THE HONG KONG POLYTECHNIC UNIVERSITY

Department of Mechanical Engineering

Full-time

BEng (Hons) in Product Analysis and Engineering Design

[4-year undergraduate degree structure, Programme Code: 43498]

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.

Part A: Programme Scheme

Part 1: General Information

1.1 Programme Title and Programme Code

BEng (Hons) in Product Analysis and Engineering Design [Programme Code: 43498]

1.2 Host Department

Department of Mechanical Engineering

1.3 Award Title

BEng (Hons) in Product Analysis and Engineering Design

1.4 Mode of Attendance

Full-time

1.5 Normal and Maximum Periods of Registration

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

1.6 Entrance Requirements

In addition to the general requirements for admission to the honours degree programmes of the University, a candidate has to satisfy one of the following requirements (a), (b), (c), (d), (e) or (f):

(a) For entry with HKDSE Qualification

General Entrance Requirements
4 core subjects and 1 elective subject with a minimum of:
Level 3: English Language and Chinese Language
Level 2: Mathematics, Liberal Studies and one elective subject

Preferred Subjects
Preferred elective subject(s): Physics, Biology, Chemistry, Combined Science or Information & Communication Technology
Other preferred subject(s): Preferably with any of the extended modules in Mathematics

Flexibilities
1. Alternative Chinese will be accepted as meeting the Chinese Language requirement for those students who fulfill the requirement for taking Alternative Chinese as announced by EDB.
2. Other language subjects will be accepted as elective subjects. The minimum requirement is Grade E.
3. While relevant Applied Learning (ApL) subjects will be accepted as meeting the

elective subject requirement, attainment at distinction level in those subjects will be required.

4. Students not meeting the level requirement of the elective subject may be specially considered if they have attained Level 2 in one of the extended modules of Mathematics.

(b) HKALE/HKASLE, GCEALE/GCEASLE and International Baccalaureate (IB)
- Applicants holding A-Level and IB qualifications will be granted/considered credit transfer upon admission;

(c) Higher Diploma / Associate Degree in relevant engineering disciplines;

(d) Higher Diploma / Associate Degree in relevant product design disciplines;

(e) Higher Diploma / Associate Degree in applied physics;

(f) Qualifications equivalent to (a), (b), (c), (d) or (e).

Suitable holders of a Higher Diploma or Associate Degree in related disciplines may be considered for advanced standing entry to the senior year curriculum.

Part 2: Curriculum Design

2.1 Preamble

In order for Hong Kong to remain competitive in the export-led market, our industries need to switch their role 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 the profit margin. It is in particular important for them to have their own brand name of top quality products, much like the designer label of other well-developed countries, to maintain a strong competition in the international market. In order to achieve that, heavy emphasis should be placed on the added-value of products, which implies an increasingly urgent need for inter-disciplinary expertise of high-end product design and development.

Because of the huge demand of professionals to design and develop quality and new products, there are currently some academic programmes offered in Hong Kong at various levels, with the main objective to produce graduates who are able to support the development and growth of this industrial cluster. After assessing these programmes closely, it was identified that there is an urgent need as well as an excellent opportunity for the Mechanical Engineering (ME) Department to offer this BEng (Hons) in Product Analysis and Engineering Design (PAED) Programmme. The PAED programme, on the one hand, excels the PolyU's niche area in product design and development, on the other hand, produces all-round graduates to lead and support smooth operation and healthy growth of integrated product development cluster in Hong Kong.

2.2 University Mission of PolyU

The Hong Kong Polytechnic University aspires to be 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

The aims and intended learning outcomes developed by the PAED programme are fully aligned with the PolyU's mission.

2.3.1 Programme Aims

In order to support the PolyU's mission and to fulfill the programme's aims, the PAED programme is developed to achieve the following aims:

1. To synergize technology with design and business with an aim to fulfilling the PolyU'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-round 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 aims of the PAED Programme are designed to support the PolyU's mission as shown in the following Table 2-1:

Table 2-1 Matching of Programme Aims with University Mission

		University Mission		
		I	**II**	**III**
Programme Aims	**1**	X	X	
	2	X	X	
	3	X	X	X
	4	X		X
	5	X		X

2.3.2 Intended Learning Outcomes

Graduates will be expected to achieve the following twelve intended learning outcomes of the PAED programme upon completing the programme satisfactory. 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 the leader or team member.

(c) An awareness of professional ethics and social responsibilities and the drive to achieve 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 intended learning outcomes of PAED award are supporting its five aims as indicated in the following Table 2-2:

Table 2-2 Matching of PAED Intended Learning Outcomes with its Aims

		Programme Intended Learning Outcomes											
		PA Ka	PA Kb	PA Kc	PA Kd	PA Ke	PA Kf	PA Kg	PO Wa	PO Wb	PO Wc	PO Wd	PO We
Programme Aims	**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		

The Hong Kong Institution of Engineers (HKIE) adopts twelve desired learning outcomes for an engineering degree (Reference: Professional Accreditation Handbook (Engineering Degrees): Revised by Authority of the Accreditation Board of the HKIE, April 2011). A comparison between the desired learning outcomes for an engineering degree programme as proposed by the HKIE and the intended learning outcomes of PAED Programme is given in the following Table 2-3:

Table 2-3 Matching Desired Learning Outcomes Proposed by HKIE and PAED Intended learning Outcomes

Learning Outcomes	Definition of Desired Learning Outcomes Proposed by HKIE	ILOs of PAED AWARD
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 learning outcomes as proposed by the HKIE, the PAED award proposes two additional intended learning outcomes as shown in the following Table 2-4:

Table 2-4 PAED Intended learning Outcomes Proposed in Addition to Those of HKIE

Additional ILOs of PAED	Description of Additional Intended Learning Outcomes Proposed by PAED
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

2.4 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:

1. **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.

2. **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.

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

4. **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.

5. **Lifelong learner**: Graduates should recognize 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.

6. **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.

Table 2-5 illustrates the relationship between Intended Learning Outcomes of PAED and Institutional Learning Outcomes.

Table 2-5 Relationship between the PAED Intended Learning Outcomes and the Institutional Learning Outcomes

PAED	**Institutional Learning Outcomes**					
PROGRAMME OUTCOMES	1	2	3	4	5	6
PAK (a)	X	X				
PAK (b)	X	X		X		
PAK (c)		X		X	X	
PAK (d)		X			X	X
PAK (e)	X		X		X	
PAK (f)		X		X	X	X
PAK (g)				X	X	
POW (a)	X	X		X		
POW (b)			X		X	X
POW (c)						X
POW (d)			X			
POW (e)					X	

2.5 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. On the one hand, the students are able to know the purpose of every subject before learning. On the other hand, 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 2.3.2 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.

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.

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**.**

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.

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 Definite Programme Document (or communicated to students by the subject lecturer at beginning of the semester). 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.

3. PROGRAMME STRUCTURE

3.1 General Structure

The number of credits required for graduation is 124 academic credits and 10 Industrial Centre Practical Training credits. In addition, the students are required to fulfill the Work-Integrated Education (WIE).

The 124 academic credits consist of 30 mandatory credits of General University Requirements (GUR) and 94 credits of Discipline-Specific Requirements (DSR). Details of GUR and DSR are shown in Table 3.1 and Table 3.2 respectively. For further information on the GUR, please refer to section 4.14.

For students without HKDSE Physics, additional credits on "AP10001-Introduction to Physics" should be taken. Details can be found in section 3.1.1.

Table 3-1: General University Requirements (GUR)

Areas	Credits
Language & Communication Requirements (LCR)	9
▪ English	(6)
▪ Chinese	(3)
Cluster Areas Requirement (CAR)	12
▪ 3 credits from each of the following 4 cluster areas	
o Human Nature, Relations and Development	(3)
o Community, Organisation and Globalisation	(3)
o History, Cultures and World Views	(3)
o Science, Technology and Environment	(3)
and of which	
▪ A minimum of 3 credits on subjects designated as "China-related"	
Other Requirements	9
▪ Leadership and Intra-personal Development	(3)
▪ Service-Learning	(3)
▪ Freshman Seminar	(3)
▪ Healthy Lifestyle (non-credit bearing)	(Nil)
Total GUR credits	30

Table 3-2: Discipline-specific Requirements (DSR)

Subjects		Credits	Subjects		Credits
I) Faculty Common Subjects		34	II) Award Core Subjects		54
AF3625	Engineering Economics	(3)	BME31125	Biomechanics	(3)
AMA1110	Basic Mathematics I – Calculus and Probability & Statistics	(3)	EE2901S	Basic Electricity and Electronics	(3)
AMA1120	Basic Mathematics II– Calculus and Linear Algebra	(3)	ISE386	Integrated Design for Manufacture	(3)
AMA2111	Mathematics I	(3)	ME22002	Integrated Product Development Fundamentals	(3)
AP10005	Physics I	(3)	ME23001	Engineering Mechanics	(3)
AP10006	Physics II	(3)	ME31003	System Dynamics	(3)
ENG2001 #	Fundamentals of Materials Science and Engineering/ Chemistry/Biology	(3)	ME33001	Mechanics of Materials	(3)
ENG2003	Information Technology	(3)	ME34003	Thermofluid Mechanics	(3)
ENG3003	Engineering Management	(3)	ME41004	Mechatronics and Control	(3)
ENG3004	Society and the Engineer	(3)	ME42005	CAD/CAE Technologies for Product	(3)
CBS3241P @	Professional Communication in Chinese	(2)	ME42006	Product Modeling and Prototyping	(3)
ELC3521	Professional Communication in English	(2)	ME42007	Design for Product Safety and Reliability	(3)
			ME46001	Numerical Predictive Product Analysis	(3)
			ME49003	Capstone Project	(6)
			MM2711	Introduction to Marketing	(3)
			SD348	Introduction to Industrial Design	(3)
			SD3401	Designing for Humanities	(3)
III) Electives Students are required to complete 2 elective subjects from the subject pool listed in section 3.3.					6
IV) Training Subjects					10
IC2105	Engineering Communication and Fundamentals				(4)
IC348	Appreciation of Manufacturing Processes				(3)
IC382	Multidisciplinary Manufacturing Project				(3)
Total DSR credits			94 + 10 training credits		

Remarks:

@ Non-Chinese speakers or those whose Chinese standards are at junior secondary level or below will be exempted from the Discipline-Specific Chinese Language requirement. Students of this category can take a replacement subject of any level to make up for credit requirement.

\# The following CAR subjects are adopted as options for the areas of "Biology" and "Chemistry":
Biology – Biotechnology and Human Health (ABCT1303), Introductory Life Science (ABCT1101), Bionic Human and the Future of Being Human (BME11101)
Chemistry – Chemistry and Modern Living (ABCT1301), Chemistry and Sustainable Development (ABCT1314)

3.1.1 Remedial Subject Requirement for Physics

Students who do not have Level 2 or above in HKDSE Physics subjects (or Combined Science with a component in Physics) are required to take the following remedial subject:

- Introduction to Physics (AP10001) (3 credits)

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.

3.1.2 Double Fulfilment of DSR and CAR

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.

Some DSR subjects are also designated as CAR subjects under the four cluster areas. They are the same subjects designated with different subject codes. Upon passing them, students will fulfill the requirements of both DSR and CAR. However, credits will not be counted twice. For example, if you have taken MM2711, you have fulfilled the CAR B requirement and earned only 3 credits instead of 6 credits. So you may need to take other subjects[@] to make up the total credit requirement of the award. The list of subjects that fulfill both DSR and CAR of PAED award are shown below:

DSR Subjects	CAR Subjects	Cluster Area	Subject Title
MM2711	MM2B05	CAR – B	Introduction to Marketing
ABCT1101	ABCT1D04	CAR – D	Introductory Life Science
ABCT1301	ABCT1D01	CAR – D	Chemistry and Modern Living
ABCT1314	ABCT1D14	CAR – D	Chemistry and Sustainable Development
ABCT1303	ABCT1D03	CAR – D	Biotechnology and Human Health
BME11101	BME1D01	CAR – D	Bionic Human and the Future of Being Human

Remarks:
@ 'Free electives' under the 4-year Ug degree programmes refers to any subjects (including CAR subjects) offered by the University, unless otherwise specified. Level-0 subjects and training subjects (including clinical/field training) will not be counted to fulfill free elective requirement for graduation purpose.

3.2 Normal Study Pattern

This section outlines the normal 4-year study pattern for the programme. The three LCR subjects and the four CAR subjects are required for fulfilling the Language & Communication Requirements and the Cluster Area Requirements, respectively.

Table 3-3 Specified Progression Pattern with Level 2 or above in HKDSE Physics (or Combined Science with a component in Physics) or equivalent

(Total credits required for graduation: 124 + 10 IC training credits)

1st Year (33 Credits + 4 IC training credits)	
Semester I (15 Credits)	**Semester II (18 Credits)**
LCR I # English Language Subject (3)	LCR II # English Language Subject (3)
CAR I # (3)	CAR II # (3)
Freshman Seminar for Engineering (ENG1003) (3)	Information Technology (ENG2003) (3)
Basic Mathematics I – Calculus and Probability & Statistics (AMA1110) (3)	Basic Mathematics II – Calculus and Linear Algebra (AMA1120) (3)
Physics I (AP10005) (3)	Physics II (AP10006) (3)
--	Leadership and Intra-personal Development # (3)
Healthy Lifestyle # (0)	
Engineering Communication and Fundamentals (IC2105) + (4 IC training credits)	

2nd Year (30 Credits + 3 IC training credits)	
Semester I (15 Credits)	**Semester II (15 Credits)**
CAR III # (3)	CAR IV # (3)
LCR III # Chinese Language Subject (3)	Introduction to Marketing (MM2711) (3)
Engineering Economics (AF3625) (3)	Integrated Product Development Fundamentals (ME22002) (3)
Introduction to Industrial Design (SD348) (3)	Fundamentals of Materials Science and Engineering (ENG2001) / Chemistry / Biology (3)
Mathematics I (AMA2111) (3)	Society and the Engineer (ENG3004) (3)
Appreciation of Manufacturing Processes (IC348) + (3 IC training credits)	--

3rd Year (31 Credits + 3 IC training credits)	
Semester I (16 Credits)	**Semester II (15 Credits)**
Biomechanics (BME31125) (3)	Designing for Humanities (SD3401) (3)
Service Learning # (3)	Thermofluid Mechanics (ME34003) (3)
Basic Electricity and Electronics (EE2901S) (3)	System Dynamics (ME31003) (3)
Engineering Mechanics (ME23001) (3)	Mechanics of Materials (ME33001) (3)
Professional Communication in Chinese (CBS3241P) (2)	Integrated Design for Manufacture (ISE386) (3)
Professional Communication in English (ELC3521) (2)	--
Multidisciplinary Manufacturing Project (IC382) + (3 IC training credits)	

4th Year (30 Credits)	
Semester I (15 Credits)	**Semester II (15 Credits)**
CAD/CAE Technologies for Product Development (ME42005) (3)	Product Modeling and Prototyping (ME42006) (3)
Engineering Management (ENG3003) (3)	Design for Product Safety and Reliability (ME42007) (3)
Mechatronics and Control (ME41004) (3)	Elective Subject I @ (3)
Numerical Predictive Product Analysis (ME46001) (3)	Elective Subject II @ (3)
Capstone Project (ME49003) (6)	

Remarks:

General University Requirements (GUR) subjects. The study pattern for GUR subjects (with the exception of Freshman Seminars) is indicative only. Students may take those subjects at their own schedule.

@ Students are required to select two subjects from the pool of elective subjects as shown in section 3.3.

\+ Industrial Centre Training subjects

Table 3-4 Specified Progression Pattern <u>without</u> Level 2 or above in HKDSE Physics (or Combined Science with a component in Physics)

(Total credits required for graduation: 127 + 10 IC training credits)

1st Year (33 Credits + 4 IC training credits)	
Semester I (15 Credits)	**Semester II (18 Credits)**
LCR I # English Language Subject (3)	LCR II # English Language Subject (3)
CAR I # (3)	CAR II # (3)
Freshman Seminar for Engineering (ENG1003) (3)	Information Technology (ENG2003) (3)
Basic Mathematics I – Calculus and Probability & Statistics (AMA1110) (3)	Basic Mathematics II – Calculus and Linear Algebra (AMA1120) (3)
Introduction to Physics (AP10001) (3)	Physics I (AP10005) (3)
--	Leadership and Intra-personal Development (3)
Healthy Lifestyle (0)	
Engineering Communication and Fundamentals (IC2105) + (4 IC training credits)	

2nd Year (33 Credits + 3 IC training credits)	
Semester I (18 Credits)	**Semester II (15 Credits)**
CAR III # (3)	CAR IV # (3)
LCR III # Chinese Language Subject (3)	Introduction to Marketing (MM2711) (3)
Engineering Economics (AF3625) (3)	Integrated Product Development Fundamentals (ME22002) (3)
Physics II (AP10006) (3)	Fundamentals of Materials Science and Engineering (ENG2001) / Chemistry/ Biology (3)
Introduction to Industrial Design (SD348) (3)	Society and the Engineer (ENG3004) (3)
Mathematics I (AMA2111) (3)	--
Appreciation of Manufacturing Processes (IC348) + (3 IC training credits)	--

3rd Year (31 Credits + 3 IC training credits)	
Semester I (16 Credits)	**Semester II (15 Credits)**
Biomechanics (BME31125) (3)	Designing for Humanities (SD3401) (3)
Service Learning # (3)	Thermofluid Mechanics (ME34003) (3)
Basic Electricity and Electronics (EE2901S) (3)	System Dynamics (ME31003) (3)
Engineering Mechanics (ME23001) (3)	Mechanics of Materials (ME33001) (3)
Professional Communication in Chinese (CBS3241P) (2)	Integrated Design for Manufacture (ISE386)(3)
Professional Communication in English (ELC3521) (2)	--
Multidisciplinary Manufacturing Project (IC382) + (3 IC training credits)	

4th Year (30 Credits)	
Semester I (15 Credits)	**Semester II (15 Credits)**
CAD/CAE Technologies for Product Development (ME42005) (3)	Product Modeling and Prototyping (ME42006) (3)
Engineering Management (ENG3003) (3)	Design for Product Safety and Reliability (ME42007) (3)
Mechatronics and Control (ME41004) (3)	Elective Subject I @ (3)
Numerical Predictive Product Analysis (ME46001) (3)	Elective Subject II @ (3)
Capstone Project (ME49003) (6)	

Remarks:

General University Requirements (GUR) subjects. The study pattern for GUR subjects (with the exception of Freshman Seminars) is indicative only. Students may take those subjects at their own schedule.

@ Students are required to select two subjects from the pool of elective subjects as shown in section 3.3.

\+ Industrial Centre Training subjects

Teaching department abbreviations

AF	School of Accounting and Finance
AMA	Applied Mathematics
AP	Applied Physics
CBS	Chinese and Bilingual Studies
EE	Electrical Engineering
ELC	English Language Centre
ENG	Engineering Faculty
IC	Industrial Centre
SD	School of Design

3.3 Elective Subjects

Students are required to study two elective subjects (of which at least 1 should normally be ME Subject).

The elective subjects currently offered are listed as follows:

ENG4001	Project Management
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

Remarks:
The elective subjects are updated from time to time to ensure the best development of the programme and to ensure the best career for our students. Since there is minimum planned class size for each subject, the Department has the discretion to cease the offering of subjects which fail to enroll students up to the minimum class size.

3.4 Work-Integrated Education (WIE)

In accordance with the University's policies, all full-time UGC-funded undergraduates should fulfill the mandatory requirement of Work-integrated Education (WIE). WIE is a work-based, structured and measurable learning experience in an industrial context which is relevant to the students' areas of studies. A student is required to spend at least 2 weeks on WIE before graduation.

WIE is aimed at providing value-added education leading to the development of all-round students with professional competence.

Mandatory WIE activities are credit-bearing, but they are not included in the 124 academic credits required for graduation. The WIE components will not be counted towards GPA calculation except as stipulated below. For the completion of every two weeks of WIE activities, one credit will be earned. The WIE activities can be fulfilled by at least one of the following:

- Integration into the Capstone Project, which is industrially/commercially based. However, it is most important that the Capstone Project and WIE activities should be assessed separately. It is equally important that the WIE activities of students working in the same project team should be assessed individually as they can vary from student to student. In addition, the duration of the WIE activities is not necessarily the same as that of the

Capstone Project. In these cases the credit value of the project incorporating the WIE component will be counted in full towards the GPA calculation.

- Perform during a summer placement in industrial/commercial sector.
- Conduct in a form proposed by students with the prior approval of the WIE coordinator.

Detailed guidelines for students on WIE are available on the ME website. (http://www.polyu.edu.hk/me/)

3.5 Curriculum Mapping

A curriculum map is provided in Tables 3-5. The specific learning outcomes achieved by every subject of the award are listed clearly, such that all the specific learning outcomes as specified in Section 2.3.2 can be shown to be fully fulfilled by the curriculum built upon a combination of most suitable subjects as shown in Section 3.1.

Table 3-5 ILOs Achieved by PAED Award
(T – TEACH; P – PRACTICE; M – MEASURED)

I) General University Requirements (GUR) Subjects

		PROGRAMME OUTCOMES											
		PAK							POW				
		a	b	c	d	e	f	g	a	b	c	d	e
COURSE/MODULE/SUBJECT NUMBERS	LCR English I											TP	
	LCR English II											TP	
	LCR Chinese											TP	
	Leadership							T					
	Service-learning				TP		TP			T	T		
	Freshman Seminar										T		T
	CAR I - IV								T				T

II) Discipline-specific Requirements (DSR) Subjects

COURSE/MODULE/SUBJECT NUMBERS	PROGRAMME OUTCOMES											
	PAK							POW				
	a	b	c	d	e	f	g	a	b	c	d	e
Faculty Common												
AF3625	T	T				T		T	T		T	T
AMA1110	T	T	T									
AMA1120	T	T	T									
AMA2111	T	T	T									
AP10005			T									
AP10006			T									
CBS3241P											TPM	
ELC3521											TPM	
ENG2001	T	T	P					T				
ENG2003	T	T	P		T			T			TP	
ENG3003					T		TPM	T	T	T	T	
ENG3004							TP	TPM	T	TPM	T	T
Award Core												
ME22002	TP	TP				TP	TP		TP	TP	TP	TP
MM2711	T		T		TP	T						
ISE386	T	TP	TP	P	P	TP		T	T		P	P
SD348	T	TP	TP	TP	P	TP	TP	TP	TP		TP	
SD3401					P	TP		TP				
EE2901S			T		TP							T
BME31125		TP	TP	T								
ME23001		TP	TPM		P				TP		T	
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	
ME46001			TP	TP	TP						P	
ME49003	TPM	TPM	TP	TPM	TP	TPM	TP	TP	TPM	TP	TPM	TPM

III) Elective Subjects

		PROGRAMME OUTCOMES											
		PAK							POW				
		a	b	c	d	e	f	g	a	b	c	d	e
	ENG4001							TP M		TP		TP	T
	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

IV) Training Subjects

		PROGRAMME OUTCOMES											
		PAK							POW				
		a	b	c	d	e	f	g	a	b	c	d	e
COURSE/MODULE/ SUBJECT NUMBERS	IC2105	TP	TP	TP		TP	TP	TP					
	IC348				P	P	P	PM					
	IC382	PM			PM	P	P	P		PM		P	
	WIE								P	P	P	P	P

- ***Definition of the Intended Learning Outcomes of the PAED Award are shown in Section 2.3.2.***

3.6 Curriculum Design for Senior Year Intakes

3.6.1 Credit Requirements for Graduation

Normally 64 (plus 6 IC training credits)*

* Since students may be required to meet specific requirements at admission, the credits required for graduation will vary according to the academic background of students.

3.6.2 Work-Integrated Education (WIE)

In accordance with the University's policies, all full-time UGC-funded undergraduates should fulfill the mandatory requirement of Work-integrated Education (WIE). WIE is a work-based, structured and measurable learning experience in an industrial context which is relevant to the students' areas of studies. A student is required to spend at least 2 weeks on WIE before graduation.

3.6.3 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). ■ Students may apply for a waiver if they have fulfilled the English and Chinese reading and writing requirements and/or CSR requirement in their previous studies.	6
Service-Learning	3
Language and Communication Requirements (LCR) **	-
Total GUR credits	**9**
** 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.	

3.6.4 Discipline-Specific Requirements (DSR)

Discipline Specific Requirements (DSR) Subjects		Credits
I) Compulsory		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)
ME49003	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.		6
III) Training		6
IC348	Appreciation of Manufacturing Process	(3)
IC382	Multidisciplinary Manufacturing Project	(3)
Total DSR credits		55 + 6 training credits

3.6.5 Normal Progression Pattern

1st Year (34 Credits + 6 IC training credits)	
Semester I (16 Credits)	**Semester II (18 Credits)**
Introduction to Industrial Design (SD348) (3)	Designing for Humanities (SD3401) (3)
Society and the Engineer (ENG3004) (3)	Thermofluid Mechanics (ME34003) (3)
Service Learning # (3)	System Dynamics (ME31003) (3)
CAR I # (3)	Mechanics of Materials (ME33001) (3)
Professional Communication in Chinese (CBS3241P) (2)	Integrated Design for Manufacture (ISE386)(3)
Professional Communication in English (ELC3521) (2)	CAR II # (3)
Appreciation of Manufacturing Processes (IC348) + (3 IC training credits)	Multidisciplinary Manufacturing Project (IC382) + (1.5 IC training credits)
Summer Term	
Multidisciplinary Manufacturing Project (IC382) + (1.5 IC training credits)	

2nd Year (30 Credits)	
Semester I (15 Credits)	**Semester II (15 Credits)**
CAD/CAE Technologies for Product Development (ME42005) (3)	Product Modeling and Prototyping (ME42006) (3)
Engineering Management (ENG3003) (3)	Design for Product Safety and Reliability (ME42007) (3)
Mechatronics and Control (ME41004) (3)	Elective Subject I @ (3)
Numerical Predictive Product Analysis (ME46001) (3)	Elective Subject II @ (3)
ME49003 Capstone Project (6)	

Remarks:

\# General University Requirements (GUR): The pattern for GUR subjects are indicative only. Students may take these subjects according to their own schedule.

@ Students are required to select two subjects from the pool of elective subjects as shown in section 3.3.

\+ Industrial Centre Training subjects

4. 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.

4.1 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. Students will be allowed to take additional subjects for broadening purpose, after they fulfil the graduation requirements and for the following semester. However, they will still be subject to the maximum study load of 21 credits per semester and the availability of places in the subjects concerned, and their enrolment will be arranged as subject-based students only and be subject to the rules on 'Admission of Subject-based Students', except that graduates from UGC-funded programmes will not be restricted to taking only subjects from a self-financed programme.

4.2 Study Load

For students following the progression pattern specified for their programme, they have to take the number of credits and subjects, as specified in the Definitive Programme Document, for each semester. Students cannot drop those subjects assigned by the department unless prior approval has been given by the department.

The maximum study load to be taken by a student in a semester is 21 credits, unless exceptional approval is given by the Head of the programme offering Department. For such cases, students should be reminded that the study load approved should not be taken as grounds for academic appeal.

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.[1]

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.

4.3 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.

4.4 Credit Transfer

Students may be given credits for recognised previous studies including mandatory General University Requirements (GUR) subjects; and the credits will be counted towards meeting the requirements for award. Transferred credits may be counted towards more than one award. The granting of credit transfer is a matter of academic judgment.

Credit transfer may be done with or without the grade being carried over; the former should normally be used when the credits were gained from PolyU. Credit transfer with the grade being carried over may be granted for subjects taken from outside the University, if deemed appropriate, and with due consideration to the academic equivalence of the subjects concerned and the comparability of the grading systems adopted by the University and the other approved institutions. Subject credit transfer is normally decided by the subject offering Department. However, for applications which are submitted by students who have completed an approved student exchange programme, the decision will be made by the programme offering Department in consultation with the subject offering Departments.

The validity period of credits previously earned, is 8 years after the year of attainment. Normally, not more than 50% of the credit requirement for award may be

[1] The maximum number of credits to be taken in a semester by students on academic probation will be decided by the Departments. The maximum number could be set on a departmental basis or programme basis, or even student-specific, as deemed appropriate. If the maximum number proposed is from 16 to 18 credits in a semester, approval by Faculty/School Deans is required. For students to be allowed to take more than 18 credits in a semester, approval by Quality Assurance Committee (Academic Departments) or its sub-committee set up for the purpose will be requied.

transferable from approved institutions outside the University. For transfer of credits from programmes offered by PolyU, normally not more than 67% of the credit requirement for award can be transferred. In cases where both types of credits are being transferred (i.e. from programmes offered by PolyU and from approved institutions outside the University), not more than 50% of the credit requirement for award may be transferred.

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

Regarding credit transfer for GUR subjects, the Programmme Host Department is the approval authority at the time of admission to determine the number of GUR credits which an Advanced Standing student will be required to complete for the award concerned. Programme Host Departments should make reference to the mapping lists of GUR subjects, compiled by the Committee on General University Requirements (Cogur), on the eligibility of the subjects which can qualify as GUR subjects. Applications for credit transfer of GUR subjects after admission will be considered, on a case-by-case basis by the Subject Offering Department or Office of General university Requirements (OGUR)/Office of Service Learning (OSL), in consultation with the relevant Sub-committee(s) under CoGUR, as appropriate.

For Senior Year intakes, 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 compassable components in their earlier studies.

4.5 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.

4.6 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 withhold the issuance of any certificate of study to a student who has unsettled matters with the University, or subject to disciplinary action.

4.7 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.

4.8 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.

4.9 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.

4.10 Progression/Academic Probation/Deregistration

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

(i) eligible for progression towards an award; or
(ii) eligible for an award; or
(iii) required to be deregistered from the programme.

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 the transcript of studies.

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

(i) the student has exceeded the maximum period of registration for that programme as specified in the Definitive Programme Document; or
(ii) the student's GPA is lower than 2.0 for two consecutive semesters and his Semester GPA in the second semester is also lower than 2.0; or
(iii) the student's GPA is lower than 2.0 for three consecutive semesters.

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 (ii) or (iii) 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.

4.11 Retaking of Subjects

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

The number of retakes of a subject is not restricted. Only the grade obtained in the final attempt of retaking (even if the retake grade is lower than the original grade for originally passed subject) will be included in the calculation of the Grade Point Average (GPA). If students have passed a subject but failed after retake, credits accumulated for passing the subject in a previous attempt will remain valid for satisfying the credit requirement for award. (The grades obtained in previous attempts will only be reflected in the 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 Requirement (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.[2]

[2] 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 in the calculation of the GPA.

4.12 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 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.

4.13 Grading

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

Subject Grade	Short Description	Elaboration on Subject Grading Description
A+	Exceptionally Outstanding	The student's work is exceptionally outstanding. It exceeds the intended subject learning outcomes in all regards.
A	Outstanding	The student's work is outstanding. It exceeds the intended subject learning outcomes in nearly all regards.

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 many of the intended 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 subject grade, as follows:

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

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

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

where n = number of all subjects (inclusive of failed subjects) taken by the student up to and including the latest semester/term. 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:

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

Subject which has been given an "S" 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. Although the Industrial Centre training credits are counted in the GPA calculation, they are excluded from the calculation of weighted GPA and award GPA. 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.

For students taking the Major/Minor study route, a separate GPA will be calculated for their Major and Minor programmes. The Major GPA will be used to determine his award classification, which will be so reflected on the award parchment. The Minor GPA can be used as a reference for Board of Examiners to moderate the award classification for the Major, as explained further in Section 6.

4.14 University Graduation Requirements

To be eligible for a Bachelor's Degree award under the 4-year full-time undergraduate curriculum, a student must:

1. Complete successfully the requisite number of credits as defined in Section 3.
2. Earn a cumulative GPA of 2.0 or above at graduation.
3. Complete successfully the mandatory Work-Integrated Education (WIE) component.
4. Satisfy the residential requirement for at least one-third of the normal credit requirement for the award unless the professional bodies concerned stipulate otherwise.
5. Satisfy any other requirements as specified in the Definitive Programme Document.
6. Satisfy the following GUR requirements:

(a) Language and Communication Requirements	9 credits
(b) Freshman Seminar	3 credits
(c) Leadership and Intra-Personal Development	3 credits
(d) Service-Learning	3 credits
(e) Cluster Areas Requirement (CAR)	12 credits
(f) China Studies Requirement	(3 of the 12 CAR credits)
(g) Healthy Lifestyle	Non-credit bearing
	Total = 30 credits

(a) Language and Communication Requirements (LCR)

English

All undergraduate students must successfully complete two 3-credit English language subjects as stipulated by the University (Table 4-1). These subjects are designed to suit students' different levels of English language proficiency at entry, as determined by their HKDSE score or the English Language Centre (ELC) entry assessment (when no HKDSE score is available).

Students who can demonstrate that they have achieved a level beyond that of the LCR proficient level subjects as listed in Table 4-2 (based on an assessment by ELC) may apply for subject exemption or credit transfer of the LCR subject or subjects concerned.

Table 4-1: Framework of English LCR subjects

HKDSE	Subject 1	Subject 2
Level 5 or Equivalent	Advanced English for University Studies (AEUS) (ELC1014) 3 credits	Any LCR proficient level subject in English (see Table 5.2) 3 credits
Level 4 or Equivalent	English for University Studies (EUS) (ELC1012 / ELC1013) 3 credits	Advanced English for University Studies (AEUS) (ELC1014) 3 credits
Level 3 or equivalent	Practical English for University Studies (PEUS) (ELC1011) 3 credits	English for University Studies (EUS) (ELC1012 / ELC1013) 3 credits

Table 4-2: LCR Proficient level subjects in English

For students entering with HKDSE Level 5, or at an equivalent level or above	ELC2011 Advanced English Reading and Writing Skills	3 credits each
	ELC2012 Persuasive Communication	
	ELC2013 English in Literature and Film	

Chinese

All undergraduate students are required to successfully complete one 3-credit Chinese language subject as stipulated by the University (Table 4-3). These Chinese subjects are designed to suit students' different levels of Chinese language proficiency at entry, as determined by their HKDSE score or the Chinese Language Centre (CLC) entry assessment (when no HKDSE score is available). Students can also opt to take additional Chinese LCR subjects (Table 4-5) in their free electives.

Students who are non-Chinese speakers (NCS), or whose Chinese standards are at junior secondary level or below, will also be required to take one LCR subject designed to suit their language background and entry standard as shown in Table 4-4.

Students who can demonstrate that they have achieved a level beyond that of the course "Advanced Communication Skill in Chinese" as listed in Table 4-3 (based on an assessment made by CLC) may apply for subject exemption or credit transfer of the LCR subject concerned.

Table 4-3: Framework of Chinese LCR subjects

HKDSE	Required Subject
HKDSE Level 4 and 5 or equivalent	Advanced Communication Skills in Chinese (ACSC) (CBS1102P) 3 credits
HKDSE Level 3 or equivalent	Fundamentals of Chinese Communication (FCC) (CBS1101P) 3 credits

HKDSE	Required Subject
For non-Chinese speakers or students whose Chinese standards are at junior secondary level or below	One subject from Table 4-4 below

Table 4-4: Chinese LCR Subjects for non-Chinese speakers or students whose Chinese standards are at junior secondary level or below

Subject	Pre-requisite/exclusion	
CBS1151 Chinese I (for non-Chinese speaking students)	• For non-Chinese speaking students at beginners' level	3 credits each
CBS1152 Chinese II (for non-Chinese speaking students)	• For non-Chinese speaking students; and • Students who have completed Chinese I or equivalent	
CBS2151 Chinese III (for non-Chinese speaking students)	• For non-Chinese speaking students at higher competence levels; and • Students who have completed Chinese II or equivalent	
CBS2154 Chinese IV (for non-Chinese speaking students)	• For non-Chinese speaking students at intermediate competence levels; and • Students who have completed Chinese III or equivalent	
CBS2152 Chinese Literature - Linguistics and Cultural perspectives (for non-Chinese speaking students)	• For non-Chinese speaking students at higher competence levels	

Table 4-5: Other LCR Electives in Chinese

Subject	Pre-requisite/exclusion	
Chinese and the Multimedia	• For students entering with HKDSE level 4 or above; or • Students with advanced competence level as determined by the entry assessment; or • Students who have completed "Fundamentals of Chinese Communication"	3 credits each
Creative writing in Chinese	• For students entering with HKDSE level 4 or above; or • Students with advanced competence level as determined by the entry assessment; or • Students who have completed "Fundamentals of Chinese Communication"	
Elementary Cantonese	• For students whose native language is not Cantonese	
Intermediate Cantonese	• Successful completion of "Elementary Cantonese"; or • Meet a certain standard in a pre-course assessment	
Putonghua in the	• Students have completed "Fundamentals of	

Subject	Pre-requisite/exclusion	
Workplace	Chinese Communication" or could demonstrate with proof their basic proficiency in Putonghua • For students whose native language is not Putonghua	

Writing Requirement

In additional to the LCR in English and Chinese explained above, all students must also, among the Cluster Areas Requirement (CAR) subjects they take (see section (e) below), pass one subject that includes the requirement for a substantial piece of writing in English and one subject with the requirement for a substantial piece of writing in Chinese.

Reading Requirement

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

A list of approved CAR subjects for meeting the Writing Requirement (with a "W" designation) and for meeting the Reading Requirement (with an "R" designation) is shown at: https://www2.polyu.edu.hk/as/Polyu/GUR/index.htm.

Non-Chinese speakers and those students whose Chinese standards are at junior secondary level or below will by default be exempted from the DSR – Chinese and CAR – Chinese Reading and Writing requirement. However, this group of students would still be required to take one Chinese LCR subject to fulfil their Chinese LCR.

Note: In addition to the LCR in General Education Requirements, students also have to complete 4 credits of discipline-specific language requirements (2 credits in English and 2 credits in Chinese) as specified in the curriculum requirements of their Major.

(b) Freshman Seminar

All students must successfully complete, normally in their first year of study, one 3-credit Freshman Seminar offered by their chosen Broad Discipline. The purpose is to (1) introduce students to their chosen discipline and enthuse them about their major study, (2) cultivate students' creativity, problem-solving ability and global outlook, (3) give students an exposure to the concepts of, and an understanding of, entrepreneurship, and (4) engage students, in their first year of study, in desirable forms of university learning that emphasises self-regulation, autonomous learning and deep understanding.

A list of Freshman Seminars offered by the Broad Disciplines can be found at: https://www2.polyu.edu.hk/as/Polyu/GUR/index.htm.

(c) Leadership and Intra-Personal Development

All students must successfully complete one 3-credit subject in the area of Leadership and Intra-Personal Development, which is designed to enable students to (1) understand and integrate theories, research and concepts on the qualities (particularly intra-personal and interpersonal qualities) of effective leaders in the Chinese context, (2) develop greater self-awareness and a better understanding of oneself, (3) acquire interpersonal skills essential for functioning as an effective leader, (4) develop self-

reflection skills in their learning, and (5) recognise the importance of the active pursuit of knowledge on an intra-personal and interpersonal level and its relationship to leadership qualities.

A list of designated subjects for meeting the leadership and intra-personal development requirement is available at: https://www2.polyu.edu.hk/as/Polyu/GUR/index.htm.

(d) 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.

A list of designated subjects for meeting the service-learning requirement is available at: https://www2.polyu.edu.hk/as/Polyu/GUR/index.htm.

(e) 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 at least one 3-credit subject in each of the following four Cluster Areas:

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

A list of CAR subjects under each of the four Cluster Areas is available at: https://www2.polyu.edu.hk/as/Polyu/GUR/index.htm.

(f) China Studies Requirement

Of the 12 credits of CAR described in (e) 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 list of approved CAR subjects for meeting the China Studies Requirement is available at: https://www2.polyu.edu.hk/as/Polyu/GUR/index.htm

(g) Healthy Lifestyle

Healthy lifestyle is the platform for all-round development. Students are required to successfully complete a non-credit-bearing programme in healthy lifestyle.

With effect from the 2015/16 intake cohort, students will be required to complete the following components: (i) sports training/participation, (ii) e-learning modules, and (iii) lectures/talks. The syllabus covers physical health, mental health, social health, spiritual health, values and priorities on health behavior with reference to competing

priorities in life, reflection on healthy living and plans for self-improvement or maintenance of health behavior. Details of the programme can be found at:

http://www.polyu.edu.hk/ogur/student/4yr/gur/hls/revised

Students on Articulation Degree Programmes and Senior Year Intakes to the 4-year Ug degree programmes are not required to take the Health Lifestyle Programme. Advanced Standing students are required to take HLS (except for those who are HD/AD holders who follow the Senior Year/Articulation Degree programme GUR curriculum).

A student is required to graduate as soon as he satisfies the graduation requirements. The student concerned is required to apply for graduation, in the semester in which he is able to fulfil all his graduation requirements, and after the add/drop period for that semester has ended.

Students are allowed to take more elective subjects beyond GUR and DSR until the total number of credits reaches 150 without incurring a higher tuition rate. 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.

The awards will be classified based upon the Award GPA. Any subject passed after the graduation requirement has been met or subject taken on top of the prescribed credit requirements for award shall not be taken into account in the grade point calculation for award classification. However, if a student attempts more elective subjects (or optional subjects) than the requirement for graduation in or before the semester in which he becomes eligible for award, the elective subjects (or optional subjects) with higher grade/contribution shall be included in the grade point calculation (i.e. the excessive subjects with lower grade/contribution, including failed subjects, will be excluded).

The following are guidelines for Boards of Examiners' reference in determining award classifications:

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.

5. PROGRAMME OPERATION AND MANAGEMENT

5.1 Departmental Undergraduate Programme Committee

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

5.2 Programme Executive Group

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

5.3 Student-Staff Consultative Committee

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

5.4 Academic Advising

There are two components to the academic advising system which PolyU currently provides for students of 4-year undergraduate degree programmes – department-based academic advising (primarily for broad discipline and major programme matters) and academic advising at the institutional level operated by the Office of General University Requirements (primarily for matters related to the GUR).

Academic advising at PolyU aims to help students to make informed and intelligent academic decisions/choices about their study at PolyU that suit their intellectual, professional and personal goals. It is instrumental to promoting student success, and plays a vital role in enhancing students' overall learning experience at PolyU. The specific objectives are:

- To build up an early connection between the students and their home departments, and to promote their sense of affiliation to the department and the University,
- To provide students with accurate information about the academic regulations and requirements regarding their Major/programme, as well as the GUR,
- To assist students to explore their interests, abilities and values on academic pursuits, and formulate appropriate intellectual, professional and personal goals,
- To provide advice and guidance to students that enables them to develop and pursue a study plan for their 4 years of study appropriate for meeting their intellectual, professional and personal goals,
- To connect students to resources, opportunities and support within and outside the University that enhance their educational experiences and success.

Every student will be assigned an Academic Advisor from the ME Department. The main responsibilities of the academic advisor will include:

- Building rapport with the students, serving as a bridge that connects them to the department,

- Being accessible and available to students, and responding to their questions and concerns,
- Helping student to consider and clarify their intellectual, professional and personal goals,
- Helping students to develop an appropriate study plan (particularly with regard to their Major), and assisting in their selection of appropriate courses to achieve their identified goals,
- Clarifying to students academic regulations and requirements, particularly those relating to the Major,
- Identifying students with special learning needs or early signs of learning problems, and referring/encouraging them to seek help or support.

6. MINOR and DOUBLE MAJOR

The 4-year undergraduate degree framework allows students to work for a single discipline Major, a Major plus a Minor (unless the Major is so designed as to preclude the possibility of a further Minor study) or Double Majors.

Minor Study

Minor study will be a free choice by students and not mandatory. Each student is allowed to take not more than one Minor. This option will not be applicable to students who are admitted to the advanced stage of the programme. Students who opt for Minor study will be subject to the following regulations.

(i) A Minor programme will comprise a collection of subjects totaling 18 credits, with at least 50% of the subjects (9 credits) at Level 3 or above.

(ii) Students must apply to and obtain approval from the Minor-offering Department, at the start of second year of study.

(iii) Subject to approval by the Minor-offering Department, students may count up to 6 credits from their Major/GUR subjects [including Language Communication Requirement (LCR) subjects at proficiency level] towards their chosen Minor.

(iv) Only students with a GPA of 2.5 or above can be considered for Minor study enrolment. The Minor-offering Department can also set a quota and additional requirements for enrolment on their Minors.

(v) Departments have the discretion to allow students who fail to obtain a GPA of 2.5 or above after enrolment, to stay on the Minor programme for a longer while in order to pull up their GPA to the required level.

(vi) Students must complete their approved Minor as part of their graduation requirements. Students who wish to withdraw from a Minor need to obtain approval from the Minor-offering Department, before the end of the add/drop period of the last Semester of study.

(vii) Students are required to obtain a GPA of at least 2.0 in order to satisfy the requirement for graduation with a Major plus a Minor.

(viii) Since students are expected to complete their approved Minor as part of their graduation requirements, students taking the Major/Minor route will be considered for an award of both the Major and Minor simultaneously, and not separately.

(ix) Students graduating with a Major plus a Minor will receive one award parchment, which will list the title of the Major programme only. The honours classification will be based on the Major GPA, and reflected accordingly on the parchment. The award title of the Minor programme will not be reflected on the parchment. It will be recorded in the Transcript of Studies.

(x) There is no guarantee that a clash-free timetable can be provided for all students who pursue Minor study.

Double Majors

Double Majors will provide an opportunity for the more capable students, who are interested in expanding their study beyond a single degree, to take a Second Major study. Students who opt for a double Major study will be subject to the following regulations:

(i) Completion of Double Majors requires more than the normative study period of 4/5 years and extra credits on self-financed basis (i.e. higher tuition fee). The total credit

requirements of a Double Major will depend on the degree of commonality between the 2 Majors, but should be more than 120 in all instances. Apart from the 30 credits of GUR subjects, up to 1/3 of the Discipline-Specific Requirements (DSR) of the First Major which are common to the Second Major can be double-counted towards the Second Major.

(ii) Students who wish to take a Second Major must obtain approval from the host Department of the First Major.

(iii) Only students with a GPA of 3.0 or above can be considered for admission to a Second Major, while Departments offering the Second Major can stipulate a higher GPA requirement if deemed appropriate.

(iv) Students will be put on academic probation if they fail to obtain a GPA of 2.0 or above.

(v) Students who wish to withdraw from a Second Major must obtain approval from the Department offering the Second Major, before the end of the add/drop period of the last Semester of study.

(vi) Students will not be allowed to drop the First Major and continue with the Second Major only. This is to avoid students using the Double Major mechanism to gain a 'backdoor' entry to a 'popular' and oversubscribed Major programme.

(vii) Students are required to obtain an overall GPA of at least 2.0, in order to satisfy the requirement for graduation with Double Majors. They will not be allowed to graduate with one of the 2 Majors.

(viii) Two award parchments will be issued for the Double Majors (one for each Major programme). The honours classification of the two Major awards need not be identical.

Part B:
Syllabi

Subject Description Form

Subject Code	ENG1003
Subject Title	Freshman Seminar for Engineering
Credit Value	3
Level	1
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	The objectives of this subject are to: (1) Introduce students to the engineering broad discipline and enthuse them about their major study (2) Cultivate students' creativity and problem-solving ability, and global outlook (3) Introduce students to the concept of entrepreneurship (4) Engage the students in desirable forms of learning at university that emphasizes self-regulation, autonomous learning and deep understanding
Intended Learning Outcomes	Upon completion of the subject, students will: (a) Be able to demonstrate an understanding and an enthusiasm about the engineering broad discipline and their major study (b) Develop their problem-solving ability and global outlook (c) Be able to demonstrate an understanding of entrepreneurship (d) Be able to search for information, formulate a project plan, and manage a project with initiative (e) Be able to demonstrate an understanding of academic integrity.
Subject Synopsis/ Indicative Syllabus	***1. Online Tutorial on Academic Integrity (4 hours*)*** Students will be required to complete successfully an Online *Tutorial on Academic Integrity* on or before week 5 of the first semester. The students will understand the importance of academic integrity by completing the Online Tutorial. ***2. Seminars (12 hours*)*** There will be seminars given by various speakers on various topics to introduce to students the engineering broad discipline, to enthuse them about their major study, to arouse students' interests in engineering and to cultivate their understanding of and sense of belonging to the discipline and the engineering profession, and to cultivate students' global outlook. The formats of the seminars may be, but not limited to, Departmental Seminars, and Renowned Speaker Seminar. ***3. Freshman Project (45 hours*)*** There will be practical workshops, presentation and demonstration sessions for the Freshman Project. The freshman project aims at developing students' creativity, problem-solving skills, and team-work abilities through practical and hands-on tasks at a level commensurate with their first-year engineering backgrounds. Students will work in small groups under the guidance of teachers/instructors to design and implement an engineering solution to some given problems.

	4. Entrepreneurship Project (45 hours*) The entrepreneurship project is designed to develop students' appreciation and understanding about entrepreneurship and the commercialization process by attending lectures, workshops and tutorials. In the course of the Entrepreneurship Project, students will identify technology opportunities and learn the skills of preparing a simple business plan. (* Note: hours indicate total student workload)
Teaching/Learning Methodology	***Online Tutorial on Academic Integrity*** The *Online Tutorial on Academic Integrity* is developed by the University to help the students understand the importance of academic integrity. By going through the Online Tutorial, students will be aware of the importance of upholding academic integrity during University study. They will also learn good practices by which to stay clear of dishonest behaviors and academic plagiarism. ***Seminars*** The seminars (such as renowned speaker seminars and departmental seminars) are designed to arouse students' interest about engineering. The delivery mode will be *interactive* and *engaging*. Students will be motivated to make preparation by searching for information and doing background reading. They will be encouraged to raise questions and discuss with the presenters. Assessment tasks (quizzes) will be designed to measure students' learning outcomes as well as to encourage participation and interaction. ***Freshman Project*** For the Freshman Project, students will work collaboratively with their group members to design and implement an engineering solution to a given problem under the guidance of instructors. There will be close staff-students and students-students *interaction*. Students will be given opportunities to develop creativity, problem-solving skills and team-work abilities. Assessment tasks will consist of demonstration, presentation, reports, and reflective essay writings. These are designed to evaluate individual student's performance and achievement as well as to encourage active participation. ***Entrepreneurship Project*** There will be lectures, workshops, and tutorials. A general overview of the concepts required to conduct the project will be provided to students through lectures. They will then work in small groups in a workshop to appreciate the essential elements in the development of a business plan and subsequently to produce a simple business plan and to present it to fellow classmates. Assessment will focus towards students' understanding about entrepreneurship, innovation and creativity.

Assessment Methods in Alignment with Intended Learning Outcomes

Students' performance in this subject will be assessed by using a letter-grading system in accordance with the University's convention from grade F (failure) to A+. The relative weights of the different assessment components are as follows:

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
Online Tutorial on Academic Integrity	0%					✓
Seminars Quizzes	10%	✓				
Freshman Project Project demonstration, presentation, report and reflective essay writing	45%		✓		✓	
Entrepreneurship Project Business plan	45%			✓	✓	
Total	100 %					

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

Quizzes (online or paper-based) can measure the students' *understanding* about the engineering discipline. Through reflective essays, students can reflect on their appreciation and understanding about the *engineering* discipline. Through project demonstration, presentation and project reports, students can demonstrate their *creativity*, *problem-solving skills* and *team-work abilities*. They can also demonstrate their *ability to search for information, formulate a project plan,* and *manage a project with initiative*. Through business plan, students can demonstrate their understanding about *entrepreneurship*.

Pass Conditions

In order to pass this subject, students must obtain a Grade D or above for total marks comprising the Seminars, Freshman Project and Entrepreneurship Project as described here AND pass the Online Tutorial on Academic Integrity on or before week 5 of semester 1 as described in the previous section.

Student Study Effort Expected

Class contact:	
▪ Introduction and Seminars (such as Departmental Seminars, Renowned Speaker Seminar)	6 hours
▪ Freshman project: 3 hours per week for 5 weeks	15 hours
▪ Entrepreneurship project: 3 hours per week for 5 weeks	15 hours
▪ Other student study effort: 4 hours for Online Tutorial on Academic Integrity; 6 hours for seminars quizzes preparation; 60 hours for Freshman project and Entrepreneurship project: background information search, project work preparation, meeting and discussion, presentation and demonstration, and report writing.	70 Hours

	▪ Total student study effort	106 Hours
Reading and References List	H. Scott Fogler and Steven E. LeBlanc, *Strategies for creative problem solving*, Upper Saddle River, N.J. : Prentice Hall, 2008 N.J. Smith (ed), *Engineering project management*, Oxford, UK; Malden, MA: Blackwell, 2008 Gene Moriaty, *The engineering project: its nature, ethics, and promise*, University Park, Pa.: Pennsylvania State University Press, 2008. K. Allen, *Entrepreneurship for scientists and engineers*, Upper Saddle River, N.J. : Prentice Hall, 2010. The Hong Kong Institution of Engineers, "Engineering Our City", Youtube clip ref. no. nYMmI6vlVeQ HKIE Corporate Video, Youtube clip ref. no. lNMVl8MuNEY	

June 2016

Subject Description Form

Subject Code	AF3625
Subject Title	Engineering Economics
Credit Value	3
Level	3
Normal Duration	1-semester
Pre-requisite / Co-requisite/ Exclusion	**Exclusion**: AF2618
Objectives	This subject aims to equip students with 1. the fundamental concepts of micro- and macroeconomics related to the engineering industry; 2. the fundamental understanding of finance and costing for engineering operations, budgetary planning and control.
Intended Learning Outcomes	Upon successful completion of this subject, students will be able to: a. understand how the relevant economic factors shape the environment within which an engineering company operates; b. evaluate the financial condition of a company based on the financial statements; c. apply the basic cost accounting techniques in the planning and control of engineering and production activities.
Subject Synopsis/ Indicative Syllabus	**Economic Environment of a Firm** **Microeconomic Factors** Scarcity, choice and opportunity cost; Demand, supply and price; Profit-maximizing behavior of the firm; Organization of industry: perfect competition, monopoly and oligopoly **Macroeconomic Factors** Government interventions: fiscal policy and monetary policy; International trade and globalization **Accounting and Engineering Economics** Financial statements; Financial ratio analysis; Return on investment; Composition of cost; Cost-volume-profit analysis; Accounting profit versus economic profit **Fundamentals of Budgetary Planning and Control** Principle types of budgets for production and service operations; Approaches to budgeting and the budgeting process; Investment and source of finance; Cost of capital; Evaluation of investment alternatives
Teaching/Learning Methodology	The two-hour lecture each week focuses on the introduction and explanation of key concepts of Engineering Economics. The one-hour tutorial provides students with directed studies to enhance their self-learning capacities. Individual and group activities including discussions and presentations are conducted to facilitate students'

<table>
<tr><td></td><td>understanding and application of the concepts they have learned to tackling real-life problems in Engineering Economics.</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="5">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></tr>
<tr><td>Continuous Assessment</td><td>50%</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>1. In-class activities</td><td>15%</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>2. Written assignments</td><td>15%</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>3. Test</td><td>20%</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>Final Examination</td><td>50%</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="5"></td></tr>
</table>
To pass this subject, students are required to obtain Grade D or above in <u>both</u> the Continuous Assessment and Examination components.
</td></tr>
<tr><td>Student Study Effort Required</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>26 Hrs.</td></tr>
<tr><td>▪ Tutorial</td><td>13 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Study and self-learning</td><td>48 Hr.</td></tr>
<tr><td>▪ Written assignments</td><td>18 Hr.</td></tr>
<tr><td>Total student study effort</td><td>105 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>Recommended Textbooks
Parkin and Bade, 2015, Foundations of Microeconomics, 7th Edition, Pearson.
Sullivan, Wicks and Koelling, 2014, Engineering Economy, 16th Edition, Pearson.
References
Drury, Colin, 2008, Management and Cost Accounting, 7th Edition, Cengage Learning.
Frank, Robert H., 2007, The Economic Naturalist: Why Economics Explain Almost Everything? Basic Books.</td></tr>
</table>

Updated August 2016

Subject Description Form

Subject Code	AMA1110
Subject Title	Basic Mathematics I – Calculus and Probability & Statistics
Credit Value	3
Level	1
Pre-requisite	Nil
Objectives	This subject aims to introduce students to the basic concepts and applications of elementary calculus and statistics. Emphasis will be on the understanding of fundamental concepts and the use of mathematical techniques in handling practical problems in science and engineering.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: (a) apply analytical reasoning to solve problems in science and engineering; (b) make use of the knowledge of mathematical/statistical techniques and adapt known solutions to various situations; (c) apply mathematical modeling in problem solving; (d) demonstrate abilities of logical and analytical thinking.
Subject Synopsis/ Indicative Syllabus *(Note 2)*	Elementary calculus: Limit and continuity, derivatives and their geometric meaning, rules of differentiation including chain rule, Leibniz's rule and L'Hopital's rule, exponential and logarithmic functions, trigonometric functions and their inverses, hyperbolic and inverse hyperbolic functions, applications of differential calculus. Elementary Probability and Statistics: Descriptive statistics, random variables, probability and probability distributions, binomial, Poisson and normal distributions, applications. Population and random samples. Sampling distributions related to sample mean, sample proportions, and sample variances. Concepts of a point estimator and a confidence interval. Point and interval estimates of a mean and the difference between two means.
Teaching/Learning Methodology *(Note 3)*	Basic concepts and elementary techniques of differential and integral calculus, elementary statistics and linear algebra will be taught in lectures. These will be further enhanced in tutorials through practical problem solving.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1.Homework, quizzes and mid-term test	40%	✓	✓	✓	✓
2. Examination	60%	✓	✓	✓	✓
Total	100 %				

Continuous Assessment comprises of assignments, in-class quizzes, online quizzes and a mid-term test. An examination is held at the end of the semester.

Questions used in assignments, quizzes, tests and examinations are used to assess students' level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering.

To pass this subject, students are required to obtain grade D or above in both the continuous assessment and the examination components.

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

The subject focuses on understanding of basic concepts and application of techniques in differential/integral calculus, elementary statistics and elementary linear algebra. As such, an assessment method based mainly on examinations/tests/quizzes is considered appropriate. Furthermore, students are required to submit homework assignments regularly in order to allow subject lecturers to keep track of students' progress in the course.

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Homework and self-study	81 Hrs.
Total student study effort	120 Hrs.

Reading List and References	Chung, K.C. *A Short Course in Calculus and Matrices*, McGraw Hill 2013 Hung, K.F., Kwan, Wilson, Pong, T.Y. *Foundation Mathematics & Statistics*, McGraw Hill 2013 Larson, R., Edwards, B. *Single Variable Calculus*, Brooks/Cole 2012 Walpole, R.E., Myers, R.H., Myers, S.L. Ye, K. *Probability and Statistics for Engineers and Scientists*, Prentice Hall, 2012

Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon completion of the subject. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/ Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time over-crowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method purports to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.

Subject Description Form

Subject Code	AMA1120
Subject Title	Basic Mathematics II –Calculus and Linear algebra
Credit Value	3
Level	1
Pre-requisite	Basic Mathematics I – Calculus and Probability & Statistics (AMA1110)
Objectives	This subject aims to introduce students to the basic concepts and applications of elementary calculus and statistics. Emphasis will be on the understanding of fundamental concepts and the use of mathematical techniques in handling practical problems in science and engineering.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: (a) apply analytical reasoning to solve problems in science and engineering; (b) make use of the knowledge of mathematical/statistical techniques and adapt known solutions to various situations; (c) apply mathematical modeling in problem solving; (d) demonstrate abilities of logical and analytical thinking.
Subject Synopsis/ Indicative Syllabus *(Note 2)*	Elementary calculus: Mean Value Theorem with applications to optimization and curve sketching. Definite and indefinite integrals, fundamental theorem of calculus, methods of integration (integration by substitution, integration by parts, integration of rational functions using partial fractions and integration of trigonometric and hyperbolic functions), reduction formulas, applications to geometry and physics. Improper Integrals. Linear algebra: Basic properties of matrices and determinants, linear systems, Gaussian elimination, inverse of a square matrix, Cramer's rule, vectors in 2-space or in 3-space, applications to geometry.
Teaching/Learning Methodology *(Note 3)*	Basic concepts and elementary techniques of differential and integral calculus and linear algebra will be taught in lectures. These will be further enhanced in tutorials through practical problem solving.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1.Homework, quizzes and mid-term test	40%	✓	✓	✓	✓
2. Examination	60%	✓	✓	✓	✓
Total	100 %				

Continuous Assessment comprises of assignments, in-class quizzes, online quizzes and a mid-term test. An examination is held at the end of the semester.

Questions used in assignments, quizzes, tests and examinations are used to assess students' level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering.

To pass this subject, students are required to obtain grade D or above in both the continuous assessment and the examination components.

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

The subject focuses on understanding of basic concepts and application of techniques in differential/integral calculus, elementary statistics and elementary linear algebra. As such, an assessment method based mainly on examinations/tests/quizzes is considered appropriate. Furthermore, students are required to submit homework assignments regularly in order to allow subject lecturers to keep track of students' progress in the course.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Homework and self-study	81 Hrs.
	Total student study effort	120 Hrs.

Reading List and	
	Chung, K.C. *A Short Course in Calculus and Matrices*, McGraw Hill 2013

References	Hung, K.F., Kwan, Wilson, Pong, T.Y. *Foundation Mathematics & Statistics*, McGraw Hill 2013 Larson, R., Edwards, B. *Single Variable Calculus*, Brooks/Cole 2012 Larson, R. *Elementary Linear Algebra*, Brooks/Cole 2013

Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon completion of the subject. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/ Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time over-crowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method purports to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.

Subject Description Form

Subject Code	AMA2111
Subject Title	Mathematics I
Credit Value	3
Level	2
Pre-requisite	Calculus I (AMA1101) or Calculus IA (AMA1102) or Basic Mathematics II – Calculus and Linear Algebra (AMA1120) or Foundation Mathematics for Accounting and Finance (AMA1500)
Co-requisite/ Exclusion	**Exclusion:** Intermediate Calculus and Linear Algebra (AMA2007), Mathematics for Engineers (AMA2308), Engineering Mathematics (AMA2380), Applied Mathematics I (AMA2511), Mathematics for Scientists and Engineers (AMA2882), Engineering Mathematics (AMA290)
Objectives	This subject aims to introduce students to the basic principles and techniques of engineering mathematics. Emphasis will be on the understanding of fundamental concepts as well as applications of mathematical methods in solving practical problems in science and engineering.
Intended Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. apply mathematical reasoning to analyze essential features of different problems in science and engineering; 2. extend their knowledge of mathematical and numerical techniques and adapt known solutions in various situations; 3. develop and extrapolate the mathematical concepts in synthesizing and solving new problems 4. demonstrate abilities of logical and analytical thinking; 5. search for useful information in the process of problem solving.
Subject Synopsis/ Indicative Syllabus	1. <u>Algebra of complex numbers</u> Complex numbers, geometric representation, complex exponential functions, n-th roots of a complex number. 2. <u>Linear algebra</u> Review of matrices, determinants and systems of linear equations, vector

Subject Description Form

Subject Code	AP10001
Subject Title	Introduction to Physics
Credit Value	3
Level	1
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This is a subject designed for students with no background in physics studies. Fundamental concepts in major topics of physics (mechanics, heat, wave and electromagnetism) will be discussed. The aim of this subject is to equip students with some basic physics knowledge, and to appreciate its applications in various branches of science and technology.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) solve simple problems in kinematics Newton's law and Energy; (b) solve problems in heat capacity and latent heat; (c) explain phenomena related to the wave character of light; (d) apply the superposition of waves; (e) understand electrostatic field and potential; (f) solve problems on interaction between current and magnetic field; and (g) describe and demonstrate the phenomenon of electromagnetism.
Subject Synopsis/ Indicative Syllabus	**Mechanics**: scalars and vectors; kinematics and dynamics; Newton's laws; momentum, impulse, work and energy; conservation of momentum and conservation of energy. **Thermal physics**: heat and internal energy; heat capacity; conduction, convection and radiation; latent heat. **Waves**: nature of waves; wave motion; reflection and refraction; image formation by mirrors and lenses; superposition of waves; standing waves; diffraction and interference; electromagnetic spectrum; sound waves. **Electromagnetism**: charges; Coulomb's law; electric field and potential; current and resistance; Ohm's law; magnetic field; magnetic force on moving charges and current-carrying conductors; Faraday's law and Lenz's law.
Teaching/Learning Methodology	**Lecture**: Fundamentals in mechanics, waves and electromagnetism will be explained. Examples will be used to illustrate the concepts and ideas in the lecture. Students are free to request help. Homework problem sets will be given. **Student-centered Tutorial**: Students will work on a set of problems in tutorials. Students are encouraged to solve problems and to use their own knowledge to verify

their solutions before seeking assistance. These problem sets provide them opportunities to apply their knowledge gained from the lecture. They also help the students to consolidate what they have learned. Furthermore, students can develop a deeper understanding of the subject in relation to daily life phenomena or experience.

e-learning: In order to enhance the effectiveness of teaching and learning processes, electronic means and multimedia technologies would be adopted for presentations of lectures; communication between students and lecturer; delivery of handouts, homework and notices etc.

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	g
(1) Continuous assessment	40	✓	✓	✓	✓	✓	✓	✓
(2) Examination	60	✓	✓	✓	✓	✓	✓	✓
Total	100							

Continuous assessment:
The continuous assessment includes assignments, quizzes and test(s) which aim at checking the progress of students study throughout the course, assisting them in fulfilling the learning outcomes.
Assignments in general include end-of-chapter problems, which are used to reinforce and assess the concepts and skills acquired by the students; and to let them know the level of understanding that they are expected to reach.
At least one test would be administered during the course of the subject as a means of timely checking of learning progress by referring to the intended outcomes, and as means of checking how effective the students digest and consolidate the materials taught in the class.

Examination: This is a major assessment component of the subject. It would be a closed-book examination. Complicated formulas would be given to avoid rote memory, such that the emphasis of assessment would be put on testing the understanding, analysis and problem solving ability of the students.

Student Study Effort Expected

Class contact:	
• Lecture	33 h
• Tutorial	6 h
Other student study effort:	
• Self-study	81 h
Total student study effort	120 h

Reading List and References

John D. Cutnell & Kenneth W. Johnson, **Introduction to Physics**, 9th edition, 2013, John Wiley & Sons.

Hewitt, **Conceptual Physics**, 11th edition, 2010, Benjamin Cummings.

<table>
<tr><td></td><td>spaces, inner product and orthogonality, eigenvalues and eigenvectors, applications.

3. <u>Ordinary differential equations</u>
ODE of first and second order, linear systems, Laplace transforms, Convolution theorem, applications to mechanical vibrations and simple circuits.

4. <u>Differential calculus of functions of several variables</u>
Partial derivatives, total differential, chain rule, Taylor's expansion, maxima and minima, directional derivatives, Lagrange multipliers, implicit differentiation, applications.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>The subject will be delivered mainly through lectures and tutorials. The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. Tutorials will mainly be used to develop students' problem solving ability.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific assessment methods/tasks</th><th rowspan="2">% weighting</th><th colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr>
<tr><td>1.Homework, quizzes and mid-term test</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="5"></td></tr>
</table>

Continuous Assessment comprises of assignments, in-class quizzes, online quizzes and a mid-term test. An examination is held at the end of the semester.

Questions used in assignments, quizzes, tests and examinations are used to assess students' level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering.

To pass this subject, students are required to obtain grade D or above in both the continuous assessment and the examination components.</td></tr>
</table>

	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: *The subject focuses on understanding of basic concepts and application of techniques in engineering mathematics. As such, an assessment method based mainly on examinations/tests/quizzes is considered appropriate. Furthermore, students are required to submit homework assignments regularly in order to allow subject lecturers to keep track of students' progress in the course.*	
Student Study Effort Expected	**Class contact:**	
	• Lecture	26 Hours
	• Tutorial	13 Hours
	• Mid-term test and examination	
	Other student study effort	
	• Assignments and Self study	78 Hours
	Total student study effort:	**117 Hours**
Reading List and References	1. C.K. Chan, C.W. Chan and K.F. Hung, *Basic Engineering Mathematics*, McGraw-Hill, 2015. 2. Anton, H. *Elementary Linear Algebra* (11th edition). Wiley, 2014. 3. Kreyszig, E. (2011). *Advanced Engineering Mathematics*, 10th ed. Wiley. 4. James, G. (2015). *Modern Engineering Mathematics*, 5th ed. Pearson Education Limited 5. Thomas, G. B., Weir, M. D. & Hass, J. R. *Thomas' Calculus*, 13th ed. Pearson Education 2014	

Subject Description Form

Subject Code	AP10005
Subject Title	Physics I
Credit Value	3
Level	1
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This course provides a broad foundation in mechanics and thermal physics to those students who are going to study science, engineering, or related programmes.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) solve simple problems in single-particle mechanics using calculus and vectors; (b) solve problems in mechanics of many-particle systems using calculus and vectors; (c) understand simple harmonic motion and solve simple problems; (d) solve problems related to acoustic standing waves; (e) calculate changes in frequency received due to Doppler's effect; (f) apply ideal gas laws to solve problems; (g) apply the first law of thermodynamics to simple processes; and (h) solve simple problems related to the cyclic processes.
Subject Synopsis/ Indicative Syllabus	**Mechanics**: calculus-based kinematics, dynamics and Newton's laws; calculus-based Newtonian mechanics, involving the application of impulse, momentum, work and energy, etc.; conservation law; gravitational force; systems of particles; collisions; rigid body rotation; angular momentum; oscillations and simple harmonic motion; pendulum; statics; longitudinal and transverse waves; travelling wave and standing wave; Doppler effect; sound waves and beats. **Thermal physics**: conduction, convection and radiation; black body radiation; ideal gas and kinetic theory; work, heat and internal energy; first law of thermodynamics; entropy and the second law of thermodynamics; Carnot cycle; heat engine and refrigerators.
Teaching/Learning Methodology	**Lecture**: Fundamentals in mechanics, waves and electromagnetism will be explained. Examples will be used to illustrate the concepts and ideas in the lecture. Students are free to request help. Homework problem sets will be given. **Student-centered Tutorial**: Students will work on a set of problems in tutorials. Students are encouraged to solve problems and to use their own knowledge to verify their solutions before seeking assistance. These problem sets provide them opportunities to apply their knowledge gained from the lecture. They also help the students to consolidate what they have learned. Furthermore, students can develop a deeper understanding of the subject in relation to daily life phenomena or experience. **e-learning**: In order to enhance the effectiveness of teaching and learning processes, electronic means and multimedia technologies would be adopted for presentations of lectures; communication between students and lecturer; delivery of handouts, homework and notices etc.

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	g	h
(1) Continuous assessment	40	✓	✓	✓	✓	✓	✓	✓	✓
(2) Examination	60	✓	✓	✓	✓	✓	✓	✓	✓
Total	100								

Continuous assessment:
The continuous assessment includes assignments, quizzes and test(s) which aim at checking the progress of students' study throughout the course, assisting them in fulfilling the learning outcomes.
Assignments in general include end-of-chapter problems, which are used to reinforce and assess the concepts and skills acquired by the students; and to let them know the level of understanding that they are expected to reach.
At least one test would be administered during the course of the subject as a means of timely checking of learning progress by referring to the intended outcomes, and as means of checking how effective the students digest and consolidate the materials taught in the class.

Examination: This is a major assessment component of the subject. It would be a closed-book examination. Complicated formulas would be given to avoid rote memory, such that the emphasis of assessment would be put on testing the understanding, analysis and problem solving ability of the students.

Student Study Effort Expected

Class contact:	
• Lecture	33 h
• Tutorial	6 h
Other student study effort:	
• Self-study	81 h
Total student study effort:	120 h

Reading List and References

John W. Jewett and Raymond A. Serway, "Physics for Scientists and Engineers", 2014, 9th edition, Brooks/Cole Cengage Learning.

Hafez A. Radi, John O. Rasmussen, "Principles of physics: for scientists and engineers", 2013, Springer.

W. Bauer and G.D. Westfall, "University Physics with Modern Physics", 2011, McGraw-Hill.

Subject Description Form

Subject Code	AP10006
Subject Title	Physics II
Credit Value	3
Level	1
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with fundamental knowledge in physics focusing on the topics of waves and electromagnetism. This course prepares students to study science, engineering or related programmes.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) apply simple laws in optics to explain image formation; (b) understand phenomena related to the wave character of light; (c) solve problems in electrostatics; (d) solve problems on interaction between current and magnetic field; (e) apply electromagnetic induction to various phenomena; and (f) solve problems in simple circuits.
Subject Synopsis/ Indicative Syllabus	**Waves and optics**: nature of light, reflection and refraction; Snell's law; image formation by mirrors and lenses; compound lens; microscope and telescope; superposition of waves; Huygen's principle; interference and diffraction; diffraction grating; Rayleigh's criterion and optical resolution; polarization. **Electromagnetism**: charge and Field; Coulomb's law and Gauss' law; electrostatic field and potential difference; capacitors and dielectric; current and resistance; Ohm's law; electromotive force, potential difference; Lorentz force; magnetic force on moving charges and current; Hall effect; Biot-Savart law and Ampere's law; Faraday's law and Lenz's law; induction; transformers; AC circuits and applications.
Teaching/Learning Methodology	**Lecture**: The fundamentals in optics and electromagnetism will be explained. Examples will be used to illustrate the concepts and ideas in the lecture. Students are free to request help. Homework problem sets will be given. **Student-centered Tutorial**: Students will work on a set of problems in tutorials. Students are encouraged to solve problems and to use their own knowledge to verify their solutions before seeking assistance. These problem sets provide them opportunities to apply their knowledge gained from the lecture. They also help the students to consolidate what they have learned. Furthermore, students can develop a deeper understanding of the subject in relation to daily life phenomena or experience. **e-learning**: In order to enhance the effectiveness of teaching and learning processes, electronic means and multimedia technologies would be adopted for presentations of lectures; communication between students and lecturer; delivery of handouts, homework

<table>
<tr><td></td><td>and notices etc.</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="7">Intended subject learning outcomes to be assessed
(Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td></td></tr>
<tr><td>(1) Continuous assessment</td><td>40</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>(2) Examination</td><td>60</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Total</td><td>100</td><td colspan="7"></td></tr>
</table>
Continuous assessment:
The continuous assessment includes assignments, quizzes and test(s) which aim at checking the progress of students' study throughout the course, assisting them in fulfilling the learning outcomes.
Assignments in general include end-of-chapter problems, which are used to reinforce and assess the concepts and skills acquired by the students; and to let them know the level of understanding that they are expected to reach.
At least one test would be administered during the course of the subject as a means of timely checking of learning progress by referring to the intended outcomes, and as means of checking how effective the students digest and consolidate the materials taught in the class.

Examination: This is a major assessment component of the subject. It would be a closed-book examination. Complicated formulas would be given to avoid rote memory, such that the emphasis of assessment would be put on testing the understanding, analysis and problem solving ability of the students.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>• Lecture</td><td>33 h</td></tr>
<tr><td>• Tutorial</td><td>6 h</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Self-study</td><td>81 h</td></tr>
<tr><td>Total student study effort</td><td>120 h</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>John W. Jewett and Raymond A. Serway, "Physics for Scientists and Engineers", 2014, 9th edition, Brooks/Cole Cengage Learning.

Hafez A. Radi, John O. Rasmussen, "Principles of physics: for scientists and engineers", 2013, Springer.

W. Bauer and G.D. Westfall, "University Physics with Modern Physics", 2011, McGraw-Hill.</td></tr>
</table>

Subject Description Form

<table>
<tr><td>Subject Code</td><td>BME31125</td></tr>
<tr><td>Subject Title</td><td>Biomechanics</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>3</td></tr>
<tr><td>Pre-requisite / Co-requisite/ Exclusion</td><td>Pre-requisite: BME2119 Fundamentals of Biomechanics, or equivalent</td></tr>
<tr><td>Objectives</td><td>Biomechanics is one of the most important supporting subjects for the principles and practices of health technology. This subject aims to apply the mechanical principles extensively in the biomechanical context.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:

1. Apply statics, kinematics and kinetics to load and motion analysis for human body supports and musculoskeletal system;
2. Explain how our bodies, in particular the musculoskeletal system, function
3. Demonstrate understanding of tissue properties, especially viscoelasticity
4. Describe the structure-property-function relationship of biological tissues.</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td>Fundamentals of mechanics, inverse dynamics, human joint load analysis, fundamentals of human movement analysis, application to musculoskeletal system and body support system, mechanical properties of biological tissues (bone, muscle, tendon, ligament, and other connective tissues), viscoelasticity, bone fracture and fixation, responses of biological tissues to their mechanical environment, and stress-strain relationship.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>There will be lectures and tutorials dealing with fundamental mechanics and application examples on human body. Students' knowledge is tested by home assignments, lab report, midterm quiz, and final examination.</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>d</td><td>e</td><td></td></tr>
<tr><td>1. Continuous assessment (including home assignments and class quiz)</td><td>40</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>2. Final examination</td><td>60</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
</table>
</td></tr>
</table>

	Note: To pass this subject, students must obtain grade D or above in both continuous assessment and final examination Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: All the continuous assessments and final examination will be designed to assess the three outcomes.	
Student Study Effort Required	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study effort:	
	▪ Self-study	54 Hrs.
	▪ Assignments and preparation for presentation	39 Hrs.
	Total student study effort	135 Hrs.
Reading List and References	1. Nordin M and Frankel VH, ed., Basic Biomechanics of the Musculoskeletal System, Lea & Febiger, Philadelphia, 1989 or 2001 2. Ozkaya N and Nordin M, Fundamentals of Biomechanics: Equilibrium, Motion, and deformation, Van Nostrand Reinhold, New York, 1999. 3. Nigg BM and Herzog W, Biomechanics of the Musculoskeletal System, Wiley, New York, 2008. 4. Mow VC and Hayes WC, Basic Orthopaedic Biomechanics, Raven Press, New York, 1991. 5. Riley WF, Sturges LD and Morris DH, Statics and Mechanics of Materials, John Wiley & Sons Inc., 1996.	

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。	

Subject Description Form

Subject Code	EE2901S
Subject Title	Basic Electricity and Electronics
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To introduce the basic concepts and fundamental principles of electric circuits and electric machines applicable to ME students. 2. To develop an ability for solving problems involving electric circuits and electric machines. 3. To develop skills for experimentation on electric circuits. 4. To impart relevant skills and knowledge in basic electricity and electronics for independent learning of other subjects that requires such skills and knowledge.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. Understand the basic concepts of dc and ac electric circuits. 2. Solve simple problems using circuit analysis techniques. 3. Understand the fundamental principles of analog electronic and digital logic circuits. 4. Understand the operating principles of electric machines. 5. Use suitable instrumentation to carry out experimental investigations and to validate the theoretical investigations.
Subject Synopsis/ Indicative Syllabus	**DC Circuit Analysis —** Basic electric quantities: charge, potential, current, voltage and power. Sign conversion. Lumped circuit elements. Linear resistor, Ohm's law and simple resistor circuits: series and parallel circuits, voltage and current dividers. Voltage and current sources: ideal and practical sources, independent and dependent sources. Power absorption and delivery. Network description: branch, node, loop and mesh. Kirchhoff's voltage and current laws. Tellegen's theorem. Mesh-current and node-voltage methods. Thévenin and Norton theorems. Source loading and maximum power transfer. **AC Circuit Analysis —** Time-dependent and sinusoidal sources. Periodic signals. Average and rms values. Steady-state analysis: sinusoidal function of time. Phasors and phasor diagrams. Impedance and admittance. Steady-state analysis: phasor approach. Instantaneous, average and complex powers. Power factor. Three-phase power and circuits. **First-Order Transients —** Constitutive relations of capacitors and inductors. Introduction to time-varying circuits. Simple *RC* and *LC* circuits. Independent state variables. First-order differential equation (with solution in exponential form). First-order transient analysis. Time-domain solution and transient behavior of first-order circuits. Time constant. **Basic Analog Electronic Circuits —** P-N junction diodes and diode circuits: basic structure and symbol, ideal *I–V* characteristics, breakdown characteristics, analysis of basic diode circuits, specific diode circuits. Bipolar junction transistors (BJTs) and BJT amplifiers: basic structure and symbol, linear analog amplifiers, basic BJT amplifiers, modes of operation of BJTs, dc equivalent circuit and analysis, load line and Q-point, various dc biasing schemes.

Digital Logic Circuits — Binary number systems: addition, subtraction, multiplication and division. Conversion between binary and decimal numbers. Two's complement. Boolean algebra. Basic logic gates. Karnaugh maps. Combinational logic circuit design.

Electric Machines — Basic coupled inductance equation. Concept of ideal transformer. Dot conversion. Applications in voltage/current level conversion and galvanic isolation. DC machines: construction, generator and motor actions, electromotive force, torque equations. Three-phase induction motors: construction, generation of rotating magnetic fields, torque-slip curves.

Laboratory Experiments:

1. EE2901S-E01: Kirchhoff's Laws, Equivalent Resistance and The Maximum Power Transfer Theorem.
2. EE2901S-E02: Use of NAND Gates.
3. EE2901S-E03: Transients in *RC* Circuits.

Teaching/Learning Methodology

Lecture: Students are introduced to the knowledge of the subject and the comprehension is strengthened with interactive Q&A (outcomes 1 to 4).

In-class Practice: Students apply what they have learnt in solving the problems in the class (outcomes 1 to 4).

Assignment: Students will develop a firm understanding and comprehension of the knowledge taught (outcomes 1 to 4).

Laboratory: Students acquire hands-on experience in using electronic equipment and apply what they have learnt in the class to experimentally validate the theoretical investigations (outcome 5).

Teaching/Learning Methodology	Outcome				
	1	2	3	4	5
Lecture	✓	✓	✓	✓	
In-class Practice	✓	✓	✓	✓	
Assignment	✓	✓	✓	✓	
Laboratory					✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended learning outcomes to be assessed				
		1	2	3	4	5
Continuous Assessment	50%	✓	✓	✓	✓	✓
Examination	50%	✓	✓	✓	✓	
Total	100%					

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

Overall Assessment:

$$0.5 \times \text{Continuous Assessment} + 0.5 \times \text{End of Subject Examination}$$

	Continuous Assessment covers all intended learning outcomes 1 to 5, while examination involves intended learning outcomes 1 to 4. Continuous Assessment (50%) contains Assignment (15%), Test (20%) and Laboratory Logs & Report (15%). Examination (50%) is in form of a three-hour, closed book, end-of-subject examination. Continuous Assessment is able to provide timely feedbacks to students on various topics of syllabus, including their assignment works, laboratory skills, usages of appropriate equipment and data analysis on experiment results, etc. Examination is able to assess their overall understanding and ability of applying the concepts.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	24 Hrs.
	▪ In-class Practice	6 Hrs.
	▪ Laboratory	9 Hrs.
	Other student study effort:	
	▪ Self-study	32 Hrs.
	▪ Assignment	12 Hrs.
	▪ Laboratory logbook & report writing	8 Hrs.
	Total student study effort	91 Hrs.
Reading List and References	**Textbooks:** 1. G. Rizzoni, *Principles and Applications of Electrical Engineering*, 5th Edition, New York: McGraw-Hill (2006). 2. Donald A. Neamen, *Microelectronics: Circuit Analysis and Design*, 3rd Edition, Boston: McGraw-Hill (2006). **References:** 1. W. H. Hayt, J. E. Kemmerly, and S. M. Durbin, *Engineering Circuit Analysis*, 7th Edition, New York: McGraw-Hill (2006). 2. A. H. Robbins and W. C. Miller, *Circuit Analysis: Theory and Practice*, 4th Edition, Thomson Learning (2006). 3. C. K. Tse, *Linear Circuit Analysis*, London: Addison-Wesley (1998). 4. R. A. DeCarlo and P. M. Lin, *Linear Circuit Analysis*, 2nd Edition, Oxford University Press (2001).	

June 2016

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	ENG2001
Subject Title	Fundamentals of Materials Science and Engineering
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	1. To realize the impact of the development of engineering materials on human civilization; 2. To enable students to establish a broad knowledge base on the structure and properties of materials for solving engineering problems. 3. To enable students to understand the applications and selection of engineering materials based on the consideration of properties, cost, ease of manufacture, environmental issues and their in service performance.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. comprehend the importance of materials in engineering and society; b. explain the properties and behaviour of materials using fundamental knowledge of materials science. c. apply the knowledge of materials science to analyze and solve basic engineering problems related to stress, strain and fracture of materials; d. select appropriate materials for various engineering applications taking into consideration of issues in cost, quality and environmental concerns.
Subject Synopsis/ Indicative Syllabus	1. <u>Introduction</u> Historical perspective; Evolution of engineering materials; Materials science and engineering; Classification of materials 2. <u>Atomic Structure and Structures of Materials</u> Atomic structure; Bonding forces and energies; Primary interatomic bonds and secondary bonding; Crystalline and non-crystalline materials; Phase diagram and microstructure of alloys 3. <u>Electrical and Optical Properties of Materials</u> Conductors and insulators; Semi-conductor materials; N-type and P-type semiconductors; P/N junction; Light interactions with materials; Light emitting diode (LED) and photovoltaics; Light propagation in optical fibers; Liquid crystal; Photoelasticity

4. Mechanical Properties of Materials
   Concept of stress and strain; Stress-strain behaviour; Elastic and plastic properties of materials; Concepts of dislocations and strengthening mechanisms; Tensile properties; Elastic recovery after plastic deformation; Hardness; Stress concentration; Impact energy, Fracture toughness; Design and safety factors

5. Introduction to Failure Analysis and Prevention
   Fundamentals of fracture: ductile, brittle, fatigue and creep; Corrosion; Nondestructive testing; Techniques for failure analysis and prevention

6. Selection of Engineering Materials
   Characteristics of metallic, polymeric, ceramic, electronic and composite materials; Economic, environmental and recycling issues

Teaching/Learning Methodology

The subject will be delivered mainly through lectures but tutorials, case studies and laboratory work will substantially supplement which. Practical problems and case studies of material applications will be raised as a focal point for discussion in tutorial classes, also laboratory sessions will be used to illustrate and assimilate some fundamental principles of materials science. The subject emphasizes on developing students' problem solving skills.

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. Assignments	15%	√	√	√	√		
2. Test	20%		√	√	√		
3. Laboratory report	5%		√	√			
3. Examination	60%		√	√	√		
Total	100 %						

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

The assignments are designed to reflect students' understanding of the subject and to assist them in self-monitoring of their progress.

The laboratory report is designed to assess the capability of students in analyzing and reporting experimental data relates to learning outcome (b).

The test and examination are for determining students' understanding of key concepts as well as for assessing their achievement of the learning outcomes.

Student Study Effort Expected	Class contact:	
	▪ Lectures, tutorials, practical	39Hrs.
	Other student study effort:	
	▪ Guided reading, assignments and reports	37Hrs.
	▪ Self-study and preparation for test and examination	47Hrs.
	Total student study effort	123Hrs.
Reading List and References	1. William D. Callister, Jr., David G. Rethwisch, *Fundamentals of materials science and engineering*, 4th edition, *E-Text* John Wiley & Sons; ISBN: 978-1-118-53126-6 2. William D. Callister, Jr., David G. Rethwisch, *Materials Science and Engineering*, 8th edition, *E-Text* John Wiley & Sons; ISBN: 978-1-118-37325-5 3. Materials World (Magazine of the Institute of Materials, Minerals and Mining)	

Revised (April 2014)

Subject Description Form

Subject Code	ENG2003
Subject Title	Information Technology
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	To provide the foundation knowledge in internet applications, computer networks, and database management that is essential to modern information system design
Intended Learning Outcomes	Upon completion of the subject, students will be able to: Category A: Professional/academic knowledge and skills 1. Understand the functions and features of modern computers and operating systems. 2. Understand the client-server architecture and be able to set up multiple internet applications. 3. Understand the principles of computer networks and be able to set up simple computer networks. 4. Understand the basic structure of a database system and be able to set up a simple database system. Category B: Attributes for all-roundedness 1. Solve problems using systematic approaches.
Subject Synopsis/ Indicative Syllabus	1. Introduction to computers Introduction to information technology using Cloud Computing as a real life example. Introduction to modern computers (Personal Computers/Computer Clusters) and operating systems (Resource Management/Privilege Control). 2. Computer Networks Introduction to computer networks (Client-Server Architecture). Study different internet applications (HTTP/FTP/DNS). Explain basic concepts on packet routing (Data Encapsulation/IP Addressing/Functions of Routers). Introduction to basic network security measures. 3. Introduction to data processing and information systems Database systems – architecture, relational database concept, structural query language (SQL), database management systems, Web and database linking, database application development. Introduction to Information systems. Workflow management. Case study: Database design, implementation and management.
Teaching/Learning Methodology	There will be a mix of lectures, tutorials, and laboratory sessions/workshops to facilitate effective learning. Students will be given case studies to understand and practice the usage of modern information systems.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		A1	A2	A3	A4	B1	
1. Continuous Assessment	50%	√	√	√	√	√	
2. Examination	50%	√	√	√	√	√	
Total	100 %						

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

The assessment methods include an end-of-subject examination (50%) and continuous assessment (50%), including quizzes, laboratory sessions/workshops, and assignments. The examination and quizzes cover intended subject learning outcomes A1, A2, A3, A4, and B1. The laboratory sessions/workshops cover intended subject learning outcomes A2, A3, A4, and B1.

The examination is a 2-hour, closed-book examination. Quizzes in lectures and tutorial sessions can be either open-book or closed-book quizzes. The laboratory sessions/workshops give students hands-on experience on setting up internet-applications, building up computer networks, and constructing database.

Student Study Effort Expected

Class contact:	
▪ Lectures (18), tutorials (6), and workshops (15)	39 Hrs.
Other student study effort:	
▪ Workshops preparation (6/workshop)	30 Hrs.
▪ Self study (3/week)	39 Hrs.
Total student study effort	108 Hrs.

Reading List and References

1. B. Williams and S. Sawyer, *Using Information Technology: A Practical Introduction to Computers and Communications*, 10th ed., McGraw-Hill, 2013.
2. J. F. Kurose and K. W. Ross, *Computer Networking: A Top-Down Approach*, 6th ed., Pearson, 2012.
3. D. E. Comer, *Computer Networks and Internets: with Internet Applications*, 5th ed., Prentice-Hall, 2008.
4. B. A. Forouzan, *TCP/IP Protocol Suite*, 4th ed., McGraw-Hill, 2009.
5. W. Stalling, *Data and Computer Communications*, 9th ed., Prentice-Hall, 2011.
6. P. Rob and C. Coronel, *Database Systems: Design, Implementation, and Management*, 9th Edition, Thomson, 2011.
7. M. Mannino, *Database Design, Application Development, & Administration*. 5th ed., McGraw-Hill, 2011.

June 2015

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

<table>
<tr><td></td><td>3. <u>Project Management</u>

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

4. <u>Management of Change</u>

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

5. <u>Effects of Environmental Factors</u>

The effects of extraneous factors on the operations of engineering organizations, such as ethics and corporate social responsibilities issues</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>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.</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></td><td></td></tr>
<tr><td>1. Coursework
• Group learning activities (10%)
• Presentation (individual) (30%)</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>2. Final examination</td><td>60%</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 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.
</td></tr>
</table>

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>

<table>
<tr><td></td><td>Roles of the engineer in energy conservation, ecological balance, and sustainable development

3. Outlook of Hong Kong's Industry

Support organizations and impacts on economic development in Greater China and the Pacific Rim

4. Industrial Health and Safety

The Labour Department and the Occupational Health and Safety Council; Legal dimensions such as contract law and industrial legislation

5. Professional Institutions

Local and overseas professional institutions; Washington Accord and the qualifications and criteria of professional engineers

6. Professional Ethics

Prevention of bribery and corruption; The work of the Independent Commission Against Corruption (ICAC); Social responsibilities of engineers</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>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</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></td><td></td><td></td></tr>
<tr><td>1. Continuous assessment</td><td>60%</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
</table>

	• 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

25.8.2014

<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	ME22002
Subject Title	Integrated Product Development Fundamentals
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students the knowledge for understanding the entire design process and development of a new product through a design project.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Recognize the key steps in integrated product development process including identification of customer needs and market trends, concept generation and realization, assessment of alternative product design concepts, and implementation of the selected design concept. b. Apply the fundamental knowledge of product design project management and manufacturing process. c. Demonstrate team-playing and self-learning abilities and engineering communication skills through drawings and writing.
Subject Synopsis/ Indicative Syllabus	**Design and Planning Processes in Product Development -** Identification of customer needs. Product planning and development process. Formulation of a product design problem. Development of design specifications. Generation and selection of design concept. Design concept realization. Fundamentals of CAD/CAE in product design processes. **Communication in Product Design -** Representing objects and working drawings. Design project presentation skills such as oral presentation, interim and final project reports. **Understanding of Manufacturing Methods and Consideration –** Understanding materials properties, manufacturing methods, manufacturing cost consideration. **Prototyping -** Fabrication with simple hand- and machine-tools.

Teaching/Learning Methodology

This subject aims to arousing students' awareness in multiple issues encountered in product design and development. It also aims at developing interest and curiosity in all relevant subsequent subjects. The subject is taught through a combination of lectures, laboratory and tutorials.

Lectures introduce students basic knowledge in the current practices of product design and manufacturing processes. (Outcomes a – c).

Laboratory works/tutorial exercises provide opportunities for students to learn and practice with the guided study project. (Outcomes a – c).

The intended outcomes are best achieved through implementation of the design project including the prototyping process. (Outcomes a – c)

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lecture	√	√	√
Tutorials / Laboratory works	√	√	√
Project and Prototyping	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
Assignment	25 %	√	√	√
Oral presentation	30 %		√	
Written report	40 %	√	√	√
Prototype making	5 %		√	
Total	100 %			

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

Overall Assessment:

1.0 x Continuous Assessment

Assignment is used to assess the understanding of the students on the entire process and fundamental knowledge involved in the design and development of a new product. The written report is a final report of all the task activities and technical analysis involved in the project. Each group prepares a written report, with individual contributions indicated. Oral presentations are required so that students can orally present the progress and findings.

Student Study Effort Required	Class contact:	
	▪ Lecture	24 Hrs.
	▪ Tutorial/ Case Study	9 Hrs.
	▪ Laboratory/ Workshop	6 Hrs.
	Other student study effort:	
	▪ Preparation and performing project	36 Hrs.
	▪ Workshop practice	18 Hrs.
	▪ Self-study	21 Hrs.
	Total student study effort	114 Hrs.
Reading List and References	1. Baxter, Mike, *Product design : a practical guide to systematic methods of newproduct development*, Chapman & Hall, latest edition. 2. Dym, Clive L, *Engineering design: a project-based introduction*, John Wiley, latest edition. 3. Earle, James H, *Engineering design graphics : AutoCAD*, Prentice Hall, latest edition. 4. Hyman, B, *Fundamentals of engineering design*, Prentice Hall, latest edition. Dieter, G E, *Engineering Design: a materials and processing approach*, McGraw-Hill, latest edition.	

Revised July 2014

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.

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

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

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.	

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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.

<table>
<tr><td></td><td colspan="2">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.</td></tr>
<tr><td rowspan="8">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture and seminar</td><td>33 Hrs.</td></tr>
<tr><td>▪ Tutorial and group discussion</td><td>6 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Performing group project</td><td>25 Hrs.</td></tr>
<tr><td>▪ Conducting case study and assignment</td><td>23 Hrs.</td></tr>
<tr><td>▪ Literature search and private study</td><td>18 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>105 Hrs.</td></tr>
<tr><td>Reading List and References</td><td colspan="2">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.</td></tr>
</table>

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	ME49003
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	MM2711
Subject Title	Introduction to Marketing
Credit Value	3
Level	2
Normal Duration	1-semester
Pre-requisite / Co-requisite/Exclusion	**Exclusion**: Marketing and the Consumer (MM2791) or Introduction to Marketing (MM2B05) or equivalent
Role and Purposes	This core subject introduces the basic principles and concepts of Marketing. It provides an analytical foundation for further study of Marketing and also contributes to the BBA Programme Outcomes in two ways. First, the content directly addresses the creation of value (Outcome 8), ethics (Outcome 4), cultural diversity and globalization (Outcome 2). Second, the classroom activities and assessments develop students' teamwork, ability to communicate in English, analyse business situations by applying relevant conceptual frameworks (Outcomes 10) and creative thinking (Outcome 3).
Subject Learning Outcomes	Upon completion of the subject, students will be able to: (a) Analyse diverse marketing situations and identify marketing opportunities and threats (**BBA Outcomes 2 & 10**); (b) Apply marketing theories and models to practical marketing situations (**BBA Outcome 10**); (c) Evaluate ethical issues from a marketing perspective and suggest appropriate actions (**BBA Outcome 4**); (d) Analyse and/or suggest ways to create value in goods and services and deliver these to customers (**BBA Outcomes 3 and 8**); (e) Critically select and manage information, develop and present coherent arguments on marketing issues.
Subject Synopsis/ Indicative Syllabus	**Overview of Marketing** What is marketing and why is it important? The marketing process **Developing Marketing Strategies and a Marketing Plan** The marketing plan and strategic planning tools **Marketing and Society** Marketing's impact on individual consumers, society and other businesses Marketing ethics and corporate social responsibility **UNDERSTANDING THE MARKET** **Analyzing the Marketing Environment** The company's macro- and micro- environment

	Consumer Behaviour The consumer decision making process Types of buying decision behaviour Factors affecting consumer behaviour: cultural, social, personal, psychological **Business Buying Behaviour** Business to business markets Business buyer behaviour Factors affecting the buying process: buying centre, buying situations Role of the internet in business-to-business marketing **Marketing Research and Information Systems** The marketing research process Marketing information systems **VALUE CREATION** **Market Segmentation, Targeting and Positioning** Benefits of segmentation Segmentation bases The segmentation process The positioning process and repositioning **Product and Services** Product Lifecycle Branding Characteristics of services and their implications for marketing **Price** Considerations affecting pricing decisions Major pricing strategies New product pricing: skimming and penetration pricing Price adjustment strategies **Distribution** Nature and importance of marketing channels Channel design decisions: channel structure, distribution intensity Channel management **Promotion** The communication process AIDA model Importance of integrated marketing communications Designing the promotion mix Setting the promotion budget
Teaching/Learning Methodology	The two-hour weekly lecture aims to guide and promote students' understanding of relevant concepts. The weekly one-hour tutorial activities include discussions on case studies, contemporary marketing topics and journal articles. Students will also work in groups to prepare and make presentations, and to critique the work presented by others. Emphasis is placed throughout on the application of theory to the solution of practical and realistic marketing problems in the local and global setting.

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	
Continuous Assessment	**50%**						
1. Individual essay	15%			✓		✓	
2. Group project(s) and presentation	25%	✓	✓	✓	✓	✓	
3. Individual contribution to class discussions	10%					✓	
Examination	**50%**	✓	✓		✓	✓	
Total	100 %						

**Weighting of assessment methods/tasks in continuous assessment may be different, subject to each subject lecturer.*

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

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: the above methods are designed to ensure that all students -

- Read the recommended material;
- Discuss the issues brought up in the lectures/seminars;
- Appreciate the different approaches that may be adopted in solving marketing problems and
- Participate in presenting the group's views on a case/marketing situation.

Feedback is given to students immediately following the presentations. All students are also invited to join the discussion.

Student Study Effort Required

Class contact:	
▪ Lectures	26Hrs.
▪ Seminars	13 Hrs.
Other student study effort:	
▪ Preparation for tutorials and presentation	26 Hrs.
▪ Reading and essay writing	21 Hrs.
▪ Self study in preparation for exam	40 Hrs.
Total student study effort	126 Hrs.

Reading List and References	***Recommended Textbook*** Kotler, P., Armstrong, G., Ang, S.H., Leong, S.M., Tan, C.T., Yau, O.H.M. (2011) ***Principles of Marketing: An Asian Perspective***, 3rd Edition, Singapore, Pearson Education South Asia. ***References*** Kerin, R. A., Hartley, S. W., Rudelius, W. and Lau, G.T. (2012), ***Marketing in Asia***, Singapore, McGraw-Hill. Grewal, D. and Levy, M. (2012) ***Marketing***, 3rd Edition, New York, McGraw-Hill. Various newspapers, magazines, journal articles and web addresses will be referenced.

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.	

	10. Law, Kenneth Wing-kin (ed.). *Aging, gender and family in Singapore, Hong Kong and China.* Taipei: Programme for Southeast Asian Area Studies Academia Sinica. 2001. 11. Monk, A. *Improving your human computer interface.* New York: Prentice Hall, 1993. 12. Norman, D. A. *The invisible computer.* Cambridge MA: MIT Press, 1998. 13. Norman, D. *The design of everyday things.* New York: Doubleday,1990. 14. Philips, D. R; Yeh, A. (ed.). *Environment and ageing: environmental policy, planning and design for elderly people in Hong Kong.* Hong Kong: Centre of Urban Planning and Environmental Management, University of Hong Kong. 1999. 15. Prikl, J. *Guidelines and strategies for designing transgenerational products: a resource manual for industrial design professionals.* Syracuse, NJ: Syracuse University. 1998. 16. Sanders, M. *Human factors in engineering and design.* New York : McGraw-Hill, 1993. 17. Siu, K. W. M. (ed.). *New era of product design: Theory and practice.* Beijing: Beijing Institute of Technology Press, 2009. 18. Tilley, A. *The Measure of man and woman: Human factors in design.* New York: Whitney Library, 1993. 19. *Trans-generational design: Products for an aging population.* New York: Van Nostrand Reinhold, 1994. **Websites:** 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	ENG4001
Subject Title	Project Management
Credit Value	3
Level	4
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	This subject provides students with knowledge in: 1. project management tools in business organizations, taking into account the time-cost relationships, resources, processes, risks, the project life cycle, organization, and management principles; 2. project management methodologies and their application; 3. choosing project variables for effective project management; and 4. various developments of project management.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. demonstrate good understanding of definition of a project, the characteristics and project life cycle; b. identify appropriate project variables and practices that are applicable to engineering projects; c. perform project planning, cost/resources estimation, evaluate and monitor of project progress. d. propose project management solutions, taking into consideration the project objectives and constraints; and
Subject Synopsis/ Indicative Syllabus	1. <u>Project Overview, Management Principles, and the Systems Approach</u> Characteristics of projects and project management. Management principles. Project organization. Team development. Systems concepts and principles. Conflict management. 2. <u>Project Methodologies and Planning Techniques</u> Constraints: time, cost, and technical performance. Work breakdown structure. Management of scope. Scheduling tools: Gantt charts, network analysis techniques, time-phased networks, CPA, PERT, and resource smoothing. 3. <u>Cost Estimation and Cost Control for Projects</u> Types of estimates. Budgeting project costs. Experience curve. Cost schedules and forecasts. Cost control systems. 4. <u>Evaluation and Control of Projects</u> Earned value measurement system. Managing project risks. Status reporting. Project closeout and termination.

Teaching/Learning Methodology

A mixture of lectures, tutorial exercises, case studies, and laboratory work are used to deliver the various topics in this subject. Some material is covered using a problem-based format where this advances the learning objectives. Other material is covered through directed study to enhance the students' "learning to learn" ability. Some case studies are from best practices of projects, based on a literature review. They are used to integrate the topics and demonstrate to students how the various techniques are interrelated 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. Tutorial exercises/ written report	20%		✓	✓	
2. Mid Term Test	20%	✓	✓	✓	
3. Written examination	60%	✓	✓	✓	✓
Total	100%				

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

Continuous assessment (1) & (2): Test, written reports and tutorial exercises are used to assess students' understanding and application of the knowledge that they have learnt relative to learning outcomes (a), (b) and (c).

Written examination: questions are designed to assess learning outcomes (a), (b), (c), and (d).

Student Study Effort Expected

Class contact:	
▪ Lectures 3 hours/week for 9 weeks	27 Hrs.
▪ Tutorials / Case studies 3 hours/week for 4 weeks	12 Hrs.
	39 Hrs.
Other student study effort:	
▪ Preparation for assignments, short tests, and the written examination	79 Hrs.
Total student study effort	118 Hrs.

Reading List and References

1. Meredith JR and Mantel SJ, 2010, *Project Management: a Managerial Approach*, Wiley, Hoboken NJ
2. Kerzner, H 2009, *Project Management: a Systems Approach to Planning, Scheduling, and Controlling*, John Wiley, New York
3. Smith, NJ (ed.) 2008, *Engineering Project Management*, Blackwell, Oxford

(Revised) July 2015

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 Code	IC2105
Subject Title	Engineering Communication and Fundamentals
Credit Value	4 Training Credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject offers a wide spectrum of fundamental engineering practice that are essential for a professional engineer. This subject includes Engineering Drawing and CAD, Industrial Safety and Electronic Product Safety Test and Practice, Basic Mechatronic Practice and Basic Scientific Computing with MATLAB that aims at providing fundamental and necessary technical skills to all year 1 students interested in engineering.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) Describe the principles and conventional representation of engineering drawings according to engineering standards and be able to use it as a medium in technical communication and documentation with CAD application, modelling and practice with application in mechanical, industrial systems and electrical engineering; b) Interpret basic occupational health and industrial safety requirements for engineering practice; c) Explain common electronic product safety tests; d) Design and implement simple mechatronic systems with programble controller, software, actuation devices, sensing devices and mechanism; and e) Apply scientific computing software for computing in science and engineering including visualization and programming;

Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. (TM8059) Engineering Drawing and CAD 1.1. Fundamentals of Engineering Drawing and CAD Principles of orthographic projection; sectioning; dimensioning; sketching; general tolerances; conventional representation of screw threads and fasteners; types of drawings including part drawing and assembly drawing. Introduction to CAD; features of 2D CAD system (layer; draw; modify; block & attributes; standard library); techniques for the creation of titleblock; setup of 2D plotting; general concepts on 3D computer modeling; parametric feature based solid modeling; construction and detailing of solid features; solid model modification and its limitations; concepts of assembly modeling including bottom up and top down approaches for the generation of parts, subassemblies, and final assembly; virtual validation and simulation, generation of 2D drawings from 3D parts and assemblies; drawing annotation including dimensioning, tolerancing, and part list. 1.2. Electrical Drawing Wiring diagram and wiring table for electronic and electrical installation, functional representation of circuit, system block diagram, electrical and electronic device symbols and layout, architectural wiring diagram with reference to the architectural symbols for electrical drawings in Hong Kong and international standards. 2. (TM2009) Industrial Safety 2.1. Safety Management: Overview, essential elements of safety management, safety training, accident management, and emergency procedures. 2.2. Safety Law: F&IU Ordinance and principal regulations, OSH Ordinance and principal regulations. 2.3. Occupational Hygiene and Environmental Safety: Noise hazard and control; dust hazard and control; ergonomics of manual handling. 2.4. Safety Technology: Mechanical lifting, fire prevention, dangerous substances and chemical safety, machinery hazards and guarding, electrical safety, first aid, job safety analysis, fault tree analysis, personal protective equipment. 3. (TM1116) Electronic Product Safety Test and Practice 3.1 Use of basic electronic test instruments, current and voltage measurements, waveform measurement, power supply and signal

	sources; 3.2 Electronic product safety test method; High Voltage Isolation Test, Insulation Resistance Test, Continuity Test, Leakage Current Measurement, Electrostatic Discharge (ESD) Test. 4. <u>(TM0510) Basic Mechatronic Practice</u> 4.1. Definitions of mechatronics; design and operation of typical mechatronic systems; appreciation of measurement system, actuator system, motor drives, mechanical drives, gear train and linkage, pneumatic and hydraulic systems, signal conditioning, and human-machine interfaces. 4.2. Integration of system components using appropriate controller hardware and software such as PLC, PAC, and Microcontroller system; use of simulation software packages for pneumatic and hydraulic circuit design. 5. <u>(TM3014) Basic Scientific Computing with MATLAB</u> 5.1. Overview to scientific computering; introduction to MATLAB; interactive calculations, random number generators, variables, vectors, matrices and string; mathematical operations, polynomial operation, data analysis and curve fitting, file I/O functions. Basic 2D and 3D plots. 5.2. M-file programming & debugging; scripts, functions, logic operations, flow control, introduction to graphical user interface.
Learning Methodology	The teaching and learning methods include lectures, workshop tutorials, and practical works. The lectures are aimed at providing students with an overall and concrete background knowledge required for understanding key issues in engineering communication, use of standard engineering components and systems, and importance of industrial safety. The workshop tutorials are aimed at enhancing students' in-depth knowledge and ability in applying the knowledge and skills to complete specific tasks. The practical works aim at facilitating students to review the diverse topics covered in this course and perform active learning with research, practice, questioning, and problem solving in a unified activity.

Assessment Methods in Alignment with Intended Learning Outcomes

Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed				
		a	b	c	d	e
Continuous Assessment						
1. Assignment / Project	Refer to individual Module Description Form	✓	✓	✓	✓	✓
2. Test			✓		✓	✓
3. Report / Logbook				✓	✓	
Total	100					

Assessment Methods	Remarks
1. Assignment / Project	The project is designed to facilitate students to reflect and apply the knowledge periodically throughout the training.
2. Test	Test is designed to facilitate students to review the breadth and depth of their understanding on specific topics.
3. Report / Logbook	Report / Logbook is designed to facilitate students to acquire deep understanding on the topics of the training and to present those concepts clearly.

Student Study Effort Expected

Class Contact	**TM8059**	**TM2009**	**TM1116**	**TM0510**	**TM3014**
▪ Mini-lecture	11 Hrs.	7 Hrs.	2 Hrs.	6 Hrs.	6 Hrs.
▪ In-class Assignment/ Hands-on Practice	40 Hrs.	8 Hrs.	4 Hrs.	21 Hrs.	15 Hrs.
Other Study Effort					
▪ Nil					
Total Study Effort					**120 Hrs.**

Reading List and References	**Reference Software List:** 1. AutoCAD from Autodesk Inc. 2. SolidWorks from Dassault Systèmes Solidworks Corp. 3. MATLAB from The Mathworks Inc. **Reference Standards and Handbooks:** 1. BS8888 Technical Product Specification (TPS) Specification. 2. Cecil H. Jensen, et al, Engineering Drawing and Design, McGraw-Hill, 2008. 3. Warrendale, SAE fastener standards manual, Society of Automotive Engineers, 1997. 4. Timothy H Wentzell, et al, Machine Design, Delmar Learning, 2004. 5. Czernik, Daniel, Gaskets: Design, Selection, and Testing, McGraw-Hill, 1995. 6. Michael M. Khonsari, E. Richard Booser, Applied Tribology: Bearing Design and Lubrication, Wiley-Interscience, 2001. 7. IEEE Standard 315 / ANSI Y32.2 / CSA Z99 Graphic Symbols for Electrical and Electronics Diagrams. 8. IEC 61082 Preparation of Documents used in Electrotechnology. **Reference Books:** Training material, manual and articles published by Industrial Centre.

Subject Description Form

Subject Code	IC348
Subject Title	Appreciation of Manufacturing Processes
Credit Value	3 Training Credits
Level	3
Pre-requisite	IC2105
Objectives	This subject aims at developing students' understanding on: - • the principles and operations of common manufacturing processes, and • the properties and application of common materials.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) demonstrate a holistic understanding on the working principle, capability and operation of different manufacturing processes. b) justify appropriate manufacturing processes for specific product requirements. c) select and use various common engineering materials for specific purpose. and d) collaboratively complete an application oriented project through group work and discussions, and discuss current industrial practices and technologies
Subject Synopsis/ Indicative Syllabus	**Outline Syllabus**: 1) Properties and uses of common materials including ferrous metal, non-ferrous metals, and polymers. 2) Working principles and operation of metal removal processes including turning, milling, CNC machining, and electro-discharge machining. 3) Working principles and operation of common production processes including casting methods for metal parts, and plastic injection moulding. 4) Working principles and operation of arc welding and gas welding. 5) Working principles and operation of common sheet metal parts manufacturing processes including blanking, forming, and turret pressing. 6) Working principles, operation, and comparison of surface-finish processes including electro-plating, and aluminium anodising.

<table>
<tr><td></td><td>7) Application of dimensional and geometrical measuring tools.</td></tr>
<tr><td>Learning Methodology</td><td>Min-lectures aim at providing students an understanding of the principles and application of common manufacturing technologies, properties and selection of common engineering materials.

Hands-on activities will be used for students to appreciate the working principles, capability and operation procedures of common manufacturing processes.

Group product assembly will be used to enable students to apply acquired practical knowledge and skills to produce a functional product, and to facilitate students in performing group collaboration and problem solving skills learning.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Assessment Methods</th><th rowspan="2">Weighting (%)</th><th colspan="4">Intended Learning Outcomes Assessed</th></tr>
<tr><th>a</th><th>b</th><th>c</th><th>d</th></tr>
<tr><td>1. Individual Performance</td><td>60</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>2. Product Assembly</td><td>10</td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>3. Individual Report</td><td>30</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="4"></td></tr>
</table>
The Individual Performance is aimed at assessing student’s practical ability in using various processes to produce the components for the product.

The Product Assembly is aimed at assessing student’s group collaboration, organization, time management and problem solving capability.

The individual Report is aimed at assessing student’s appreciation, understanding, and application of all the processes involved in the product.</td></tr>
<tr><td>Student Study Effort Required</td><td>
<table>
<tr><td colspan="2">Class Contact</td></tr>
<tr><td>Min-lecture /Hands-on Practice/ Product Assembly /Report Writing</td><td>90 Hrs.</td></tr>
<tr><td>Other Study Effort</td><td>0 Hrs.</td></tr>
<tr><td>Total Study Effort</td><td>90 Hrs.</td></tr>
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Reading List and References	Reading Materials published by the Industrial Centre : 1. Marking Out, Measurement, Fitting & Assembly 2. Metal Cutting Processes 1-Turning 3. Metal Cutting Processes 2 - Milling 4. Computer Numerical Control (CNC) 5. Foundry Processing 6. Plastics Technology Practice 7. Sheet Metal Fabrication 8. Welding Practice 9. Photo-Chemical Machining (PCM) 10. Surface Finishing

Subject Description Form

Subject Code	IC382
Subject Title	Multidisciplinary Manufacturing Project
Credit Value	3 Training Credits
Level	3
Pre-requisite	IC348 or IC2114 or IC381
Objectives	The subject provides opportunity for students to work in a multidisciplinary project team to accomplish realistic engineering goals. Through the project, students will apply and integrate the engineering knowledge and practical skills acquired from prior engineering subjects and industrial trainings. Students will also be able to analyse engineering problems from multiple perspectives, and synthesize a solution from ideas contributed by teammates of multiple disciplines.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) apply engineering knowledge in carrying out an industrial project starting from problem definition, design, manufacturing, down to assembly, testing and evaluation; b) select and use appropriate technology building blocks, components and manufacturing processes to develop a solution to meet given specifications and constraints; c) Work collaboratively and effectively in a multidisciplinary team to accomplish mutual project goals; and d) Communicate effectively in a multidisciplinary project team.
Contribution of the Subject to the Attainment of Outcomes of EIE Programmes	<u>Category A: Professional/academic knowledge and skills</u> • Design systems, components and processes to meet given specifications and constraints. • Use modern engineering/IT tools appropriate to EIE practice. <u>Category B: Attributes for all-roundedness</u> • Work with others collaboratively in a multi-disciplinary team and have a knowledge of leadership
Subject Synopsis/ Indicative Syllabus	Students will be divided into groups to design and manufacture an engineering product that satisfy an existing demand in IC or a certain customer from the industry. Throughout the project, students will encounter situations that reinforce the following skills: 1) **Project specification**: Identification of client needs and wants; Identification of resource constraints such as time, manpower, equipment, budget; Formulation of project plan. 2) **Engineering design**: Selection of design methodology; collaborative

	design; Make-or-buy decisions; Design prototyping; Testing and simulation. 3) **Product manufacturing:** Material procurement; Component machining; PCB fabrication; Programming; Assembly and fine-tuning. 4) **Project collaboration:** Determination of project stages and milestones; CAD and PDM; Leadership and Collaborative decision making; Tolerances and fits; Project documentations.
Learning Methodology	Students will be divided into groups of 5-8 to design and manufacture an engineering product. Each project group will be formed by students from two or more engineering streams. The project topics will be provided by the subject supervisor team. Topics will be either initiated by supervisors or by commercial clients. All topics shall demand two or more skillsets including Mechanics, Electronics, and IT. Typical topics include: automated production equipment, mobility products, robotic toys, airframe structures, cabin installations, aircraft maintenance tools, jigs and gauges, *etc*. The subject is divided into two stages: • Design Stage During this period, the project team, under the guidance of the supervisors and clients, have to discover, understand and analyze the requirement of the project; and apply their knowledge to design a solution. Furthermore, students are required to search and track down parts and components with suppliers to obtain materials for the following manufacturing stage. • Manufacturing stage During this period, the project team will fabricate, test, and debug the product they designed. The supervisors will guide and monitor the groups on personal commitment, cooperation and coordination among team members. Regular group tutorials in the form of student-centred project meeting will be arranged between project group and respective supervisors.

Assessment Methods in Alignment with Intended Learning Outcomes

Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed			
		a	b	c	d
1. Quality of final product	30	✓	✓		
2. Report	20	✓	✓	✓	✓
3. Presentation and demonstration	20			✓	✓
4. Reflective Journal	30	✓	✓	✓	✓
Total	100				

Group assessment components

Quality of final product will be assessed by the supervisor team during demonstration. The assessment is to determine how well the group's solution meets with client's requirement in terms of completeness and functionality. The assessment also determines how well the group has carried out the manufacturing in terms of accuracy and craftsmanship. This addresses the intended learning outcomes (a) & (b).

Report submitted at the end of project will be summative evidence of how well the group applied knowledge and made decisions collectively. Compulsory report chapters include: Technical description of final design; Justification of technology building blocks used; Critical review on project execution; and Record of internal communications. This addresses the intended learning outcomes (a), (b), (c) & (d).

Individual assessment components

Oral presentation and demonstration in an exhibition booth setting allow individual members to demonstrate their ability in presenting engineering contents clearly and logically. Through Q&A session supervisors can also determine the effectiveness of individual members' effort toward the final product outcomes. This addresses the intended learning outcomes (c) & (d).

Individual reflective journal serves as summative evidence of how well the student has functioned in the group and embrace the multidisciplinary collaboration concept. Compulsory journal contents include: Technical description of design and manufacturing tasks performed; Critical review of technical ideas proposed and adapted; Critical review on personal performance in the project execution and the collaboration experience. This addresses the intended learning outcomes (a), (b), (c) & (d).

Student Study Effort Required

Class Contact	
▪ Project works	78 Hrs.
▪ Tutorial	12 Hrs.

	Other Study Effort	**0 Hrs.**
	Total Study Effort	**90 Hrs.**
Reading List and References	1. E. Tebeaux and S. Dragga, 'Proposals and Progress Reports', in *The Essentials of Technical Communication*, 2nd ed., New York: Oxford, 2012, pp. 197-238. 2. J. Abarca et al, 'Teamwork and Working in Teams', in *Introductory Engineering Design: A Projects-Based Approach*, 3rd ed., University of Colorado at Boulder, 2000. 3. J. Tropman, *Effective meetings*. Thousand Oaks, Calif.: Sage Publications, 1996. 4. P. Harpum, 'Design Management', in *Engineering Project Management*, 3rd ed., N. Smith, Ed. Oxford: Blackwell, 2008, pp. 234-254.	