d and e).
2. Tutorials are used to illustrate the application of fundamental knowledge to practical situations (outcomes a, b, c, d and e).

It is intended to make use of these teaching/learning methodologies to achieve the intended subject learning outcomes as indicated in the following table:

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lecture	√	√	√	√	√
Tutorial	√	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
1. Assignment	30%	√	√	√	√	√
2. Test	20%	√	√	√		
3. Examination	50%	√	√	√	√	√
Total	100%					

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

Overall Assessment:

$0.50 \times$ Examination + $0.50 \times$ Continuous Assessment

1. The continuous assessment will comprise two components: assignments (30%) and tests (20%). The assignments are aimed at evaluating the progress of students study, assisting them in fulfilling the respective subject learning outcomes, and enhancing the integration of their knowledge learnt. The mid-term test which covers the first half of the subject material provides useful feedback to both lecturer and students on the learnt topics.

2. The examination (50%) will be used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study effort:	
	▪ Coursework	33 Hrs.
	▪ Self-study/	33 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	1. ASHRAE Handbooks on HVAC Systems and Equipment, Fundamentals, Refrigeration, and HVAC Applications, latest edition. 2. F.C. McQuiston, J.D. Parker and J.D. Spitler, Heating, Ventilating and Air Conditioning- Analysis and Design, John Wiley & Sons, Inc., latest edition. 3. W.T. Grondzik W.T.; J.S. Reynolds ; B. Stein; A.G. Kwok Mechanical and Electrical Equipment for Buildings, John Wiley & Sons, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	SD4041
Subject Title	Design in Business for Engineering
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ **Exclusion**	SD348 Introduction to Industrial Design ME49003/ME49005 Capstone Project **OR** ISE445 PEM Capstone Project Nil
Objectives	Upon completion of the subject, students will be able to: To apply a model of strategies and processes to a Level 4 product development project undertaken concurrently to support the creation and development of a breakthrough product and services. The model includes the following: 1. Methods to obtain insights into emerging trends in consumer and industrial markets. 2. A means to navigate and control the 'fuzzy front end' of the product development process. 3. The use of qualitative research to understand who the customer is. 4. Techniques to assist in the integration of diverse team players. 5. A complete product development process from opportunity identification to patenting. 6. An approach that connects strategic planning and brand management to product development.
Intended Learning Outcomes	a. Formulate a design problem addressing certain market needs and to develop design specifications with due consideration of industrial design. b. Generate alternative design concepts, and then evaluate each of these concepts by considering the impacts of various important factors related to business. c. Apply arts, mathematics, information technology, material technology and manufacturing processes via analytical and computational approaches to realize a selected design concept. d. Understand the importance of life-long learning and perform literature search to upkeep with the state-of-the-art product design technology. e. Work effectively as a member or the leader in a multi-disciplinary design project team, and able to present a design project via oral presentation and written report.
Subject Synopsis/ Indicative Syllabus	The syllabus sets out the sequence for developing a breakthrough product/service and is delivered concurrently with the Capstone Project which has this objective. The process for new product development is as follows: *Stage 1 - Identifying the Opportunity*

	a) Interpret the interconnected factors of Social Change, Economic Trends, and Technological Innovation that lead to the Identification of Product Opportunity Gaps in the marketplace, for both products and services. b) Examine the concept of the Positioning Map, which shows how break-through products and services are differentiated from the competition by Style, Technology and Value. *Stage 2 - Understanding the Opportunity* Examine the complex combination of value attributes that connect breakthrough products/services to people's lifestyles. Turn insights into product concepts, list product characteristics and constraints. *Stage 3 - Conceptualizing the Opportunity* Turn value opportunities into useful, useable, and desirable product concepts. Identify the parts differentiation matrix. Produce visual prototype, functional prototype, clear market definition. *Stage 4 - Realizing the opportunity* Develop a clear marketing plan, taking account of the interests of stakeholders. Consider intellectual property protection. Consider materials and manufacturing process.
Teaching/Learning Methodology	This syllabus has evolved over three years of application as a core subject in the BA Hons Design. It is now a very successful component of this degree because the delivery of the syllabus is concurrent with an individual design project. This syllabus provides a powerful framework for new product development that is proposed by Professors Cagan and Vogel of Carnegie Mellon University. The framework described in their 2002 book *Creating Breakthrough Products: Innovation from Product Planning to Program Approval* (Prentice Hall) is the reference textbook for this syllabus. Professor Vogel is a visiting faculty in the School of Design which will enable us to maintain close links with the continuing refinement of this new product development framework. The pattern of lectures, seminars and tutorials shifts from a general approach of establishing an understanding of the framework for innovative product development which is established in the lectures, to a more specified application of the concepts which is progressed in seminars and tutorials. This approach to the syllabus enables a close integration between this syllabus and the Capstone Project. **Major Teaching/Learning Activities:** Weeks 1 – 7 Lectures and seminars in which the conceptual framework is explained to students, and they begin to apply it to the early stages of the capstone project Week 7 Hand in progress report Week 8 Self study Week 9 Review of progress reports Weeks 10-12 Tutorials on the production of final reports Week 12 Hand in final report

	Week 13 Review of final reports

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	
1.Progress report	30	V	V	V	V		
2. Final report	60	V	V	V	V	V	
3. Contribution to class activities	10					V	
Total	100 %						

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

The participation in the co-requisite Capstone Project is based on groups of 3 students. It is desirable that all 3 students should elect to undertake this subject. In this case the presentations, Progress Report and Final Report are produced by the same group of 3 students.

In the event of only one or two members of a Capstone Project group electing to undertake this subject, their input to the Project is expected to be enhanced and enable them to take a leading role in the development of the Project.

The *Progress Report* (30% of assessment) should demonstrate how the concepts learned in this syllabus inform the Capstone Project The concepts relating to the development of breakthrough products/services should strengthen the project proposal(s) of the Capstone Project by providing useful frameworks for developing new product ideas. The *Progress Report* should be about 2,000 words of explanation in addition to images, figures and other visual contributions. It is a draft of the Final Report that is to be handed in at the end of the semester.

The *Final Report* (60% of assessment) is to be handed in for grading in week 12. This report should provide a basis for the project report(s) of the Capstone Project. It will be a more developed version of the *Progress Report.* The structure of the report should reflect the choices made from the key concepts discussed in this syllabus, and should contain about 3,000 words of explanation in addition to images, figures and other visual contributions.

Contribution to class activities (10% assessment).

The assessed activities – the Progress and Final reports, are closely linked with progress in the Capstone Project. The Progress Report is both formative and summative. This approach supports deep engagement in the learning materials.

Student Study	Class contact:	

Effort Required	▪ Lecture	26 Hrs.
	▪ Seminar and tutorial	13 Hrs.
	Other student study effort:	
	▪ Research and self study	13 Hrs.
	▪ Preparation of report	28 Hrs.
	Total student study effort	80 Hrs.
Reading List and References	1. Cagan J. & C.M. Vogel, 2002, Creating Breakthrough Products: Innovation from Product Planning to Program Approval. Prentice Hall. 2. Bruce, M. & J. Bessant, (eds.) 2002, Design in Business: Strategic Innovation Through Design. Pearson Education. 3. Gilmore, F. & S. Dumont, 2003, Brand Warriors China: Creating Sustainable Capital. Profile Books. 4. Bruce, M & W.G. Biemans, 1995, Product Development: Meeting the Challenge of the Design-Marketing Interface. John Wiley. 5. Design Management Journal, Design Management Institute. Various editions.	

Subject Description Form

Subject Code	SD4414
Subject Title	Design of Home and Personal Electronic Products
Credit Value	3
Level	4
Pre-requisite/ **Co-requisite/ Exclusion**	SD348 Introduction to Industrial Design Nil Nil
Objectives	We are surrounded by electronic products. They do not only affect some of our events or at particular occasions. Instead, they are almost completely related to our daily lives. The objective of this subject is for each student to have understanding and project experience in designing home and personal electronic products. The areas of the subject cover home audio and visual products, home appliances, personal electronic entertainment and leisure products, etc. Students are required to conduct an investigation on lifestyle, especially related to Asian lifestyle. Students will research and analyse successful brands in the personal electronics industry. By applying their research findings together with their knowledge and experience, students are required to design an electronic product.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate a design project of electronic products addressing certain market needs and to develop design specifications with due consideration of industrial design. b. Generate alternative design concepts, and then evaluate each of these concepts by considering the impacts of various important factors including functionality, performance, costs, time to market and reliability. c. Apply arts, mathematics, information technology, material technology and manufacturing processes via analytical and computational approaches to realize a selected design concept. d. Understand the importance of life-long learning and perform literature search to upkeep with the state-of-the-art electronic product design. e. Work effectively as a member or the leader in a multi-disciplinary design project team, and able to present a design project via oral presentation and written report.
Subject Synopsis/ Indicative Syllabus	Applied research on lifestyle (especially on Asian lifestyle). Different types of home and personal electronic products. Case study of electronic products (e.g., development of "Walkman"; "tamagoch", etc). Design Factors: e.g., functionality, performance, user interface, form-factor, battery life, cost, time to market (TTM), reliability.

Physiological, social, cultural and ideological factors.

Application of technological and engineering knowledge and experience in design.

Successful brands in the personal electronics industry.

Product evaluation: user testing.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures, tutorials and design projects related to home and personal electronic (digital) products.
2. The lectures are aimed at providing design theories related to lifestyle (especially Asian lifestyle) and electronic products for the students.
3. Tutorials are used to support the students' design projects.
4. Students are required to tackle a design project. If necessary, they are required to realize their projects (may be in model and prototype forms) in computer labs and design workshops.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	
1. design and realization of design project	80	v	v	v	v	v	
2. presentation	20	v	v	v	v	v	
Total	100 %						

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

1. The assessment will comprise of 80% project (design and realisation) and 20% presentation.
2. Each student is required to get satisfactory performance in project and presentation.
3. Continuous assessment will be applied to access each student's performance of project.
4. There will be two critical presentation in the subject: Interim and final project presentations.

Student Study Effort Required

Class contact:	
▪ Lecture and tutorial	20 Hrs.
▪ Design project	19 Hrs.
Other student study effort:	

	▪ Design project and preparation of presentation	41 Hrs.
	Total student study effort	80 Hrs.
Reading List and References	**Books:** 1. Haskell, B. (2004). Portable electronics product design and development:For cellular phones, PDAs, digital cameras, personal electronics, and more. New York, NY: McGraw Hill. 2. Jordan, P. W. (1997). Putting the pleasure into products. IEE Review, Nov. 1997, 249-252. 3. Norman, D. A. (1998). The design of everyday things. London: The MIT Press. 4. Payne, B. (1997). Electronic products: Design, system, control. London: Collins Educational. 5. Roqueta, H. (2002). Product design. London: Te Neues. 6. Sanders, M. S. (1993). Human factors in engineering and design. New York, NY: McGraw-Hill. 7. Siu, K. W. M. (Ed.) (2009). New Era of Product Design: Theory and Practice. Beijing: Beijing Institute of Technology Press. 8. Stanton, N. (Ed.) (1998). Human factors in consumer products. London: Taylor & Francis. 9. Ulrich, K. T. (2004). Product design and development (3rd ed.). New York, NY: McGraw-Hill/Irwin. 10. Ward, A. E. (1996). Electronic product design. London: Chapman & Hall. 11. Whiteley, N. (1993). Design for society. London: Reaktion Books. **Journals:** 1. Design Issues. The MIT Press. 2. Design Studies. Elsevier Science. 3. The Design Journal. Bloomsbury.. 4. The Journal of Sustainable Product Design. Kluwer. 5. Human Factors. Extenza. 6. Journal of Engineering Design. Taylor & Francis.	

SUBJECT DESCRIPTION FORM

Subject Title: Mathematics **Subject Code:** ME2001

Number of Credits: N/A **Hours Assigned:** Lecture/Tutorial 42 hours

Pre-requisite: Nil
Co-requisite: Nil
Exclusion: Nil

Objectives:

1. To provide students the mathematical knowledge and skills required for the science and technology subjects.
2. To enable the students to apply mathematical techniques for solving the basic problems in product development.

Syllabus:

Complex Number: Basic concept. Algebra. Roots

Linear Algebra: Matrices and determinants. Elementary algebra of matrices.

Calculus:- Limits. Derivative. Techniques of differentiation. Maxima and minima. Definite and indefinite integrals. Techniques of integration.

Series: Arithmetic and geometric series. Infinite series. Power series. Fourier series.

Ordinary Differential Equations (ODE): First and second order linear ordinary differential equations. Laplace transforms.

Partial Differential Equations – Introduction to partial differential equations and their formulation.

Method of Assessment:

Overall Assessment: 1 ×Continuous Assessment

Reference books:

1. G.B. Thomas, R.L. Finney, J.R. Hass & F.R. Giordano, Thomas' Calculus, Addison Wesley, latest edition.
2. G. James, Modern Engineering Mathematics, Pearson Education, latest edition.
3. R. Haberman, Applied Partial Differential Equations, Prentice Hall, latest edition.
4. A. Biran & Breiner, Matlab 6 for Engineers, Prentice Hall, latest edition.

March 2012

Subject Description Form

Subject Code	ME23001
Subject Title	Engineering Mechanics
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students the fundamental concepts of mechanics of motion and system equilibrium.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Apply the fundamental knowledge of mechanics to solve for forces and moments on simple systems. b. Distinguish the basic differences between diverse engineering systems, and select the suitable design in achieving the engineering purposes. c. Employ state-of-art technology in solving mechanics problems encounter in assignments and projects. d. Collaborate with peers from different disciplines in experiments and projects and present effectively the results of experiment or project.
Subject Synopsis/ Indicative Syllabus	***Fundamentals of Mechanics*** **-** Basic concepts of mechanics. Scalar and Vectors: Vector algebra and vector components. Position, unit and force vectors. Two and three-dimensional force systems. Moment of a force about a point. Moment of a force about a line. ***Dynamics*** **-** Kinematics and kinetics of particles, rectilinear motion, plane curvilinear motion, relative motion, equation of motion. ***Statics*** **-** Equilibrium of a particle and the associated free-body diagrams. Equilibrium of a rigid body and the associated free body diagram. Two and three force members equilibrium in three dimensions. Simple trusses: The method of joints; the method of sections; zero-force members; the method of sections. Internal forces developed in structural members. Shear and moment equations and diagrams. Relations between distributed load, shear and moment. Theory of dry friction. Systems with friction. Wedges. Belt friction. Rolling resistance. ***Equivalent Systems*** **-** Determination of the resultant concurrent forces. Equivalent force/couple systems. Centre of gravity and centroid: by composite parts; by integration. Resultant of a general distributed force system. Moment of inertia of areas. Parallel-axis theorem for an area. Radius of gyration of an area. Calculation of moments of areas: by composite areas; by integration. Product of inertia for an area. Principles of virtual work.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to the topics as described in the section subject synopsis (Outcomes a, b and c).

Tutorials are used to illustrate the application of fundamental knowledge to practical situations (Outcomes a, b and c).

Experiments are used to relate the concepts to practical applications and students are exposed to hand-on experience, proper use of equipment and application of analytical skills on interpreting experimental results (Outcomes c and d).

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√	√	
Tutorial	√	√	√	
Experiment			√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Assignment	20%	√	√	√	√
2. Test	20%	√	√	√	
3. Examination	60%	√	√	√	
Total	100%				

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

Overall Assessment:

$0.60 \times$ End of Subject Examination + $0.40 \times$ Continuous Assessment

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the tests, assignments and laboratory reports which provide timely feedbacks to both lecturers and students on various topics of the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Tutorial/Laboratory	6 Hrs.
Other student study effort:	
▪ Course work	23 Hrs.
▪ Self-study	43 Hrs.
Total student study effort	105 Hrs.

Reading List and References	1. R.C. Hibbeler, Engineering Mechanics – Statics, Prentice Hall, latest edition. 2. A. Pytel, J. Kiusalaas, Engineering Mechanics – Statics, Stamford, CT : Cengage Learning, latest edition.

Revised November 2015