THE HONG KONG POLYTECHNIC UNIVERSITY

Department of Mechanical Engineering

Part-time (self-financed)

Bachelor of Engineering (Honours) Degree

in

Mechanical Engineering

Programme Code: 43460

Definitive Programme Document

(For 2017 Cohort)

August 2017

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Elective Subjects

Remedial Subjects

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

PART A PROGRAMME SCHEME

1. PREAMBLE

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. It's the mission of the University (a) To nurture graduates who are critical thinkers, effective communicators, innovative problem solvers, lifelong learners and ethical leaders; (b) To advance knowledge and the frontiers of technology to meet the changing needs of society; and (c) To support a University community in which all members can excel through education and scholarship. Being one of the most long-serving Departments in the University, the Mechanical Engineering Department follows closely the progress and development of the University, and shares its vision and mission.

In line with the vision of the University, the ME Department aspires to achieve excellence in education and research in the discipline of mechanical engineering with global out-reach and impact. It is also our mission (a) To train future leaders, with creativity, broad vision, global outlook, and professional ethics for industry, academia, government and communities, who have sound knowledge in mechanical engineering with effective communication, analytical, and problem-solving skills; and (b) To create knowledge and technologies through fundamental research and its applications in mechanical engineering, in order to serve the societal needs.

Hong Kong is facing a fast-evolving and increasingly competitive world. In order to maintain economic growth in the face of globalization and survive in the 21st century, its economy has to change from being efficiency-based to knowledge-based. The mission of the ME Department is to produce all-rounded graduates who can lead a changing economy. This goal is accomplished by having forward looking course curricula, by placing emphasis on new technologies particularly those that impact teaching and research, and by conducting applied and basic research to serve Hong Kong society and push the frontiers of knowledge forward.

In order to provide an excellent on-job continuous professional development to the mid-level practitioners in the discipline of mechanical engineering, ME Department decides to offer a replica of the full-time BEng (Hons) in Mechanical Engineering in the part-time mode. As all admitted part-time ME students have sufficient industrial experience and obtained academic training in their tertiary study, some fundamental subjects and practical training are therefore not required for them. The number of credits required for the students compared with the full-time ME programme is thus reduced from the 124 down to 64.

2. GENERAL INFORMATION

2.1 Programme Title and Programme Code

Bachelor of Engineering (Honours) in Mechanical Engineering (43460)

2.2 Host Department

Department of Mechanical Engineering

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

2.3 Award Title

Bachelor of Engineering (Honours) in Mechanical Engineering

2.4 Mode of Attendance

Part-time

2.5 Normal and Maximum Periods of Registration

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

2.6 Total Credit Requirements for Graduation

There are 64 academic credits required for graduation.

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

2.7 Entrance Requirements

(a) A Higher Diploma in Mechanical Engineering or a related discipline;
(b) An Associate Degree in Engineering;
(c) Qualification equivalent to (a) or (b).

Preference will be given to candidates with relevant working experience.

3. RATIONALE AND INTENDED LEARNING OUTCOMES (ILOs)

One of the missions of the ME Department is to produce graduates with a good general education, a competent command of the English and Chinese languages, a broad knowledge of mechanical engineering, and a special understanding of one of its sub-fields. Thus prepared, our graduates can meet and, perhaps, master the changing technological challenges of the 21st century.

3.1 Programme Objectives and Outcomes

The BEng(Hons) in Mechanical Engineering (BEME) programme offered by the ME Department is designed to produce preferred graduates that are broad-based and knowledgeable in the fundamentals of mechanical engineering. The programme is a replica of the full-time BEME award. We expect our graduates to accept responsibilities as professionals in industrial and government organizations.

3.2 Intended Learning Outcomes (ILOs)

The BEME programme is designed with the following objectives:

1. To provide students with a broad base of knowledge in the fundamentals of Mechanical Engineering.
2. To help students develop the ability to engage in life-long learning and professional development.
3. To produce graduates that are aware of the global, societal, ethical and professional issues in the practice of engineering.

Institutional Learning Outcomes

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

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

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

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

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

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

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

Correlation between the BEME Programme Learning Outcomes and the Institutional Learning Outcomes

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

The BEME programme aims to equip students with 12 learning outcomes. Each student is expected to achieve these outcomes, which are classified into two groups, before graduation:

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

(a) an ability to identify, formulate and solve engineering problems;
(b) an ability to apply their knowledge of mathematics, science and engineering;
(c) an ability to design and conduct experiments, as well as to analyze and interpret data;
(d) an ability to design a system, component or process to meet desired needs;
(e) an ability to use the techniques, skills and modern engineering tools, including computational tools necessary for engineering practice;
(f) an ability to work professionally in general mechanical systems, including the design and realization of such systems;
(g) a basic understanding of manufacturing methods.

(B) Professional outlook and workplace skills (POW)

(a) a knowledge of contemporary issues and the broad education necessary to understand the impact of engineering solutions in a global and societal context;
(b) an ability to function professionally in multidisciplinary teams;
(c) an understanding of professional and ethical responsibility;
(d) an ability to communicate effectively;
(e) a recognition of the need for and an ability to engage in life-long learning.

The BEME programme learning outcomes that support its three objectives are indicated below:

	PROGRAMME OBJECTIVES		
PROGRAMME OUTCOMES	**1**	**2**	**3**
PAK (a)	X	X	
PAK (b)	X	X	
PAK (c)	X	X	
PAK (d)	X	X	
PAK (e)	X	X	
PAK (f)	X	X	
PAK (g)	X	X	
POW(a)		X	X
POW(b)		X	
POW(c)		X	X
POW(d)		X	
POW(e)		X	

3.3 General Approach to Teaching, Learning and Assessment

To accomplish the ILOs of the programme, students are expected to achieve specific learning outcomes for each subject outlined in Part B. These learning outcomes are spelt out explicitly in the syllabus of each subject. They provide a motivation and a target for students who may use this information to formulate their study plan before the teaching. The students may also use the information to conduct a self-assessment after the teaching.

Generally speaking, a three-credit subject consists of 39 hours of contact time in PolyU and the details are provided in the syllabuses. The Department uses a wide variety of teaching methods, in a number of different settings including formal lectures, invited lectures by guest speakers, seminars, laboratory work, practical work, project work, case studies and student project presentations. In most of the classroom activities, the staff member will begin with a formal lecture that is designed to give students an overview of the topic on hand, which may also require their engagement through questioning or interactive hand-outs. Some of these hand-outs form a part of the assignments where the students are required to work after the class. The students are frequently required to contribute through presentations, through working on case studies and mini-projects, through experimental studies by laboratory classes. In many of these teaching/learning activities, students are asked to participate in small groups. These different teaching and learning approaches will be assessed with appropriate methods. In case of group activity, both the overall performance of the group as well as the individual effort/contribution of each team member will normally be assessed.

The prime purpose of assessment is to enable students to demonstrate that they have met the aims and objectives of the academic programme: in particular, they have fulfilled the

requirement of each subject and have, at the end of their study achieved the standard appropriate to the award.
Assessment also fulfils two major functions. It is used to evaluate whether the specific student-learning-outcomes of a subject have been achieved by the students, and distinguish their performance in achieving them.

Assessment will also serve as prompt and useful feedback to students. Students will be informed of their performance in the assessment so that they are aware of their progress and attainment to facilitate teaching and learning. Students' performance in a subject will be judged by continuous assessment or final examination and continuous assessment as deemed appropriate. Where both methods are used, the weighting of each in the overall subject grade will be clearly stated in the relevant subject syllabuses. Continuous assessment may include tests, assignments, project reports and oral presentations, laboratory work and other forms of classroom participation. As assessment should be a matter of judgment, the subject lecturer will have the discretion to assign a final grade which is considered to reflect more appropriately the overall performance of the student in a subject.

The 'generic skills' set out in PolyU's strategic objective have been integrated into the learning outcomes of the programme. These generic skills will be developed and assessed within the formal curriculum.

3.4 Alignment of Teaching, Learning and Assessment Methods with Programme Outcomes

There are compulsory and elective subjects offered in the programme. The details for each individual subject are contained in the respective syllabus listed in Part B. These explain how the objectives, teaching/learning activities, and eventually student learning outcomes, can be matched together so that they are constructively aligned within the context of these subjects. Typical teaching methods include lectures, tutorials, laboratory work, case studies which are supplemented by mini-projects, and presentations by individual students.

The major forms of assessment used in the programme are written examinations (open or closed book) and continuous assessment. In assessing students' academic performance and attainment of teaching and learning outcomes, much emphasis is placed on their ability to analyze, synthesize, integrate and apply what they have learnt in the course of their studies.

Details of the alignment of teaching, learning and assessment methods with programme outcomes are shown in section 4.4 and the individual subject syllabus.

4. PROGRAMME STRUCTURE

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

4.1 General Structure

For the part-time programme, the number of credits required for graduation is 64. Students are expected to be employed in a relevant industry. Application for credit transfer/exemption will be considered based on the student's previous study according to the pertinent University policy. Students enter as graduates of Associate Degree/Higher Diploma programmes will normally not be considered for credit transfer on any subject. In addition, students not meeting the equivalent standard of the Undergraduate Degree Language & Communication Requirements (LCR) will be required to take degree LCR subjects (up to 9 credits). 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 64 academic credits consist of 9 mandatory credits of General University Requirements (GUR) and 55 credits of Discipline-Specific Requirements (DSR). Details of GUR and DSR are shown in Table 4.1 and Table 4.2 respectively. For further information on the GUR can be referred to section 5.13.

Table 4.1: General University Requirements (GUR)

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

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

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

Table 4.2: Discipline-specific Requirements (DSR)

Subjects		Credits
I) Core		40
AMA2112	Mathematics II	(3)
CBS3241P	Professional Communication in Chinese	(2)
ELC3521	Professional Communication in English	(2)
ENG3003	Engineering Management	(3)
ENG3004	Society and the Engineer	(3)
ME31001	Dynamics and Vibrations	(3)
ME31002	Linear Systems and Control	(3)
ME32003	Design and Manufacturing	(3)
ME33001	Mechanics of Materials	(3)
ME34002	Engineering Thermodynamics	(3)
ME34004	Fluid Mechanics	(3)
ME46002	Numerical Methods for Engineers	(3)
ME49004	Final Year Capstone Project	(6)
II) Elective Students are required to complete five elective subjects from the elective pool.		15
	Total DSR credits	55

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

Remedial subjects are designed for new students who are in need of additional preparations in 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.

4.2 Normal Study Pattern

This section outlines the normal 4-year study pattern for the part-time BEng(Hons) degree programme.

Year 1: 15 Credits	
For students not required to take any remedial subject	
Semester 1	**Semester 2**
ME32003 Design and Manufacturing (3)	ME33001 Mechanics of Materials (3)
AMA2112 Mathematics II (3)	ME34002 Engineering Thermodynamics (3)
CAR I # (3)	
For students required to take remedial subject (s)	
Semester 1	**Semester 2**
ME32003 Design and Manufacturing (3)	ME33001 Mechanics of Materials (3)
ME2001 Mathematics ** (non-credit bearing)	ME34002 Engineering Thermodynamics (3)
ME23001 Engineering Mechanics** (3)	AMA2112 Mathematics II (3)
CAR I # (3) (or in Year 2 summer term)	
Year 2: 16 Credits	
Semester 1	**Semester 2**
ME34004 Fluid Mechanics (3)	ME31001 Dynamics and Vibrations (3)
ELC3521 Professional Communication in English (2)	CBS3241P Professional Communication in Chinese (2)
CAR II # (3)	Service Learning #@ (3)
Year 3: 18 Credits	
Semester 1	**Semester 2**
ME31002 Linear Systems and Control (3)	Elective Subject I (3)
ME46002 Numerical Methods for Engineers (3)	Elective Subject II (3)
ENG3004 Society and the Engineer (3)	Elective Subject III (3)
Year 4: 15 Credits	
Semester 1	**Semester 2**
ENG3003 Engineering Management (3)	Elective Subject V (3)
Elective Subject IV (3)	
ME49004 Final Year Capstone Project (6)	
Total Credits: 64	

Remark:

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

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

** Remedial subject

4.3 Elective Subjects

Students are required to study five elective subjects. They may choose five elective subjects from the following list. Most of the elective subjects are classified into the following three technical streams:

- Aerospace Engineering (AE)
- Design and Automation (DA)
- Environmental and Energy Engineering (EE)

Students completing four elective subjects from any one of the above specialism streams are considered to have completed a stream of study in that specialism.

Elective Subjects ^		**Specialism Stream**		
		EE	**AE**	**DA**
ME41001	Automatic Control System			X
ME41002	Noise Abatement and Control	X		
ME41003	Principles of Sound and Vibration	X		
ME42001	Artificial Intelligence in Products			X
ME42004	Development of Green Products			X
ME42008	Computer-Aided Technology for Design			X
ME42010	Industrial Automation			X
ME42011	Fundamentals of Robotics			X
ME43001	Advanced Materials for Design and Technology			X
ME43003	Product Testing Technology			X
ME44001	Air Conditioning for Indoor Thermal and Environmental Quality	X		
ME44002	Engine Technology	X		
ME44003	Combustion and Pollution Control	X		
ME44004	Heat and Mass Transfer	X	X	
ME44005	Alternative Fuels	X		
ME44007	Fluids Engineering	X		
ME45001	Aerodynamics		X	
ME45002	Aircraft Systems		X	
ME45006	Aircraft Structure and Engineering Composites		X	
ME47005	Aircraft Performance and Flight Management		X	
ME47007	Aircraft and Spacecraft Propulsion		X	
ME47008	Fundamentals of Aircraft and Spacecraft Design		X	
ME49002	Environmental Noise	X		

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.

4.4 Curriculum Mapping

Section 3 outlines the objectives and intended learning outcomes of the programme. It also presents the general philosophy in teaching, learning and assessment adopted by the Department. In Section 4.1, we detailed the structure of the programme describing a range of subjects which individual students are expected to study. This enables the students to develop generic skills by achieving the learning outcomes of each subject. An analysis of the curriculum in terms of the coverage of the programme outcomes (see section 3.2) is presented in Table 4.3. In summary, the programme outcomes address two areas expecting students to achieve (A) professional/academic knowledge and skills (PAK), and (B) professional outlook and workplace skills (POW). There are seven items for PAK and five items for POW. Table 4.3 displays a curriculum map in which all subjects are mapped with appropriate PAKs and POWs. The technical elective subjects are updated continually to meet the need of the ever-evolving industrial communities in Hong Kong and the South China region. Essentially, they cover most of the programme outcomes with variations of themes from subject to subject. The subject learning outcomes to be achieved by every subject of the programme are listed in the syllabuses shown in Part B.

Table 4.3: Curriculum Map that we Teach (T), Give Students Practice (P) and Measure (M) the Intended Learning Outcomes

SUBJECT	**PROGRAMME OUTCOMES**											
	PAK							**POW**				
	a	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**
Faculty Common												
AMA2112	T	T										
CBS3241P											TPM	
ELC3521											TPM	
ENG3003					T			TPM	TPM	TPM	T	TPM
ENG3004								TPM	TPM	TPM	T	TPM
Award Core												
ME31001	T	T	PM	T								
ME31002	T	T	TPM	T	P							
ME32003	T			TPM	TP	TPM	TPM		TP		P	
ME33001	TPM	TPM	TPM	T	TP	P						
ME34002	TPM	TPM	TPM			TM		T			P	
ME34004	TPM	TPM	TPM		TM	TM						
ME46002	TP	TPM	T		TM			TP			TP	
ME49004	TPM	TPM	TP	TP	TP	TP	TP	TP	TPM	TP	TPM	TPM
Electives												
ME41001	T	T	TP	TP	TP						P	
ME41002	TP	TP		TP	TP						P	
ME41003	TP	TP		TP							P	
ME42001	TP	TP	P	P	P	P			P		P	P
ME42004	T			T				TP	P		P	T

SUBJECT	PROGRAMME OUTCOMES											
	PAK							POW				
	a	b	c	d	e	f	g	a	b	c	d	e
Electives												
ME42008	T	T	T		T	T						
ME42010	T	T	TP	TP					P			P
ME42011	T	T	TP	TP					P			P
ME43001	T	T	T	T	T		T	T	P		P	
ME43003			T	T	T				P		P	T
ME44001	T	TP		T	TP	T		T				
ME44002	T	TP						TP				
ME44003	T	TP						TP				
ME44004	TP	TP						T				
ME44005	TP	TP						T				T
ME44007	T	T	T		T	T						
ME45001	TP	TP						T				
ME45002	T	T						T	T	T		T
ME45006	T	T						T	T			
ME47005	T	T						T	T			
ME47007	TP	TP	TP	TP								
ME47008	TP	TP	TP	TP								
ME49002	TP	TP		TP				TP		T	PM	PM

Remark: GUR subjects are not included in this table.

5. ACADEMIC REGULATIONS AND ASSESSMENT

The Academic regulations described below are based on the information known as of July 2017. 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.

5.1 Subject Registration and Withdrawal

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

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

Subject to the maximum study load of 21 credits per semester and the availability of study places, students are allowed to take additional subjects on top of the prescribed credit requirement for award before they become eligible for graduation. For students of part-time programmes, they can only take additional subjects from the curriculum of the programme which they have enrolled.

5.2 Study Load

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

Students are not allowed to take zero subject in any semester, including the mandatory summer term as required by some programmes, unless they have obtained prior approval from the programme offering Department; otherwise they will be classified as having unofficially withdrawn from their programme. Students who have been approved for zero subject enrolment (i.e. taking zero subject in a semester) are allowed to retain their student status and continue using campus facilities and library facilities. Any semester in which the students are allowed to take zero subject will nevertheless be counted towards the maximum period of registration.

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

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

5.3 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.

5.4 Credit Transfer

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

As from the 2017/18 intake cohort, all students admitted to an Articulation Degree or Senior Year curriculum, irrespective of the entry qualifications they held when applying for admission to the programmes, are required to complete at least 60 credits to be eligible for award.

For credit transfer of retaken subjects, the grade attained in the last attempt should be taken in the case of credit transfer with grade being carried over. Students applying for credit transfer for a subject taken in other institutions are required to declare that the subject grade used for claiming credit transfer was attained in the last attempt of the subject in their previous studies. If a student fails in the last attempt of a retaken subject, no credit transfer should be granted, despite the fact that the student may have attained a pass grade for the subject in the earlier attempts.

Students should not be granted credit transfer for a subject which they have attempted and failed in their current study.

5.5 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.

5.6 General Assessment Regulations

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

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

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

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

5.7 Principles of Assessment

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

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

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

5.8 Assessment Methods

Students' performance in a subject can be assessed by continuous assessment and/or examinations, at the discretion of the individual subject offering Department. Where both continuous assessment and examinations are used, the weighting of each in the overall subject grade shall be clearly stated in the definitive programme document. The subject offering Department can decide whether students are required to pass both the continuous assessment and examination components, or either component only, in order to obtain a subject pass, but this requirement (to pass both, or either, components) shall be specified in the Definitive Programme Document. Learning outcome should be assessed by continuous assessment and/or examination appropriately, in line with the outcome-based approach.

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

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

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

5.9 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 or Summer Term study is mandatory for the programme), 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 any one 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.

5.10 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. However, students who have passed a General University Requirements (GUR) subject are not allowed to re-take the same GUR subject for the purpose of improving their 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 (Note 1).

5.11 Exceptional Circumstances

Absence from an assessment component

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

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

Aegrotat award

If a student is unable to complete the requirements of the programme in question for the award due to very serious illness, or other very special circumstances which are beyond his control, and considered by the Board of Examiners as legitimate, the Faculty/School Board will determine whether the student will be granted an aegrotat award. Aegrotat award will be granted under very exceptional circumstances.

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

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

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

Other Particular Circumstances

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

5.12 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.
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.

Subject Grade	Short Description	Elaboration on Subject Grading Description
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 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. 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.

5.13 University Graduation Requirements

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

1. Complete successfully 64 credits as defined in Section 4.
2. Earn a cumulative GPA of 2.00 or above at graduation.
3. Satisfy all the remedial subjects as specified when he is admitted.

4. Satisfy the residential requirement i.e. at least one-third of the normal credit requirement for the award he is currently enrolled, unless the professional bodies concerned stipulate otherwise.

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

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

(a) Service-Learning

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

(b) Cluster Areas Requirement (CAR)

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

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

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

<u>Reading and Writing Requirements</u>

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

(c) China Studies Requirement

Of the 6 credits of CAR described in (b) above, students are required to successfully complete a minimum of 3 credits on CAR subjects designated as "China-related". The

purpose is to enable students to gain an increased understanding of China (e.g., its history, culture and society, as well as emerging issues or challenges).

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

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

The following 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.

5.14 Recording of Disciplinary Actions in Students' Records

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

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

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

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

6. PROGRAMME OPERATION AND MANAGEMENT

6.1 Departmental Undergraduate Programme Committee

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

6.2 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.

6.3 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.

6.4 Academic Tutors

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

- identify academic strengths and weaknesses of the student;
- advise the student on electives and answer questions about the curriculum;
- encourage the student at times of academic frustration;
- report the general academic status of the student to the programme leader;
- alert and consult the programme leader as soon as possible about any unexpected situation faced by the student that may affect the student's academic progression;
- bring to the attention of the Student-Staff Consultative Committee any special situation concerning the student that may require special decision by the Committee;
- encourage the student to give feedbacks on the programme and put forward his comments to the Departmental Learning and Teaching Committee.

PART B SYLLABUSES

Subject Description Form

Subject Code	AMA2112
Subject Title	Mathematics II
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite : Mathematics I (AMA2111)
Objectives	This subject is a continuation of AMA2111. It 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. Multiple integrals Double and triple integrals, change of variables, applications to problems in geometry and mechanics. 2. Vector calculus Vector and scalar fields, the del operator, line and surface integrals, the theorems of Green, Gauss and Stokes, applications to electromagnetic theory and fluid mechanics. 3. Series expansion Infinite series, Taylor's expansion, Fourier series expansion of a periodic function.

4. Partial differential equations

Formulation of PDE of mathematical physics, separation of variables, initial-boundary value problems, introduction to Fourier transforms.

Teaching/Learning Methodology

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.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	**% weighting**	**Intended subject learning outcomes to be assessed (Please tick as appropriate)**				
		1	**2**	**3**	**4**	**5**
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 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

Class contact:

Expected	• 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*, 14th ed. Pearson Education 2017	

The Hong Kong Polytechnic University

Subject Description Form

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

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

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

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

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

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

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

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

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

The Hong Kong Polytechnic University

Subject Description Form

Subject Code	ELC3521
Subject Title	Professional Communication in English
Credit Value	2
Level	3
Pre-requisite / Co-requisite	English LCR subjects
Objectives	This subject aims to develop the language competence for professional communication in English required by students to communicate effectively with various parties and stakeholders in regard to engineering-related project proposals.
Intended Learning Outcomes	Upon completion of the subject, and in relation to effective communication with a variety of intended readers/audiences in English, students will be able to: a. plan, organise and produce professionally acceptable project proposals with appropriate text structures and language for different intended readers b. plan, organise and deliver effective project-related oral presentations with appropriate interactive strategies and language for different intended audiences c. adjust the style of expression and interactive strategies in writing and speaking in accordance with different intended readers/audiences
Subject Synopsis / Indicative Syllabus	1. Project proposal in English • Planning and organising a project proposal • Explaining the background, rationale, objectives, scope and significance of a project • Referring to the current situation or existing literature to substantiate a project proposal • Describing the methods of study • Describing and discussing anticipated project results and (if applicable) results of a pilot study • Presenting the budget, schedule and (if applicable) method of evaluation • Writing an executive summary 2. Oral presentation of project proposal in English • Selecting content for an audience-focused presentation • Choosing language and style appropriate to the intended audience • Using appropriate transitions and maintaining coherence in a team presentation • Using effective verbal and non-verbal interactive strategies
Teaching/Learning Methodology	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	40%	✓		✓			
2. Oral presentation of project proposal in English	60%		✓	✓			
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 collaborate in groups in planning, researching, discussing and giving oral presentations on the project. They 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.

Assessment type	Intended readers/audience	Timing
1. Project proposal in English Each team writes a proposal of 2000-2500 words; and each member writes a report of 200-250 words explaining his/her contribution to the project	Mainly engineering experts	Week 8
2. Oral presentation of project proposal in English Each team delivers a speech (30 minutes for a team of four), simulating a presentation of the final proposal	Mainly non-experts	Weeks 12-13

Student Study	Class contact:	

Effort Expected	Seminars	26 Hrs.
	Other student study effort:	
	Researching, planning and writing the project Rehearsing the presentation	52 Hrs.
	Total student study effort:	78 Hrs.
Reading List and References	1. D.F. Beer, (Ed.), *Writing and speaking in the technology professions: A practical guide*, 2nd ed., Hoboken, NJ: Wiley, 2003. 2. R. Johnson-Sheehan, *Writing proposals*, 2nd ed., New York: Pearson/Longman, 2008. 3. S. Kuiper, *Contemporary business report writing*, 3rd ed., Cincinnati, OH: Thomson/South-Western, 2007. 4. M.S. Lawrence, *Writing as a thinking process: Teacher's manual*. Ann Arbor, Mich: University of Michigan Press, 1975. 5. D.C. Reep, *Technical writing: Principles, strategies and readings*, 6th ed., Pearson, Longman, 2006.	

Subject Description Form

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

3. Project Management

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

4. Management of Change

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

5. Effects of Environmental Factors

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

Teaching/Learning Methodology

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

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

Assessment Methods in Alignment with Intended Learning Outcomes

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

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

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

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

(revised) July 2015

Subject Description Form

Subject Code	ENG3004
Subject Title	Society and the Engineer
Credit Value	3
Level	3
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	This subject is designed for engineering students as a complementary subject on the role of the professional engineer in practice and their responsibilities toward the profession, colleagues, employers, clients, and the public. The objectives of the subject are to enable students to 1. appreciate the historical context of modern technology and the nature of the process whereby technology develops and the 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, and the environmental impacts of technology; 4. observe professional conduct, as well as the legal and other applicable constraints, related to various engineering issues; and 5. develop a strong vision to optimize their contribution to sustainable development.
Intended Learning Outcomes	Upon completion of the subject, students will be able to a. identify and evaluate the effects of technology as it applies to the social, cultural, economic, legal, health, safety, and environmental dimensions of society; b. explain the importance of local and international professional training, professional conduct and ethics, and responsibilities in various engineering disciplines, particularly the Washington Accord; c. evaluate and estimate, in a team setting, the impact of contemporary issues, planned projects, and unforeseen technological advances related to engineers; effectively communicate and present the findings to laymen and peers.

Subject Synopsis/ Indicative Syllabus	1. Impact of Technology on Society Historical cases and trends of technological innovation explored through their impact on social and cultural developments of civilization and their commonalities. 2. Environmental Protection and Related Issues Roles of the engineer in energy conservation, ecological balance, and sustainable development. 3. Global Outlook for Hong Kong's Economy and Industries Support organizations, policies and their impacts on industrial and economic development in Greater China, the Pacific Rim, and the world. 4. Regulatory Organizations and Compliance Discussion of engineer's responsibilities within different regulatory frameworks and environments; Examples from various entities such as the Labour Department and the Occupational Health and Safety Council; Legal dimensions to engineering such as liability, 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.
Teaching/Learning Methodology	Class comprises short lectures to provide essential knowledge and information on the relationships between society and the engineer under a range of dimensions. Other methods include discussions, case studies, and seminars to develop students' in-depth analysis of the relationships. Students are assembled into groups; throughout the course, they will work on engineering cases by completing the following learning activities: 1. Case analysis where students explore the relationships between society and the engineering issues of a project under specific dimensions; 2. Construction and assembly of a case portfolio which includes i. Presentation slides ii. Feedback critiques iii. Weekly summary reports iv. A report on Sustainable Development

<table>
<tr><td></td><td>v. Individual Reflections

3. Final oral 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="3">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td></tr>
<tr><td>1. Continuous assessment</td><td>60%</td><td></td><td></td><td></td></tr>
<tr><td>• Group weekly learning activities
• Individual final presentation
• Group project report, SD report, individual reflection report</td><td>(24%)
(18%)
(18%)</td><td>✓
✓
✓</td><td>✓
✓
✓</td><td>✓

✓</td></tr>
<tr><td>2. Examination</td><td>40%</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Total</td><td>100%</td><td colspan="3"></td></tr>
</table>
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.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures and review</td><td>27 Hrs.</td></tr>
<tr><td>▪ Tutorial and presentation</td><td>12 Hrs.</td></tr>
<tr><td>Other student study efforts:</td><td></td></tr>
<tr><td>▪ Research and preparation</td><td>63 Hrs.</td></tr>
<tr><td>▪ Report writing</td><td>14 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>116 Hrs.</td></tr>
</table>
</td></tr>
</table>

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.enb.gov.hk/en/susdev/council/ 8. Poverty alleviation: the role of the engineer, http://publications.arup.com/publications/p/poverty_alleviation_the_role_of_the_engineer **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) July 2017

Subject Description Form

Subject Code	ME31001
Subject Title	Dynamics and Vibrations
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME23001 Engineering Mechanics
Objectives	To teach students basic concepts of rigid body planar motion and mechanical vibration.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate and solve planar motion problems in rigid body dynamics by applying knowledge of dynamic analyses and mathematics. b. Formulate and solve vibration problems in single DOF mechanical systems by applying knowledge of vibration theory and mathematics. c. Analyse and interpret data obtained from experiments in dynamics and vibrations. d. Present effectively in completing written reports of laboratory work.
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, gear trains, work and energy, impulse, momentum, impulse-momentum equations, impact and applications and whirling of rotating shafts. ***Vibration of a Single-degree-of-freedom System*** **-** Free vibration of particles, equation of motion, damping effects, forced vibration of particles, vibration of rigid bodies, energy methods, computer simulations of the free and forced vibration response of a single-degree-of-freedom system. **Laboratory Experiment** There is one 2-hour laboratory session. Typical Experiments: 1. Gear train experiment 2. Forced vibration 3. Whirling of shaft

Teaching/Learning Methodology

Lectures aim at providing students with an integrated knowledge required for understanding dynamics and single-degree-freedom vibration systems. Theories and examples will be presented to cover the syllabus on kinematics and kinetics of rigid bodies; equation of motions, work and energy, impulse and momentum, and one DOF vibrations. (Outcomes a and b)

Tutorials aim at enhancing the analytical skills of the students. Examples will be provided to teach students the skills of solving different engineering problems using the knowledge of dynamics and single-degree-freedom vibration systems. Students will be able to solve real-world problems using the knowledge they acquired in the class. (Outcomes a and b)

Experiments will provide students with experience on gear train systems, forced vibration systems and whirling of shafts. These experiments are designed to train students how to apply theories to practical applications, how to analyze and present experimental data. (Outcomes c and d)

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

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	15%	√	√		
3. Laboratory	5%			√	√
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

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

Student Study Effort Expected	Class contact:	
	▪ Lecture	31 Hrs.
	▪ Laboratory/Tutorial	8 Hrs.
	Other student study effort:	
	▪ Reading and review	45 Hrs.
	▪ Homework assignment	22 Hrs.
	▪ Laboratory report	6 Hrs.
	Total student study effort	112 Hrs.
Reading List and References	1. F.P. Beer and E.R. Johnson, Vector Mechanics for Engineers: Dynamics, McGraw-Hill, latest edition. 2. J.L. Meriam and L.G. Kraige, Engineering Mechanics, John Wiley, latest edition. 3. S. Graham Kelly, Fundamentals of Mechanical Vibrations, McGraw Hill, latest edition. 4. W.T. Thomson, Theory of Vibration with Applications, Prentice Hall, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME31002
Subject Title	Linear Systems and Control
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME31001 Dynamics and Vibrations
Objectives	To teach students time and frequency responses of dynamic systems to different inputs and the feedback control of such systems using PID controllers
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Model physical elements in dynamic systems and find the transfer function of a system comprising mechanical and other physical components. b. Predict the output response of a first- or second-order system both in time and frequency domains subject to typical input signals. c. Complete a given task in linear system control, such as an assignment or a project, by applying concepts in dynamics and control systems. d. Analyze and interpret the data obtained from a control experiment. e. Design a first-order and second-order system with suitable parameters and/or PID controller that will be stable and has the required system performance.
Subject Synopsis/ Indicative Syllabus	***Dynamic Responses of First-Order and Second-Order Systems*** **-** Mathematical modelling of system elements, interconnection of elements in systems by differential equations, parameters of first-order and second-order systems, system response analysis due to step, ramp and impulse inputs using Laplace transform, simulation of dynamic systems using Matlab. ***Frequency Response of First-Order and Second-Order Systems*** **-** Harmonic response, Bode diagrams, frequency domain specifications, frequency response applications. ***Introduction to Feedback Control*** **-** Analysis of open-loop and closed-loop systems, transfer functions and block diagrams, time-domain specifications, system stability analysis, time-domain analysis of control systems. ***Feedback Control Systems*** **-** Automatic controllers, basic P, PD, PID controllers, Routh-Hurwitz stability criterion, numerical computations for the frequency-domain analysis of dynamical systems. **Laboratory Experiment** There are two 2-hour laboratory sessions. Typical Experiments: 1. Digital simulation of feedback control systems 2. DC servomechanism 3. Water level control

Teaching/Learning Methodology

Lectures aim at providing students with an integrated knowledge required for understanding and analyzing feedback control systems. (Outcomes a, b, c and e)

Tutorials aim at enhancing analytical skills of students. Examples on system modeling, transient and frequency response of dynamic systems, and performance and stability of control systems will be involved. Students will be able to solve real-world problems using the knowledge they acquired in the class. (Outcomes a, b, c and e)

Experiments will provide students with hands-on experience on the instrumentation and measurement of physical variables such as motor speed and water level, and their control. It also trains students in the analysis and presentation of experimental data. (Outcome d)

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
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	e
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:

$0.50 \times$ End of Subject Examination + $0.50 \times$ 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 Effort Expected	Class contact:	
	▪ Lecture	31 Hrs.
	▪ Laboratory/Tutorial	8 Hrs.
	Other student study effort:	
	▪ Self-study	45 Hrs.
	▪ Homework assignment	20 Hrs.
	▪ Laboratory report	8 Hrs.
	Total student study effort	112 Hrs.
Reading List and References	1. K. Ogata, Modern Control Engineering, Prentice Hall, latest edition. 2. N.S. Nise, Control Systems Engineering, John Wiley, latest edition. 3. C.L. Phillips and R.D. Harbor, Feedback Control Systems, Prentice-Hall, latest edition. 4. M.R. Driels, Linear Control Systems Engineering, McGraw-Hill, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME32003
Subject Title	Design and Manufacturing
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide students in-depth knowledge and skills on the product analysis and simulation, use of CAD/CAE, manufacturing and prototyping techniques of products. 2. To introduce students advanced computer modelling and finite element modelling and analysis techniques during the product design process. 3. To enhance students knowledge on environmental impact and marketing skills during the design of products and engineering components.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate and solve problems related to multi-body mechanical systems by applying knowledge in mathematics and engineering. b. Determine forces and moments acting on any simple structure by applying knowledge in mathematics and engineering. c. Complete a given task on design and optimization of any product using CAD/CAE tools necessary for engineering practice. d. Complete a product related task involving manufacturing process, competitiveness, environmental impact and product management. e. Analyze and optimize any design/structure of a self-chosen design project with the help of CAE tools and present effectively by writing reports.
Subject Synopsis/ Indicative Syllabus	***Computer-aided Analysis in Product Design*** Fundamentals in Computer-aided Engineering (CAE), 3-D Product Analysis, Design Optimisation Technique, CAD and CAM integration ***Integrated Products and Process Design*** Concurrent Engineering, Reverse Engineering, Documenting of Design Process Knowledge, Environmental Impact, Computer-aided Manufacturing (CAM), Internet Applications in Product Design and Manufacture, Process Development and DFX Strategies ***Product Management and Manufacturing Competitiveness*** Product Master Platform, Manufacturing and Supply Chain Planning, Six Sigma Technique of Quality Improvement, Product Life-cycle Management (PLM)

Teaching/Learning Methodology

Lectures are used to deliver the required knowledge of engineering design and manufacturing (outcomes a to d).

Tutorials and computer workshops are used for training of using CAE tools for design analysis (outcome c).

Project and case studies are useful for the study and solving real-life engineering problems (outcomes c to e).

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lecture	√	√	√	√	
Tutorial / computer workshop			√		
Project / case study			√	√	√

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	10 %	√	√	√	√	
2. Test	15 %	√	√		√	
3. Training report	5 %			√		
3. Project report	20 %			√	√	√
3. Examination	50 %	√	√		√	
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 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. Written report and oral presentation on a specific project or case study is used to assess students' on the application of their knowledge and computer tools learnt in this subject to solve a real-life design problem.

Student Study Effort Expected	Class contact:	
	▪ Lecture and seminar	33 Hrs.
	▪ Tutorial	4 Hrs.
	▪ Workshop	2 Hrs.
	Other student study effort:	
	▪ Case study / Mini project	20 Hrs.
	▪ Assignment	12 Hrs.
	▪ Self-study	42 Hrs.
	Total student study effort	113 Hrs.
Reading List and References	1. Parviz E.N. Computer-aided analysis of mechanical systems. Prentice-Hall, latest edition. 2. George E. Dieter. Engineering Design. 3rd Ed. McGraw-Hill International Editions, Singapore, latest edition. 3. Kunwoo Lee. Principles of CAD/CAM/CAE Systems. Addison Wesley Longman, USA, latest edition. 4. Magrab. An engineer's guide to MATLAB. 2nd ed. Prentice Hall, latest edition. 5. Tirupathi R. Chandrupatla, Ashok D. Belegundu. Introduction to finite elements in engineering. Prentice Hall, latest edition. 6. Vince Adams and Abraham Askenazi. Building Better Products with Finite Element Analysis. Onword Press, USA, latest edition. 7. D.H. Stamatis. Six Sigma fundamentals : a complete guide to the system, methods and tools**.** Productivity Press, latest edition.	

Revised July 2014

Subject Description Form

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

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

Teaching/Learning Methodology

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

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

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

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

Assessment Methods in Alignment with Intended Learning Outcomes

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

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

Overall Assessment:

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

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

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

Revised August 2014

Subject Description Form

Subject Code	ME34002
Subject Title	Engineering Thermodynamics
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AP10005 Physics I, and AMA2111 Mathematics I Exclusion: ME34001 Engineering Thermodynamics
Objectives	To provide fundamental knowledge of steam and gas power cycles and refrigeration cycle, and air-conditioning, combustion and heat transfer processes.
Intended Learning Outcomes	a. Formulate and solve thermodynamic problems relating to steam power, gas power and refrigeration cycles; and air-conditioning, combustion and heat-transfer processes by applying knowledge in engineering thermodynamics, air-conditioning, combustion, heat-transfer and mathematics. b. Complete a given task such as a design project in thermodynamics by applying knowledge acquired in the subject and information obtained through literature search. c. Analyze and interpret data obtained from experiments in engineering thermodynamics, combustion and heat transfer. d. Present effectively in completing written reports of laboratory work and the given task.
Subject Synopsis/ Indicative Syllabus	***Review of Basic Concepts of Thermodynamics*** **-** Thermal properties. Ideal gas. First law of thermodynamics. Non-flow and steady-flow processes. Second law of thermodynamics. ***Second Law of Thermodynamics*** **-** Kelvin-Planck and Clausius statements. Reversible and irreversible processes. Carnot cycle. Thermodynamic temperature scale. Inequality of Clausius. Entropy. The second law for a control mass/control volume. Isentropic efficiency. ***Power and Refrigeration Cycles*** **-** Vapour cycles: Carnot cycle and Rankine cycle. Superheat and reheat. Air standard engine cycles: Otto cycle and Diesel cycle. Gas turbine cycles. Carnot efficiency. Refrigerator and heat pump. Vapor compression cycle. Coefficient of Performance. ***Psychrometry and Air Conditioning*** **-** Psychrometry. Psychrometric chart. Introduction to air conditioning. ***Combustion*** **-** Hydrocarbon fuels. Combustion equations. Stoichiometric air fuel ratio. Lean and rich mixture. ***Review of Fundamental Heat Transfer*** **-** Mechanisms and governing equations of conduction, convection and radiation. ***Convection Heat Transfer*** **-** Forced, free and mixed convection. Hydrodynamic and thermal boundary layers. Use of non-dimensional parameters: Reynolds number;

Nusselt number; Prandtl number; Grashof number and Richardson number. Application of convective heat transfer correlations to solve convective heat transfer problems.

Laboratory Experiment
There are two 2-hour laboratory sessions with the typical experiments:
1. Refrigeration system
2. Diesel engine test-bed
3. Convection heat transfer
4. Combustion

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to thermodynamics and heat transfer (outcomes a and b).

Tutorials are used to illustrate the application of fundamental knowledge to practical situations (outcomes a, b and 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 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. Examination	60%	√	√		
2. Test	20%	√	√		
3. Given Task/Report	10%	√	√		√
4. Laboratory Work/Reports	10%			√	√
Total	100%				

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

Overall Assessment:
0.6 × End of Subject Examination + 0.4 × Continuous Assessment

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts and knowledge. It is supplemented by the tests, assignments, projects and laboratory works 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 / Experiment	6 Hrs.
	Other student study effort:	
	▪ Course work	39 Hrs.
	▪ Self-study	39 Hrs.
	Total student study effort	117 Hrs.
Reading List and References	1. R.E. Sonntag, C. Borgnakke and G.J.V. Wylen, Fundamentals of Thermodynamics, John Wiley and Son, latest edition. 2. T.D. Eastop and A. McConkey, Applied Thermodynamics for Engineering Technologists, Pearson, latest edition. 3. K. Wark, and D. Richards, Thermodynamics, McGraw-Hill, latest edition. 4. K.D. Hagen, Heat Transfer with Applications, Prentice Hall, latest edition. 5. F.D. Incropera, and D.P. Dewitt, Introduction to Heat Transfer, Wiley, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME34004
Subject Title	Fluid Mechanics
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AMA2112 Mathematics II
Objectives	1. To teach fundamental concepts and knowledge of fluid mechanics. 2. To provide fundamental concepts and knowledge of inviscid and viscous flows, low-Reynolds number and high-Reynolds number flows, incompressible and compressible flows, their applications in mechanical engineering.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate and solve flow problems by applying knowledge of fluid mechanics and mathematics. b. Analyze and interpret data obtained from experiments in fluid mechanics. c. Search for updated technology in fluid engineering in completing a design project of a fluid system. d. Communicate effectively in completing written reports of laboratory work and design project.
Subject Synopsis/ Indicative Syllabus	***Basic Concepts*** - Fluid properties, viscosity and shear stress. Newton's Law of viscosity, simple viscometer, compressibility, Newtonian and non-Newtonian fluids. ***Pressure Distribution in a Fluid*** - Fluid pressure, Pascal's law, pressure-height relation, manometry, forces on submerged surfaces and buoyancy, force vortex and free vortex motion. ***General Description & Equations of Motion of Fluid Flow*** - Flow: steady and unsteady, uniform and non-uniform, incompressible and compressible, laminar and turbulent flow, Eulerian and Langrangian descriptions, streamline and streamtube, Euler equation and Bernoulli equation. Pitot and Pitot-static tubes, Venturi meter and orifice; Momentum Equation and Energy Equation; Pumps systems, pipe friction and losses. ***Dimensional Analysis*** - Principle of dimensional homogeneity. Buckingham π theorem. Dimensionless groups and their physical significance. Flow similarity and model testing. ***Conservation Equations*** - Continuity equation; Navier-Stokes equations; Energy equation; Exact solutions of N-S equations: Couette flow; Poiseuille flow; Couette-Poiseuille flow; Hagen-Poiseuille Flow through a Pipe. Examples of solving N-S equations by CFD software and numerical simulation models. ***Internal Flow*** - Exact solution for fully developed laminar flow in a pipe, Darcy's law; entrance length, Reynolds experiment and turbulence; Moody chart, frictional and minor losses, design for pipes in parallel and in series.

External Flow **-** Viscosity and viscous stress, laminar boundary layer over a flat plate; effects of adverse pressure gradient, concepts of flow separation, and transition to turbulence, velocity profiles; characteristics of flow over bluff bodies and particles, lift, friction and profile drag; boundary layers theory, boundary layer disturbance, displacement and momentum thicknesses, momentum integral equation, laminar boundary layer profiles, skin friction coefficient, turbulent boundary layers, power law and laws of walls.

Applications on Fluid Machinery **-** Dynamics of flow over an airfoil and through a cascade, Euler equation for turbo-machinery, characteristics of fans and pumps;

Compressible Flows - Review of Thermodynamics, propagation of sound waves. Isentropic flow equations. Mach cone. Subsonic and supersonic flows nozzles. Normal shock waves and oblique shock waves.

Laboratory Experiment
There are two 2-hour laboratory sessions and the typical Experiments are:
1. Compressible flow nozzle
2. Centrifugal Pump Testing
3. Potential Flow Visualization (Hele-Shaw Expt.)
4. Wind Tunnel Testing of Cylinder and aerofoil
5. Universal velocity Profile
6. Boundary Layer Experiment

Teaching/Learning Methodology

Lectures aim to deliver the fundamental knowledge in relation to fluid mechanics (Outcomes a, b, and d).

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

Experiments are arranged 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. Examination	60%	√	√		
2. Assignment/Laboratory report/Test	40%	√	√	√	√
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	20 Hrs.
▪ Self-study	45 Hrs.
Total student study effort	104 Hrs.

Reading List and References

1. Y.A. Cengel J.M. Cimbala, Fluid Mechanics (Fundamentals and Applications), McGraw-Hill, latest edition.
2. F.M. White, Fluid Mechanics, McGraw-Hill, latest edition.
3. J.F. Douglas, J.M. Gasiorek and J.A. Swaffield, Fluid Mechanics, Pearson, latest edition
4. M.C. Potter, and D.C. Wiggert, Mechanics of Fluids, Prentice-Hall, latest edition.

Revised July 2014

Subject Description Form

Subject Code	ME46002
Subject Title	Numerical Methods for Engineers
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AMA2111 Mathematics I
Objectives	To teach students numerical methods of solving typical engineering problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate simple engineering problems with knowledge in engineering mathematics. b. Solve non-linear equations, simultaneous linear algebraic equations, eigenvalue problems, using numerical methods. c. Perform numerical differentiation and integration and analyze the errors. d. Apply curve fitting to experimental data. e. Use MATLAB or other numerical software tools to compute the solutions of engineering problems using the appropriate numerical methods.
Subject Synopsis/ Indicative Syllabus	***Introduction to Mathematical Modelling and Computational Methods –*** Importance of computational modelling in engineering. Data representation and errors. Applications of commercial software packages such as MATLAB. Functions and plotting using MATLAB. ***Computer Solution of Non-linear Equations*** - Bracketing Methods. Bisection Method. Open Methods. Newton-Raphson Method. Secant Method. Convergence of methods. Determination of multiple roots. Engineering applications. ***Simultaneous Linear Equations*** - Solving simultaneous linear equations by Matrix Inversion. Cramer's Rule. Gauss Elimination. Gauss-Jordan Elimination. LU decomposition method. Engineering applications and choice of methods. ***Eigenvalue Problems*** - Standard and General Eigenvalues Problems. Methods of solving Eigenvalue problems. Applications in vibrations and Modal Analysis. ***Curve Fitting and Interpolation*** - Collocation-Polynomial Fit. Lagrange Interpolation. Newton's Divided-Difference Interpolating Polynomials. Interpolation using splines. Least-Squares Regression. ***Numerical Differentiation and Integration*** - Taylor's series expansion. Finite differences for the first derivative and the second derivative. High-accuracy differentiation formulas. Trapezoidal rule. Simpson's rule. High-order Newton-Cotes formulas. Applications of numerical differentiation and integration in heat transfer, solid mechanics and fluid flow problems.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to numerical methods. (Outcomes a - d)

Tutorials will be conducted in small groups to facilitate discussions. (Outcomes a - d)

Computational workshops provide hands-on experience in using software to solve numerical problems. (Outcomes b - e)

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

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. Assignment	30%	√	√	√	√	√
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

Tests will be conducted to assess students' learning on numerical methods.

Assignments will be used to assess students' learning on using numerical methods in solving engineering problems and using computational software in solving such problems.

Examination will be conducted to assess students' learning on numerical methods.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	5 Hrs.
	▪ Computational Workshop	1 Hr.
	Other student study effort:	
	▪ Performing assignment	40 Hrs.
	▪ Applying computational software	12 Hrs.
	▪ Private study	25 Hrs.
	Total student study effort	116 Hrs.
Reading List and References	1. S.C. Chapra and R.R. Canale, Numerical Methods for Engineers, McGraw-Hill, latest edition. 2. S.S. Rao, Applied Numerical Methods for Engineers and Scientists, Prentice-Hall, latest edition. 3. S.C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill, latest edition. 4. D.M. Etter, Engineering Problem Solving with Matlab, Prentice-Hall, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME49004
Subject Title	Final Year Capstone Project
Credit Value	6
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME31001 Dynamics and Vibrations; ME31002 Linear Systems and Control; ME32003 Design and Manufacturing; ME33001 Mechanics of Materials; ME34002 Engineering Thermodynamics; and ME34004 Fluid Mechanics
Objectives	To provide students with an opportunity of integrating and applying knowledge from different disciplines of mechanical engineering to conduct an engineering project that is open-ended and requires team collaboration for its completion.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate the problem and suggest a practical solution to solve an open-ended real-world engineering problem. b. Utilize knowledge from different disciplines of engineering to solve problems encountered in conducting the team project. c. Design, plan and carry out scientific and engineering experiments (physical tests and/or computer numerical simulations) to prove the feasibility of their designed solutions. d. Design the test apparatus, rigs, assemblies or systems as required by the project. e. Apply appropriate engineering tool (analytical, experimental, and/or computational) for carrying out tasks in the development and implementation of a designed solution. f. Work in a professional manner and comply with all applicable standards and regulations in conducting the project. g. Select and employ the appropriate manufacturing methods in the production and fabrication of components and assemblies required by the project. h. Evaluate the potential impact of their designed solution on performance, safety, cost and environment. i. Participate and lead in a multi-functional team. j. Take into account of safety, legal, environmental protection considerations in an engineering project. k. Communicate their project work to sponsors (if any), supervisors, other peer teams, and even non-technical audience and articulate the results and findings with scientific and logical arguments. l. Conduct literature search including patents, books, archived publications and product catalogues, and to perform the state-of-the-art and benchmark studies.

Subject Synopsis/ Indicative Syllabus

A project group consisting normally of three students will be expected to complete a substantial project of a major mechanical engineering task. The task can be an analytical study, an experimental investigation, a design project or a numerical simulation aimed at solving an engineering problem. The students are expected to go through the following stages of work:

- Problem identification
- Literature review
- Methodology of study
- Project execution
- Report writing
- Project presentation

Teaching/Learning Methodology

The subject is taught through guided studies. The students are given the project title, objectives and description. The students are guided by the project supervisor to go through the different stages of the project as shown in the Subject Synopsis/Indicative Syllabus. (Outcomes a – l)

Teaching/Learning Methodology	Outcomes											
	a	b	c	d	e	f	g	h	i	j	k	l
Guided study	√	√	√	√	√	√	√	√	√	√	√	√

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	i	j	k	l
1. Continuous monitoring	15%	√	√	√	√	√	√	√	√	√	√	√	√
2. Interim report	10%	√	√	√	√	√	√	√	√	√	√	√	√
3. Final report	50%	√	√	√	√	√	√	√	√	√	√	√	√
4. Oral examination	25%	√	√	√	√	√	√	√	√	√	√	√	√
Total	100%												

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

Overall Assessment: 1.0 × 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).

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 at 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. Due 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.
Reading List and References	To be advised by supervisor	

Revised July 2014

Subject Description Form

Subject Code	ME41001
Subject Title	Automatic Control Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME31002 Linear Systems and Control
Objectives	To provide students with the fundamental knowledge of controller design for automatic control systems.
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 open- or closed-loop control systems and designing controllers or compensators for mechanical systems. b. Complete a given task such as a project in system modeling or controller design 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 systems. d. Present effectively in completing written reports of laboratory work and the given task.
Subject Synopsis/ Indicative Syllabus	***Time Domain Controller Design*** **-** Multi-mode controllers; Optimum controller settings; Ratio, cascade and feedforward control. ***Frequency Domain Compensator Design*** **-** Nyquist criterion; Phase and gain margins; Multiple design constraints; Characteristics of lead, lag and lag-lead elements; Compensator design via Bode plots. ***State-Space Representation of Dynamic Systems*** **-** State variables of a dynamic system; State differential equations; State-space form equations from transfer functions; Canonical forms and decoupled systems; Relationship between eigenvalues and system poles. ***Control System Analysis Using State Variable Method*** **-** Direct numerical solution of state equation; Solution using state transition matrix; System stability; Controllability and observability. ***Control System Design Using State Variable Method*** **-** State variable feedback; Direct calculation of gains by comparison with characteristic equation; Pole placement via control canonical form of state equations; Pole placement via Ackermann's formula. **Laboratory Experiment**

There are two 2-hour laboratory sessions.

Typical Experiments:
1. Twin-rotor control
2. Inverted pendulum control
3. DC servo control

Teaching/Learning Methodology

Lectures aim at providing students with an integrated knowledge required for understanding controller or compensator design, analyzing and designing state-space control systems (Outcomes a and b).

Tutorials aim at enhancing the analytical skills of the students. Examples on time-domain controller design, frequency domain compensator design, state-space system representation, analysis and controller design are used to illustrate the application of integrated knowledge to solve real-world problems (Outcomes a and b).

Experiments will provide the students with experience on the use of simulation tools for the computer-aided analysis and controller design of typical state-space dynamic systems. It also trains students in the measurement and instrumentation, the analysis and presentation of experimental data (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. Examination	50%	√	√		
2. Test	25%	√	√		
3. Assignment	15%	√	√		
4. Laboratory report	10%			√	√
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

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	31 Hrs.
	▪ Tutorial/Laboratory	8 Hrs.
	Other student study effort:	
	▪ Course work	26 Hrs.
	▪ Self-study	45 Hrs.
	Total student study effort	110 Hrs.
Reading List and References	1. M. Gopal, Control Systems, Principles and Design, McGraw-Hill, latest edition. 2. N.S. Nise, Control Systems Engineering, Wiley, latest edition. 3. K. Ogata, Modern Control Engineering, Prentice Hall, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME41002
Subject Title	Noise Abatement and Control
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics; and ME34004 Fluid Mechanics
Objectives	To provide students with fundamental concept and knowledge of sound generation mechanism and noise abatement technology.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the sound generation mechanisms, and the method to identify and analyze the type of noise source. b. Formulate and solve the noise problem by using sound reflection, sound absorption and active noise control by applying knowledge of sound wave propagation. c. Understand the importance and usage of the noise assessment criterion for a given problem in duct or room noise applications. d. Apply the state-of the-art noise abatement technology and design elementary reactive and absorptive noise control device, analyze and interpret its performance from measurement.
Subject Synopsis/ Indicative Syllabus	***Noise Sources and Control Strategy*** **-** Sound and its energy flux, intensity measurements for source identification. Elementary noise source mechanisms, categorization of actual noise sources in transport, product and other applications. Flow induced noise sources. Overview of control strategy for different frequency ranges. ***Sound Reflection*** **-** Propagation and decay of duct acoustics modes, sound reflection by expansion chamber, and acoustic admittance of pipe systems, Helmholtz resonator, quarter-wavelength resonator, numerical simulation of reactive silencers. ***Sound Absorption*** **-** Characteristics of sound propagation in porous materials, empirical formulas and numerical modelling of sound absorption materials, grazing incident sound, and performance of duct lining. ***Active Noise Control*** **-** Destructive interference, sensors, actuators and controllers, concept of feedback and feedforward control. ***Room Acoustic Control*** **-** Basic concepts of room acoustics and room modes, noise control and sound transmission in buildings. ***Mini Project*** **-** This involves the use of numerical and/or experimental methods for noise abatement in a realistic application. **Laboratory Experiment**

There is one 1-hour laboratory session.
Typical experiment:
1. Helmholz resonator
2. Expansion chamber

Teaching/Learning Methodology

Lectures are aimed at providing students with the knowledge of acoustics and noise control for achieving the subject outcomes. (Outcomes a to d)

Tutorials are aimed at enhancing students' skills necessary for analyzing and designing the noise control method. (Outcomes a, b and d)

Laboratory experiments are conducted to improve students' ability to apply their knowledge to implement real engineering systems, to develop the students' interest and curiosity in the design of noise control method. (Outcomes b to 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	20%	√	√	√	√
2. Homework	20%	√	√		√
3. Lab report	10%		√	√	√
4. Examination	50%	√	√	√	√
Total	100%				

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

Overall Assessment:

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

Examination is adopted to assess students on understanding and the ability to apply the concepts. It is supplemented by the class test, homework 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	31 Hrs.
	▪ Tutorial/Laboratory	8 Hrs.
	Other student study effort:	
	▪ Reading and review	40 Hrs.
	▪ Homework assignment	11 Hrs.
	▪ Laboratory report	8 Hrs.
	Total student study effort	98 Hrs.
Reading List and References	1. A.D. Pierce, Acoustics: an Introduction to its Physical Principles and Applications, Acoustical Society of America, Woodbury, N.Y., latest edition. 2. A.P. Dowling and J.E. Ffowcs Williams, Sound and Sources of Sound, Chichester: E. Horwood, latest edition. 3. L.L. Beranek, Noise and Vibration Control Engineering: Principles and Applications, Wiley, latest edition. 4. D.A. Bies and C.H. Hansen, Engineering Noise Control: Theory and Practice, E & FN Spon, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME41003
Subject Title	Principles of Sound and Vibration
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics
Objectives	To provide students with the fundamental knowledge of generation and measurement of sound and vibration and the sound propagation.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the physics of the vibration of simple structure and sound propagation in the acoustic medium, in duct and in room. b. Formulate and solve the sound and vibration problem relating to vibration of string, beam and plate, sound radiation from the source, sound reflection and transmission through a junction and a flat interface of acoustic media by applying knowledge in noise mitigation method. c. Understand the mechanisms of basic measurement devices for sound and vibration, analyze and interpret the measured data from the experiments of noise and vibration.
Subject Synopsis/ Indicative Syllabus	***Fundamentals of Sound*** **-** Fluid compressibility, wave equation, sound pressure level and sound power, addition of sounds of different frequencies, octave bands and one-third octave bands, conservation of acoustic energy flux at the absence of a mean flow. ***Vibration of Continuous Systems*** **-** Vibration of string, rod, beams and plates; energy transmission through structures, natural modes, free and forced vibrations. ***Sources of Sound*** **-** Radiation of sound by pistons (1D, 2D), impedance, radiation efficiency, monopole and dipole, critical frequency, sound radiation by 2D structures. ***Sound Propagation*** **-** Single travelling wave and properties of standing wave, reflection of sound at pipe junctions and at interface of two media. ***Sound and Vibration Measurement*** **-** Measuring systems, microphones, sound level meters, background noise, measurement of sound intensity, reverberation time and absorption coefficient; accelerometers, calibration and mounting of accelerometers; shakers, hammers, force transducers and amplifiers; damping measurement, experimental modal analysis. **Laboratory Measurement** 1. Sound propagation in anechoic chamber 2. Impedance tube measurement 3. Experimental modal analysis of a vibrating beam 4. Traffic noise measurement

Teaching/Learning Methodology

Lectures are aimed at providing students with the knowledge of acoustics and vibration. (Outcomes a to c).

Tutorials are aimed at enhancing students' skills necessary for analyzing the physics of sound and vibration system (Outcomes a and b).

Laboratory experiments are conducted to improve students' ability to apply their knowledge to implement real engineering systems (Outcomes b and c).

Teaching/Learning Methodology	Outcomes		
	a	b	c
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
1. Class test	20%	√	√	√
2. Homework	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:

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

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

Student Study Effort Expected

Class contact:	
▪ Lecture	32 Hrs.
▪ Tutorial/Laboratory	7 Hrs.
Other student study effort:	
▪ Reading and review	43 Hrs.
▪ Homework assignment	10 Hrs.
▪ Laboratory report	10 Hrs.
Total student study effort	102 Hrs.

Reading List and References	1. L.E. Kinsler, et al., Fundamentals of Acoustics, Wiley, latest edition. 2. M.P. Norton, Fundamentals of Noise and Vibration Analysis for Engineers, Cambridge University Press, latest edition. 3. H. Benaroya, Mechanical Vibration: Analysis, Uncertainties and Control, Prentice-Hall, latest edition. 4. A.P. Dowling and J.E. Ffowcs Williams, Sound and Sources of Sound, Chichester: E. Horwood, latest edition. 5. L.L. Beranek, Noise and Vibration Control Engineering: Principles and Applications, Wiley, latest edition.

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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.

<table>
<tr><td></td><td>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.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>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)

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>Lecture/Tutorial</td><td>√</td><td>√</td><td>√</td><td></td></tr>
<tr><td>Mini-project report & presentation</td><td></td><td></td><td>√</td><td>√</td></tr>
<tr><td>Homework assignments/Case studies</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
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	ME42008
Subject Title	Computer-Aided Technology for Design
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME32001 Manufacturing Fundamentals; or ME32003 Design and Manufacturing
Objectives	1. To provide students advanced knowledge on the computer-aided related technologies for product design and development. 2. To provide students advanced knowledge on the principles and applications of computer-aided modelling and analysis. 3. To provide students advanced knowledge on the use of computer-aided techniques and software to solve structural, stress, heat transfer and dynamic problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Use the computer-aided techniques to facilitate the process of product design and development. b. Understand the interface among CAD, CAE and CAM during the product design process by using up-to-date software. c. Identify a set of design variables and the governing equations to analyze a conceptual design. d. Optimize the mesh size and type and apply appropriate types of boundary constraints in the CAE process. e. Analyze and optimize a design with the aid of modern CAE software.
Subject Synopsis/ Indicative Syllabus	***Computer-aided Modelling*** - Geometric Models of Products - Mathematical Modelling • Curve Modelling • Surface Modelling • Solid Modelling - 3-D Product Analysis - Modelling and Simulations - Product Animation ***Design Analysis and Evaluation*** - Finite Element Modelling and Analysis • Modelling Techniques • Mesh Types • Boundary Constraints • Material and Property Types

	- Mathematical Modelling - Mechanical and Thermal Stress Analyses - Dynamic Response - Product Optimizations (Size and Shape) - Non-linear Stress Analysis ***CAD/CAE/CAM Integration*** - Interface between CAD/CAE/CAM - Applications of CAD/CAE/CAM
Teaching/Learning Methodology	Lectures will be given to explain the theories behind CAD, CAE and CAM. Tutorials will be used to teach the students how to conduct design analysis and evaluation after finishing the process of computer-aided modeling using state-of-the-art software such as SolidWORKS, ANSYS. Students will be given sets of exercises to learn how to evaluate the structural strength, vibration frequencies of a product, the response to thermal stresses and drop test and the parameters involved in product optimization. A mini-project will be given to students so that they will go through all the phases of a design process using computer-aided technology to achieve the design objectives.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
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	e
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:

	0.5 × End of Subject Examination + 0.5 × 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	29 Hrs.
	▪ Tutorial	4 Hrs.
	▪ Guided study of CAD/CAE	6 Hrs.
	Other student study effort:	
	▪ Performing CAD/CAE in design (tutorial problems)	23 Hrs.
	▪ Performing modeling of design problems (case studies and mini-project)	24 Hrs.
	▪ Literature search and private study	20 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.	

Revised July 2016

Subject Description Form

Subject Code	ME42010
Subject Title	Industrial Automation
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME31002 Linear Systems and Control Exclusion: ME4217 Industrial Automation
Objectives	1. To teach students mechanisms of sensors, and available techniques for sensor interfacing and circuit protection in automation system. 2. To teach students principle of analog-to-digital conversion and importance of anti-alias filtering. 3. To teach students the mechanics and control of industrial robots used in flexible automation. 4. To teach students principle of industrial logic control systems used in manufacturing automation.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the major components of mechatronic systems used in automation such as sensors, and techniques for sensor interfacing and circuit protection. b. Understand the common forms of signal transmissions, the importance to suppress transmission noise in mechatronic systems, analog-to-digital converters, anti-alias filters, and sampling rates for real-time applications. c. Understand the mechanisms of actuators and method used to select sensors and actuators for practical mechatronic systems. d. Understand various types of robots for industrial applications. e. Understand industrial control logic design using ladder diagram and programmable logic controller.
Subject Synopsis/ Indicative Syllabus	***Sensors and Actuators*** **-** Generic components for mechatronic systems in automation: sensors and transducers such as displacement sensors, force sensors, ultrasonic sensors, fibre optic devices, *etc*; actuators such as dc motors, stepper motors, piezoelectric actuators, *etc*. ***Interfacing*** **-** Sensor protection circuits; Signal transmission and noise suppression; Analog-to-digital and digital-to-analog conversion; Sampling frequency; Anti-alias filtering. ***Industrial Robotics*** **–** Robot geometry; Basic forward and inverse kinematics; Robot drives; Motion control; Robot Tooling; Robot applications; Economic justifications; Robot implementation. ***Discrete Control Using PLCs*** **-** Relay logic; Combinational and sequential control; Minimization of logic equations; Ladder logic diagrams; Programmable logic controllers (PLCs); PLC components; Programming; I/O addresses; Timer and counters; PLC applications.

Laboratory Experiment:
There are two 2-hour laboratory sessions.
Typical Experiments:
1. Sequential control using PLC.
2. Programming and control of gantry robot.
3. Motor control systems.

Teaching/Learning Methodology

Lectures aim at providing students with an integrated knowledge required for the design and implementation of industrial automation systems.

Tutorials aim at enhancing the analytical skills of the students. Examples on sensors, actuators, analog-to-digital conversion, interfacing and signal conditioning circuits, programmable logic controllers (PLCs), robot kinematics and economic justifications will be provided and analyzed. Students will be able to solve real-world problems using the knowledge they acquired in the class.

Case study is used to allow students to deepen their knowledge on a specific topic through search of information, analysis of data and report writing (outcomes c and e).

Experiments will provide the students with hand-on experience on developing logic controllers using PLCs, implementing and testing industrial automations systems. It also trains students in the analysis and presentation of experimental data.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lecture	√	√	√	√	√
Tutorial	√	√		√	√
Case study			√		√
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	e
1. Class test	20%	√	√	√	√	√
2. Homework	10%	√	√	√	√	√
3. Laboratory	10%			√	√	√
4. Case study report / presentation	10%	√	√	√	√	√
5. Examination	50%	√	√	√	√	√
Total	100%					

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

Overall Assessment:
0.5 × End of Subject Examination + 0.5 × 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. Written report and oral presentation on a specific case study is used to assess the students' knowledge in the selection of sensors and actuators in a certain industrial automation scenario.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Laboratory/Tutorial	6 Hrs.
	Other student study effort:	
	▪ Reading and revision	39 Hrs.
	▪ Homework assignment	20 Hrs.
	▪ Laboratory report	6 Hrs.
	▪ Case study report	10 Hrs.
	Total student study effort	114 Hrs.
Reading List and References	1. D. Shetty, and R.A. Kolk, Mechatronics System Design, PWS Publishing Company, latest edition. 2. D.M. Auslander and C.J. Kempf, Mechatronics - Mechanical System Interfacing, Prentice-Hall, Inc., latest edition. 3. W. Kleitz, Microprocessor and Microcontroller Fundamentals, Prentice-Hall, Inc., latest edition. 4. M.P. Groover, Automation, Production Systems, and Computer-Integrated Manufacturing, Prentice Hall, latest edition.	

May 2016

Subject Description Form

Subject Code	ME42011
Subject Title	Fundamentals of Robotics
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME31002 Linear systems and control; or ME41004 Mechatronics and Control
Objectives	1. To provide students with the concepts and techniques for the design, modeling, analysis of robot manipulators. 2. To provide students with the fundamental knowledge of machine vision for robot guidance and automation.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Identify different types of robots and their applications in the industry. b. Construct the kinematics and dynamics equations of robot manipulators for motion analysis. c. Apply trajectory planning algorithms to generate the path for robot manipulators. d. Apply different machine vision and image processing algorithms to automate robot manipulators.
Subject Synopsis/ Indicative Syllabus	***Robot Manipulators*** **-** degrees of freedom, coordinate frame and homogeneous transformation, Denavit-Hartenberg (DH) convention, forward and inverse kinematics, Jacobian matrix, singularity, Lagrange's equation kinetic and potential energy, trajectory planning and obstacle avoidance. ***Computer Vision*** **-** Image formation, acquisition, histogram, edge and line detections, image enhancement, filtering, object recognition, stereo vision, camera modeling and calibration. **Laboratory Work** There is at least 1 2-hour laboratory session or an equivalent project. Typical Experiments are: 1. Object manipulation through a robot manipulator. 2. Programming and control of gantry robot. 3. Path planning of mobile robots for collision avoidance.

Teaching/Learning Methodology

Lectures aim at providing students with an integrated knowledge required for understanding and analyzing different robots, including system modeling, trajectory planning and image processing (Outcomes a to d)

Tutorials aim at enhancing students' analytical and problem solving skills on robotics. Students will be able to solve real-world problems using the knowledge they acquired in the class. (Outcomes a to d)

The project/experiments aims to have hand-on experience to automation of a robot system with vision or other functions. (Outcomes a to d)

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
1. Lectures	√	√	√	√
2. Tutorials		√	√	√
3. Homework assignments		√	√	√
4. Project or experiments	√	√	√	√

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. Examination	50%	√	√	√	√
2. Class Test	20%	√	√	√	√
3. Coursework including Project/Experimental Work	30%	√	√	√	√
Total	100%				

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

1. The assessment is comprised of 50% continuous assessment and 50% examination.
2. The continuous assessment consists of three components: homework assignments, test, and experiments/projects. They are aimed at evaluating the progress of students' study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.
3. The examination is used to assess the knowledge acquired by the students for understanding and analyse 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/Laboratory	6 Hrs.
	Other student study effort:	
	▪ Reading and review	36 Hrs.
	▪ Coursework (assignments, project)	40 Hrs.
	Total student study effort	115 Hrs.
Reading List and References	1. S. B. Niku, Introduction to robotics : analysis, control, applications, Wiley, latest edition. 2. M. W. Spong S. Hutchinson, and M. Vidyasagar, Robot Modeling and Control, Wiley, latest edition. 3. C. Bishop, Pattern Recognition and Machine Learning, Springer, latest edition. 4. R. C. Gonzalez and R. E. Woods, Digital Image Processing, Prentice Hall, latest edition.	

Revised March 2017

Subject Description Form

Subject Code	ME43001
Subject Title	Advanced Materials for Design and Technology
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME33001 Mechanics of Materials Exclusion: ME45006 Aircraft Structure and Engineering Composite
Objectives	To provide advanced knowledge on the design, development, processing, applications and structural evaluations of advanced materials and structures, including smart materials and aircraft and aerospace structures.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Apply the mechanics of composites and smart materials in the product design process. b. Design innovative products/structures by applying knowledge in advanced materials and technology including smart materials and intelligent technology. c. Identify the limitations and constraints by using advanced materials at different environments. d. Consider environmental factors during the product design process.
Subject Synopsis/ Indicative Syllabus	***Advanced Composite Materials*** **-** Design and mechanical performance; Lamination theory; The rule of mixtures; Design for aircraft and aerospace structures; Environmentally-friendly composites; Composite manufacturing process; Recycling advanced composites; Environmental impact. ***Smart Materials and Structures and Integrated Systems*** **-** Shape memory alloy (SMA) sensors and actuators; Hysteresis loop; Constitutive models; Active piezo-electric actuators; PVDF; Magnetostrictive materials; Dynamic control of smart structures; Bio-compatibility; Embedded sensor technology. ***Nano-structural Materials*** **-** Carbon nanotubes and their composite structures; Nanoclay/polymer composites; Superhard particles for wear resistance; Micro-electro-mechanical (MEMs) and Nano-electro-mechanical (NEMs) devices.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to advanced materials. (Outcomes a, b and c)

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

Project or case study is used to allow students to deepen their knowledge on a specific topic through search of information, analysis of data and report writing. (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 c)

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√	√	
Tutorial	√	√	√	
Project/case study	√	√	√	√
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. Examination	50%	√	√	√	√
2. Assignment	25%	√	√	√	√
3. Project / case study / Presentation	20%	√	√	√	√
4. Laboratory report	5%	√		√	
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 assignments and laboratory reports which provide timely feedbacks to both lecturers and students on various topics of the syllabus. Written report and oral presentation on a specific project or case study are used to assess the students' knowledge on smart materials.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial/Laboratory	6 Hrs.
	Other student study effort:	
	▪ Assignment	21 Hrs.
	▪ Self-study	40 Hrs.
	Total student study effort	100 Hrs.
Reading List and References	1. Nano-scale materials: from science to technology, S.N. Sahu, R.K. Choudhury, and P. Jena, editors, New York, Nova Science Publishers, latest edition. 2. Smart Materials, edited by Mel Schwartz, CRC Press/Taylor & Francis, latest edition. 3. Progress in Smart Materials and Structures, Peter L. Reece, editor, New York, Nova Science Publishers, latest edition. 4. Smart Structures -Analysis and Design, A. V. Srinivasan and D. M. McFarland, Cambridge University Press, latest edition. 5. Shape Memory Materials, K. Otsuka & C. M. Wayman, Cambridge University Press, latest edition. 6. Zafer Gurdal, Raphael T. Haftka and Prabhat Hajela, Design and Optimization of Laminated Composite Materials, John Wiley & Sons, latest edition. 7. Sergey Edward Lyshevski, MEMS and NEMS: Systems, Devices, and Structures, Boca Raton, Fla.: CRC Press, latest edition. 8. Facing up to the Recycling Challenge, Reinforced Plastics, Elsevier, Monthly Periodocal, latest edition. 9. Principles of Composite Material Mechanics, Ronald F. Gibson, CRC Press, Taylor & Francis Group, latest edition. 10. Materials Science and Engineering an Introduction, William D. Callister, David G. Rethwisch, John Wiley & Sons, latest edition.	

Revised March 2015

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	ME44002
Subject Title	Engine Technology
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics
Objectives	To provide students with the fundamental knowledge of engine technology, and its combustion-related emissions.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand and evaluate physical parameters of engine design and operating characteristics. b. Apply the fundamental knowledge of solving air-standard and real air-fuel engine cycles. c. Apply the fundamental knowledge of thermochemistry and fuels. d. Understand the general principles of engine combustion, emissions controls and standards.
Subject Synopsis/ Indicative Syllabus	***Introduction*** **-** Historical perspective of engines. Engine classifications. Terminology and abbreviations. Engine components. Basic engine cycles. ***Engine Design and Operating Characteristics*** **-** Engine parameters. Indicated work per cycle. Mean effective pressure. Brake torque and power. Dynamometers. Air-fuel and fuel-air ratios. Specific fuel consumption. Fuel efficiencies. Volumetric efficiency. Specific emissions and emission index. Relationships between performance parameters. Engine design and performance data. Noise abatement. ***Engine Cycles*** **-** Air-standard cycles. Otto Cycle. Diesel cycle. Dual cycle. Comparison of Otto, Diesel and Dual cycles. Real air-fuel engine cycles. ***Thermochemistry and Fuels*** **-** Thermochemistry. Gasoline, diesel and alternative fuels. ***Engine Combustion and Emissions*** **-** Spark ignition engine combustion, ignition and burning rate analysis. Compression ignition engine combustion, fuel injection, ignition delay. Engine emissions controls and standards.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to internal combustion engines (outcomes a to d).

Tutorials will be conducted to facilitate discussions of typical examples and coursework assignments (outcomes a to d).

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√	√	√
Assignment/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
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' studies, assisting them in fulfilling the respective intended subject learning outcomes, and enhancing the integration of their knowledge learnt. The mid-term test(s) covers the first half of the subject material and provides useful feedback to both the 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 intended subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Tutorial	6 Hrs.
Other student study effort:	
▪ Self-study/Coursework	67 Hrs.
Total student study effort	106 Hrs.

Reading List and References	1. C.R. Ferguson and A.T. Kirkpatrick, Internal Combustion Engines, John Wiley & Sons Inc., latest edition 2. W.W. Pulkrabek, Engineering Fundamentals of the Internal Combustion Engine, Prentice Hall, latest edition. 3. J.C. Guibet, Fuels and Engines- Technology, Energy and Environment, Vol. 1 & 2, Technip, Paris, latest edition.

Revised July 2014

Subject Description Form

Subject Code	ME44003
Subject Title	Combustion and Pollution Control
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics
Objectives	To provide students with the fundamental knowledge of combustion phenomena, and formation and control of combustion-generated air pollutants.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Apply the fundamental knowledge of thermodynamics and chemical kinetics of combustion. b. Apply the general principles of combustion of fuels. c. Understand the formation mechanisms of combustion-generated air pollutants, and fuel emissions. d. Understand and determine appropriate methods for air pollution measurement and control. e. Determine the air pollutant concentration and dispersion from source(s).
Subject Synopsis/ Indicative Syllabus	***Thermodynamics and Chemical Kinetics of Combustion*** **-** Application of First Law of Thermodynamics. Reactant and product gaseous mixtures. Enthalpy of combustion. Adiabatic flame temperatures. Chemical and partial equilibrium. Global versus elementary reaction rates. Chemical time scales. Preignition kinetics. Global and quasi-global mechanisms. Nitrogen oxide kinetics. ***Combustion of Gaseous and Vaporised Fuels*** **-** Laminar and turbulent premixed flames. Diffusion flames. Mechanisms of flame stabilisation. Explosion limits. Mechanisms of quenching, flammability and ignition. ***Combustion of Liquid Fuels*** **-** Spray formation. Size distribution. Fuel injectors. Spray dynamics. Vaporisation of single droplet. ***Air Pollutants and Their Formation*** **-** Formation of carbon monoxide, nitrogen oxides, unburnt hydrocarbon, soot and particulates. Measurement techniques and quantification of air pollutants. ***Fuels and Emissions*** **-** Gasoline and diesel fuels. LPG, natural gas and biodiesel as alternative fuels. Oxygenated fuels. Effect of sulphur contents on diesel emissions. ***Aftertreatment for Motor Vehicle and Power Plant Emissions*** **-** Two and three way catalysts. Cyclones, precipitators, filters and traps, evaluation of capturing efficiency. Scrubbers for flue gas desulphurisation. NOx reduction. Advanced aftertreatment devices/systems.

	Introduction to Air Pollutant Dispersion **-** Chimneys, inversions and the atmosphere. Air pollutant concentration and dispersion from motor vehicles and chimneys. Street canyon effect.
Teaching/Learning Methodology	Lectures are used to deliver the fundamental knowledge in relation to combustion and pollution control (outcomes a to e). Tutorials will be conducted to facilitate discussions of typical examples and coursework assignments (outcomes a to e). **Teaching/Learning Methodology** — **Outcomes**: a, b, c, d, e 1. Lecture — √ √ √ √ √ 2. Assignment/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 × End of Subject Examination + 0.50 × 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(s) covers the first half of the subject material and provides useful feedback to both the 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 intended subject learning outcomes.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study effort:	
	▪ Self-study/coursework	67 Hrs.
	Total student study effort	106 Hrs.
Reading List and References	1. G.L. Borman and K.W. Ragland, Combustion Engineering, McGraw-Hill, latest edition. 2. R.J. Heinsohn and R.L. Kabel, Sources and Control of Air Pollution, Prentice Hall, latest edition. 3. N.D. Nevers, Air Pollution Control Engineering, McGraw-Hill, latest edition. 4. S.R. Turns, An Introduction to Combustion- Concepts and Applications, McGraw-Hill, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME44004
Subject Title	Heat and Mass Transfer
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics; and ME34004 Fluid Mechanics
Objectives	To provide students with the fundamental knowledge of heat and mass transfer.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Apply the fundamental knowledge of heat transfer mechanisms, namely conduction, convection and radiation. b. Evaluate different types of heat exchangers. c. Apply the numerical techniques in heat transfer applications. d. Apply the fundamental knowledge of mass transfer.
Subject Synopsis/ Indicative Syllabus	***Introduction*** - Conduction, convection and radiation. Fourier's law. Newton's law of cooling. ***Conduction*** - The plane wall. Insulation and thermal resistance. Radial systems. The overall heat transfer coefficient. Critical thickness of insulation. Heat-Source systems. Cylinder with heat sources. Heat transfer from extended surfaces. Unsteady conduction in slab or cylinder, Lumped-heat-capacity method. ***Forced and Free Convection*** - Governing equation for the boundary layer. Fluid and thermal boundary layer. The relation between fluid friction and heat transfer. Flow over a flat plate. Flow across cylinders/tubes and spheres. Heat transfer in laminar tube flow with constant temperature and constant heat flux. Heat transfer coefficients for free convection of plates and cylinders. ***Numerical Simulation*** - General differential equations for heat conduction. Energy balance method. Finite-difference solutions for differential equations of heat conduction. Explicit and implicit methods. Grid shape and size. Gauss-Seidel iteration. Accuracy and stability. ***Heat Exchanger*** - Heat exchanger types. The overall heat transfer coefficient. Heat exchanger analysis: Log mean temperature difference, parallel and counterflow heat exchangers. Heat exchanger analysis: The Effectiveness-NTU Method. ***Radiation*** - Black body and grey body. Absorptivity and emissivity. View factors. Irradiation and radiosity. Radiation exchange between surfaces and its network approach. ***Mass Transfer*** - Basic equations in mass transfer. Analogy between heat and mass transfer. Mass diffusion. Boundary conditions. Steady mass diffusion through a wall.

<table>
<tr><td></td><td>Water vapour migration in buildings. Simultaneous heat and mass transfer.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Lectures are used to deliver the fundamental knowledge in relation to heat transfer and mass transfer (outcomes a to d).

Tutorials will be conducted to facilitate discussions of typical examples and coursework assignments (outcomes a to d).

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Assignment/Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
</table></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="4">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></tr>
<tr><td>1. Assignment</td><td>30%</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Test</td><td>20%</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>3. Examination</td><td>50%</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></td></tr>
</table>

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

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 intended subject learning outcomes, and enhancing the integration of their knowledge learnt. The mid-term test(s) covers the first half of the subject material and provides useful feedback to both the 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 intended subject learning outcomes.</td></tr>
</table>

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study effort:	
	▪ Self-study/Coursework	67 Hrs.
	Total student study effort	106 Hrs.
Reading List and References	1. Y.A. Cengel and A.J. Ghajar, Heat and Mass Transfer: Fundamentals and Applications, McGraw-Hill, latest edition. 2. J.P. Holman, Heat Transfer, McGraw Hill, latest edition. 3. F.P. Incropera, D.P. Dewitt, T.L. Bergman and A.S. Lavine, Principles of Heat and Mass Transfer, John Wiley & Sons, Inc., latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME44005
Subject Title	Alternative Fuels
Credit Value	3
Level	4
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics
Objectives	To provide students with the knowledge on the properties, applications, limitations and environmental impacts of different fuels
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Solve renewable energy related problems with knowledge in fossil fuels and alternative fuels. b. Demonstrate knowledge in production methods of different alternative fuels. c. Select from different alternative fuels available for specific potential applications. d. Understand the socio-economic, environmental impacts, limitations and applications of alternative fuels.
Subject Synopsis/ Indicative Syllabus	***Fuels*** **-** Fossil fuel and alternative fuels; Hydrogen, biomass and biofuels; Environmental benefits of alternative fuels. ***Biomass*** **-** Composition of biomass; Biomass combustion; Application of biomass combustion; Exergy analysis. ***Biodiesel*** - Production of biodiesel from plant oil, animal oil and waste cooking oil; Application of biodiesel to diesel engines. ***Hydrogen*** **-** Production and storage of hydrogen; Application of hydrogen to fuel cells and motor vehicles. ***Other Biofuels, Their Production and Applications*** **-** Bioethanol; Fischer-Tropsch Diesel; Biofuels from Microalgae and Seaweeds; Methane Biogas; Biomethanol and Biomethane ***Limitations of Biofuels*** **-** Economic, social and environmental impact of biofuels, Life cycle analysis of biofuels

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge on alternative fuels (Outcomes a to d).

Tutorials are used to illustrate the application of alternative fuels. (Outcomes a to d)

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
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
1. Examination	50%	√	√	√	√
2. Tests	35%	√	√	√	√
3. Assignments	15%	√	√	√	√
Total	100%				

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

Overall Assessment:

0.5 x End of Subject Examination + 0.5 x Continuous Assessment

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

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Tutorial	6 Hrs.
Other student study effort:	
▪ Course work	39 Hrs.
▪ Self-study	39 Hrs.
Total student study effort	117 Hrs.

Reading List and References	Reference Books 1. R.B. Gupta, Hydrogen fuel production, transport and storage, CRC Press, latest edition. 2. S.V. Loo and J. Koppejan, The handbook of biomass combustion and co-firing, Earthscan, latest edition. 3. A.A. Vertes, N. Qureshi, H.P. Blaschek, H. Yukawa, Biomass to biofuels, Wiley, latest edition. 4. J.H. Wright, D.A. Evans, New research on biofuels, Nova Science Publishers, Inc., latest edition. 5. J.C.J Bart, N. Palmeri, S. Cavallaro, Biodiesel science and technology from soil to oil, CRC Press, latest edition. 6. J. M. Marchetti, Biodiesel production technologies, Nova Science Publishers, Inc., latest edition. Reference Journals 1. International journal of hydrogen energy 2. Biofuels, bioproducts and biorefining - Biofpr 3. Bioresource technology 4. Biomass & bioengineering

Revised April 2015

Subject Description Form

Subject Code	ME44007
Subject Title	Fluids Engineering
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34004 Fluid Mechanics
Objectives	1. To teach students the principle of rotodynamic machines applied to fan design. 2. To teach students to the phenomena of flows around cylinders and the applications in flow-induced vibrations 3. To teach students to the phenomena of flows around spherical particles and the applications in environmental engineering. 4. To teach students the basic theory and applications of computational fluid dynamics (CFD).
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the principle of rotodynamic machines applied to fan design. b. Understand the characteristics and performance of different type of centrifugal fans and axial flow fans. c. Design centrifugal fans and axial flow fans for different applications. d. Understand the phenomena of flows around cylinders and spheres for different Reynolds number and the resulting force characteristics. e. Apply the knowledge in flow around cylinders and sphere in flow induced vibration and environmental protection devices. f. Understand basic theory in computational fluid dynamics.
Subject Synopsis/ Indicative Syllabus	***Fluid Machinery*** - Classification. Pumps, fans, compressors and turbines. Energy equation. Euler equation. ***Centrifugal Fans*** - Velocity triangles. Radial entry. Blade angles. Dimensionless coefficients. Reaction effect. Characteristics for infinite number of blades. Finite number of blades. Slip formulae and losses. Efficiencies. Actual fan characteristics for backward, radial & forward bladed fans. Fan laws. Design of impeller and volute. Case study. ***Axial Flow Fans*** - Aerofoil lift/drag coefficients and angle of attack. Carpet Plot of fan blades. Ideal cascade flows. Relation of lift coefficient with blade solidity and flow deflection angle. Pressure rise. Free vortex design. Circular arc camber line and stagger angle. Aerofoil blades with losses. Velocity diagrams and pressure for different axial flow fans. Fan operation and system. Fans in series and in parallel. Operational instability and temperature effects. Design illustration.

Flows around Cylinders - Effect of Reynolds numbers. Flow separations. Vortex shedding. Pressure coefficients. Mean & fluctuating forces. Velocity distributions: Prandtl's mixing length model. Flow-induced vibrations. Multi-cylinders. Effects of interference on flow field. Control of vortex induced vibrations.

Flows around Spheres - Forces in particle flows. Stokes' law. Trajectory modelling. Terminal velocity. Pressure variation. Gas-solid separation. Gravity settling and centrifugal separation. Cyclone. Velocity Distribution. Flows through packed particles. Fluidization. Ergun's equation.

Introduction to CFD - General approaches. Pre-processing. Mesh generation. Governing equations (Solver). Post-processing. Solutions of ODE by Runge-Kutta methods: one-dimensional motion of flying objects. Introduction to Finite difference method: Difference equation for Elliptic equations, Parabolic equations, and Wave equations. Introduction to Finite volume method. Introduction to Finite element methods for fluid flow. Commercial packages: Finite element, finite difference and finite volume solvers: FLUENT, CFX etc.

Laboratory Experiments:
There are 2 two-hour laboratory sessions:
Typical experiments:
1. Performance of centrifugal fans.
2. Fluidization and Cyclone experiments.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to fans, flows around cylinders and spheres, CFD (outcomes a to f).

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

Project or case study is used to allow students to deepen their knowledge and software applications on CFD such as FLUENT (outcome f).

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 b and d).

Teaching/Learning Methodology	Outcomes					
	a	b	c	d	e	f
Lecture	√	√	√	√	√	√
Tutorial	√	√	√	√	√	√
Project / Case study						√
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	e	f
1. Examination	50 %	√	√	√	√	√	√
2. Test	25 %	√	√	√	√	√	
3. Assignment	15 %	√	√	√	√	√	√
4. Laboratory report	5 %		√		√		
5. Mini-project report	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 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. Written report and oral presentation on a specific CFD project is used to assess the students' knowledge and applications of commercial package such as FLUENT.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Laboratory/Tutorial	6 Hrs.
Other student study effort:	
▪ Assignment, Laboratory report, Mini-project	20 Hrs.
▪ Self-study	43 Hrs.
Total student study effort	102 Hrs.

Reading List and References

1. Darby, R., Chemical Engineering Fluid Mechanics, Marcel Dekker Inc., latest edition.
2. Zdravkovich, M.M., Flow around Circular Cylinders, Oxford University Press, latest edition.
3. Shaw, C.T., Using Computational Fluid Dynamics, Prentice Hall, latest edition.
4. Wallis, R.A., Axial Flow Fans and Ducts, John-Wiley, latest edition.
5. Osborne, W.C., Fans, Pergamon, latest edition.

March 2015

Subject Description Form

Subject Code	ME45001
Subject Title	Aerodynamics
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34004 Fluid Mechanics
Objectives	To equip students with necessary knowledge of flow physics, analytical and numerical techniques for the prediction of forces acting on and performance analysis of aerodynamic bodies.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate and solve problems relating to low-speed flow past two-dimensional airfoils and aerodynamic bodies by applying inviscid and incompressible flow theories. b. Formulate and solve problems relating to downwash and induced drag phenomena for finite wings by applying the techniques derived from laws of vortex motion. c. Formulate and solve problems relating to compressible flow through nozzles/diffusers and supersonic flow past aerodynamic bodies by applying one-dimensional compressible flow equations and knowledge of flow compressibility and wave phenomena in aerodynamics. d. Analyze and interpret data obtained from experiments in incompressible and compressible aerodynamics. e. Present effectively in completing written reports of laboratory work and the given task.
Subject Synopsis/ Indicative Syllabus	***Fundamental Principles and Equations*** **-** Control volume concept for fluid. Continuity equation. Momentum equation. Energy equation. Substantial derivative. Angular velocity, vorticity and strain. Dimensional analysis. ***Inviscid and Incompressible Flow*** **-** Stream function and velocity potential. Potential flow. Laplace's equation and its elementary solutions. ***Incompressible Flow over Two-Dimensional Airfoils*** **-** Airfoil nomenclature and characteristics. The Kutta condition. Circulation and lift. Kelvin's circulation theorem and starting vortex. General thin airfoil theory. Symmetric and cambered airfoils. Aerodynamic Center. Panel method for arbitrary lifting bodies. Viscous airfoil drag. ***Finite Wings*** **-** Downwash and induced drag. Vortex system on finite wing. Law of vortex motion. Prantdl's lifting line theory. Lifting-surface theory and vortex lattice numerical method.

Inviscid and Compressible Flow **-** Definition of compressibility and total conditions. Governing equations. One-dimensional flow: weak waves and plane normal shock waves. Two-dimensional supersonic flow: oblique shock and expansion waves. Flow through nozzles and diffusers.

Compressible Flow over Airfoils **-** Velocity potential equation and its linearized form. Prandtl-Glauert compressibility correction. Critical Mach number. The sound barrier. Supersonic pressure coefficients. Application to supersonic airfoils.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental principles and equations of aerodynamics as well as solution techniques (outcomes a to d).

Tutorials are used to illustrate the application of fundamental principles to practical engineering situations (outcomes a to c).

Projects, in the form of design problems or case studies, are used to allow students to deepen their knowledge on a selected topic through search of information, analysis of data and report writing (outcomes a, b and e).

Experiment(s) on evaluating the effects of configurations of an airfoil on its flow field and aerodynamic characteristics, either in laboratory or numerical setup, is (are) provided for bridging the knowledge of fluid mechanics with current subject. Students are exposed to proper use of knowledge taught and analysis skills on evaluating their experimental results (outcomes a, d and e).

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lecture	√	√	√	√	
Tutorial	√	√	√		
Project/Laboratory	√	√			√
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	e
1. Assignment	20%	√	√	√		
2. Project/Laboratory report	15%		√	√	√	√
3. Test	15%	√	√			
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 continuous assessment including assignments projects and test(s), which provide timely feedback to both lecturers and students on various topics of the syllabus. Assigned homework and test are designed to enhance the students' learning of fundamental principles in aerodynamics. The projects provide students an opportunity to capitalize on the knowledge they learn for tackling practical aerodynamic problems arising from real practice. Written report and oral presentation on a specific project or case study is used to assess the students' knowledge in contemporary aircraft maintenance engineering.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study effort:	
	▪ Self-study	45 Hrs.
	▪ Homework assignment	12 Hrs.
	▪ Project/case study	12 Hrs.
	Total student study effort	108 Hrs.
Reading List and References	1. Anderson Jr., J. D., Fundamentals of Aerodynamics, McGraw-Hill, latest edition. 2. Houghton, E. L., and Carpenter, P. W., Aerodynamics for Engineering Students, Butterworth & Heinemann, latest edition. 3. Bertin, J. J. and Cummings, R. M., Aerodynamics for Engineers, Pearson Prentice-Hall, latest edition. 4. Anderson Jr., J. D., Aircraft Performance and Design, McGraw-Hill, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME45002
Subject Title	Aircraft Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34004 Fluid Mechanics
Objectives	To develop students' fundamental knowledge and basic concepts on components and operating principles of essential mechanical and electrical systems in civil transport aircraft.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate good understanding of the principles of flight control and various systems in civil transport aircraft; and formulate and solve problems relating to aircraft systems. b. Identify the flight control and utility functions to be considered in the design of an aircraft hydraulic system. c. Explain major electrical loads and the characteristics of modern aircraft electrical system. d. Explain the need for cabin and avionics conditioning and outline recent advances in aircraft environmental control system design. e. Explain the design philosophy and objectives of aircraft emergency systems.
Subject Synopsis/ Indicative Syllabus	***Flight Control Systems*** **-** Principles of flight control. Primary and secondary flight controls. Flight phases. ***Power Plant*** **-** Fuel efficiency. Effect of specific thrust. Specific fuel consumption and flight speed. Engine cycle and performance. ***Fuel Systems*** **-** Characteristics of aircraft fuel systems. Fuel system components. Aircraft mass and payload. ***Hydraulic Systems*** **-** Flight control and utility functions. Emergency power sources. Landing-gear system. Braking and anti-skid. ***Electrical systems*** **-** Characteristics of civil aircraft electrical system. Electrical loads. Emergency power generation. ***Pneumatic systems*** **-** Pitot-static systems. Use of engine bleed air**.** Bleed air control. Thrust reversers. ***Environmental Control Systems*** **-** The need for cabin and equipment conditioning. Environmental control system design. Air distribution systems. Cabin pressurization. ***Emergency Systems*** **-** Warning systems. Fire detection and suppression. Emergency oxygen. Explosion suppression. Passenger evacuation.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to various aircraft systems (outcomes a to e).

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

Industrial visits and special seminars delivered by invited industrial professionals are used to relate the concepts learnt on class to engineering practices. Students are expected to achieve better understanding of aircraft systems through these activities (outcomes a to e).

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lecture	√	√	√	√	√
Tutorial	√	√	√	√	√
Industrial field visit and special seminar	√	√	√	√	√

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. Examination	50%	√	√	√	√	√
2. Assignment and test	40%	√	√	√	√	√
3. Industrial field visit and visit report, report for special seminars	10%					√
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 continuous assessment including assignments, closed-book tests, industrial visits and special seminars. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study effort:	
	▪ Course work	20 Hrs.
	▪ Self-study	45 Hrs.
	Total student study effort	104 Hrs.
Reading List and References	1. The Rolls-Royce Book of the Jet Engine, latest edition, Rolls-Royce Ltd, latest edition. 2. SAE Aerospace Information Report 5005, Aerospace – Commercial Aircraft Hydraulic Systems, latest edition. 3. I. Moir amd A.G. Seabridge, Design and Development of Aircraft Systems – An Introduction, First Edition, AIAA Education Series, latest edition.	

Revised July 2014

Subject Description Form

Subject Code	ME45006
Subject Title	Aircraft Structure and Engineering Composites
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME33001 Mechanics of Materials Exclusion: ME43001 Advanced Materials for Design and Technology
Objectives	To provide students fundamental knowledge relevant to the structures and composite materials used in modern aircraft, and broad knowledge of all aspects of the technology related to aircraft structural applications.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate an understanding of key aspects of aircraft structures. b. Formulate, analyze, design and optimize an aircraft structure subject to a combined loading using stress analysis tools. c. Formulate and solve problems involving compression/tension, bending, torsion and buckling in aircraft structures. d. Understand mechanical behaviors and manufacturing of composites used in aircraft. e. Gain appreciation of the wide design flexibility composites in modern aircraft.
Subject Synopsis/ Indicative Syllabus	***Fundamentals of Aircraft Structures and Materials*** – Aircraft structures. Wing, fuselage, tail and landing gear. Aircraft materials. ***Elasticity*** – Equations of equilibrium in a non-uniform stress field. Linear stress-strain relations. Loads Applied on Aircraft Structures – Torsion of wing and fuselage. Bending and Flexural shear of wing and fuselage. Closed single-cell thin-walled fuselage. Transverse shear stress due to transverse force in symmetric sections of fuselage. ***Flexural Shear Flow in Fuselage*** – Flexural shear flow in open thin-walled section. Shear centre in open sections. Closed thin-walled sections and combined flexural and torsional shear flow. ***Failure Criteria*** – Ductile and brittle materials. Fracture mechanics. Stress intensity factor. Fatigue. Failure criteria. ***Elastic Instability*** – Eccentrically loaded beam-column. Elastic buckling of landing gear. Torsional-flexural buckling of thin-walled bars. ***Analysis of Lamina and Laminates in Aircraft*** – Plane stress equations for composite lamina. Off-axis loading. Stacking sequence in laminates. Symmetric laminate under in-plane loading. Effective moduli for symmetric laminates. Laminar stresses.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to aircraft structures and composites (outcomes a to e).

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

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. Examination	50%	√	√	√	√	√
2. Assignment and test	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 continuous assessment including assignments and closed-book tests. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Tutorial	6 Hrs.
Other student study effort:	
▪ Course work	20 Hrs.
▪ Self-study	45 Hrs.
Total student study effort	104 Hrs.

Reading List and References

1. C.T. Sun, Mechanics of Aircraft Structures, John Wiley & Sons, latest edition.
2. R.F. Gibson, Principles of Composite Material Mechanics, McGraw-Hill International Editions, latest edition.

Revised March 2015

Subject Description Form

Subject Code	ME47005
Subject Title	Aircraft Performance and Flight Management
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	To teach students the fundamental aerodynamic principles and performance analyses for the management of aircraft flight in atmosphere.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate a good understanding of the aircraft wing aerodynamic forces and their management in cruising flight; b. Define the combinations of aircraft aerodynamic features and propulsion methods for different cruising requirements; c. Describe the relationships between the performance prescriptions and the power and thrust requirements for steady flight; d. Evaluate the aircraft manoeuvre stability for managing flying qualities.
Subject Synopsis/ Indicative Syllabus	***Aircraft Wing Aerodynamics*** – Airfoil lift, drag and moments. Airfoil data. Compressibility correction. Finite wing aerodynamics. Induced drag. High-lift mechanisms. ***Aircraft Performance*** – Concept of drag polar. Propulsion characteristics. Tradeoff between thrust availability and performance efficiency. Thrust and power requirements for cruising flight. Altitude effects. Climb and descent performance. Gliding flight. Takeoff and landing. Level turn, pull-up and pull-down. ***Manoeuvre Management*** – Flying qualities. Elementary concepts of stability and control. Tail surfaces. Pitching moments of airfoil. Static and dynamic stability. Longitudinal and lateral stability. Stalling and spinning. Flight management and guidance computers (FMGC).

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to various aspects of aerodynamic characteristics for aircraft as well as their influence in determining the aircraft performance and manouvre management for atmospheric flight (Outcomes a to d).

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

Experiment on evaluating the effects on aircraft wing profile on aerodynamic force characteristics, either in laboratory or numerical setup, is provided for bridging the knowledge of aerodynamics with flight performance. Students are exposed to proper use of knowledge taught and analysis skills on evaluating their experimental results (Outcomes a and c).

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	√	√	√	√
Homework assignments		√	√	√
Test		√	√	
Examination	√	√	√	√

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	20%	√	√	√	√
2. Experiment	15%		√		
3. Test	15%		√	√	
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 continuous assessment including assignments projects and test(s), which provide timely feedback to both lecturers and students on various topics of the syllabus. Assigned homework and test are designed to enhance the students' learning of fundamental flight mechanics of an aircraft. The experiment provides students an opportunity to capitalize on the knowledge they learn for tackling practical aircraft flight performance problems. Written report and oral presentation on a specific project or case study is used to assess the students' knowledge in contemporary aeronautical engineering practice.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorials	6 Hrs.
	Other student study effort:	
	▪ Self Study	42 Hrs.
	▪ Homework assignments	12 Hrs.
	▪ Project/Case study	12 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	1. Kermondes, A. C., Mechanics of Flight, Prentice Hall, latest edition. 2. Anderson Jr., J. D., Introduction to Flight, McGraw-Hill, latest edition. 3. Torenbeek, E., and Wittenberg, H., Flight Physics, Springer, latest edition. 4. Hull, D. G., Fundamentals of Airplane Flight Mechanics, Springer, latest edition.	

March 2014

Subject Description Form

Subject Code	ME47007
Subject Title	Aircraft and Spacecraft Propulsion
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics; and ME34004 Fluid Mechanics
Objectives	1. To provide students with the basic knowledge relevant to propulsion systems of aircraft and spacecraft. 2. To provide students with knowledge and applications of thermodynamic cycles in propulsion systems of aircraft and spacecraft and the chemistry and thermodynamics of combustion.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand basic knowledge of modern propulsion systems used in today's aircraft and spacecraft, such as turbojet, turbofan and rocket propulsion. b. Obtain state-of-the-art knowledge in the area of advanced aerodynamics and thermodynamics related to modern propulsion systems in aircraft and spacecraft. c. Apply their knowledge, skills and hand-on experience to the design and analysis of propulsion systems in aircraft and spacecraft. d. Extend their knowledge of mechanical engineering to different situations of engineering context and professional practice in turbomachinery.
Subject Synopsis/ Indicative Syllabus	***Basic Knowledge of Compressible Flows and Thermodynamics*** **-** Conservation laws including continuity equation, momentum equation and energy equation. Brief review of thermodynamics. Isentropic and polytropic processes, stagnation concept. Speed of sound and Mach number. Quasi-one-dimensional flows, including compressible flows with friction and heat and nozzle flows. ***Introduction to Propulsion Systems of Aircraft*** **-** Thrust and drag. Engine stall. Ramjet, turbojet, turbofan, turboprop, turbo-shaft engines, and new types of engines. Engine maintenance. Engine airworthiness. ***Basic Components of Aircraft Gas-turbine Engine*** **-** Inlets. Compressor. Combustion chambers and afterburners. Turbine and nozzles. ***Cycle Analysis and Performance*** **-** Thrust equations. Engine performance parameters. Thermal and propulsion efficiencies. Fuel consumption rate and specific thrust. Basic considerations in the analysis of jet propulsion. Inter-cooling. Reheating. Regeneration. Cycle analysis. Modifications to turbojet engines. Gas turbine design. ***Turbomachinery*** **-** Basics of compressors and turbines. ***Introduction to Propulsion Systems of Spacecraft*** **-** Chemical rockets. Spacecraft propulsion. Electric propulsion. Rocket thrust. High-speed Airbreathing engines. Hypersonic propulsion.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to propulsion systems of aircraft and spacecraft (outcomes a to d).

Tutorials are used to illustrate the application of fundamental knowledge to practical situations (outcomes a to 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			
		a	b	c	d
1. Examination	50%	√	√	√	√
2. Assignments including Tests	30%	√	√	√	√
3. Experiment	20%	√	√	√	√
Total	100%				

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 continuous assessment including assignments, closed-book tests and group experiment. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus. Continuous assessment will also be used to assess the students' capacities of self-learning and problem-solving and effective communication skill in English so as to fulfill the requirements of being space engineers.

All assigned homework inclusive of any computer problems should be worked independently. It is the students' responsibilities to work out the problems individually and to ask questions on those problems they have difficulty with. Unless stated otherwise, no group submission or copies are permitted. If a copy is detected, a zero score will be assigned.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Tutorial/Lab.	6 Hrs.
Other student study effort:	
▪ Assignments	36 Hrs.
▪ Self-study	40 Hrs.
Total student study effort	115 Hrs.

Reading List and References

1. S. Farokhi. Aircraft Propulsion, Wiley, latest edition.
2. Hill P. and Peterson C., *Mechanics and Thermodynamics of Propulsion*. Addison Wesley, latest edition.
3. Sutton G. P., Biblarz O., *Rocket Propulsion Elements*, John Wiley & Sons, Inc., latest edition.
4. P. Fortescue, *et al.* Spacecraft Systems Engineering, Wiley, latest edition.

Subject Description Form

Subject Code	ME47008
Subject Title	Fundamentals of Aircraft and Spacecraft Design
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME32002 Engineering Design Fundamentals
Objectives	1. To provide students with the key knowledge relevant to design of aircraft and spacecraft. 2. To furnish students with key aspects to be considered when design aircraft and spacecraft. 3. To equip students with the capacity to formulate the design requirements for aircraft and spacecraft using modern engineering tools.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand key concepts in a process of aircraft and spacecraft design. b. Understand key components in aircraft and spacecraft. c. Identify key design features from aerodynamic point of view. d. Understand launching procedure and vehicles for spacecraft.
Subject Synopsis/ Indicative Syllabus	***Introduction to Aircraft Design*** **-** Design method and requirements. Evolution of aircraft design. Overview of aircraft design cycle and process. ***Aerodynamic Consideration for Aircraft Design*** **-** Fundamentals of aerodynamics. Flow separation. Friction and pressure drag. Airfoils. Finite wings. Drag and lift. Lift-to-drag ratio. Flapped airfoils. End effects of wing tips. Induced drag. ***Aircraft Configuration*** **-** Conventional and alternative configurations. Wing design. Fuselage design. ***Sizing and Costing*** **-** Internal layout. Structures and weight. Geometry constraints. Sizing equation. Weight fraction method. Weight and balance. Cost analysis. Elements of life-cycle cost. Cost-estimating methods. Operations and maintenance costs. Cost measures of merit. ***Airworthiness in Aircraft Design*** **-** Airworthiness requirements. Airframe loads. Designing against fatigue. Prediction of aircraft fatigue life. ***Introduction to Spacecraft Design*** **-** Fundamentals of space structures. Payloads and missions. Spacecraft environment and its effect on spacecraft design. ***Dynamics of Spacecraft*** **-** Trajectory dynamics. General attitude dynamics. Attitude motion of specific types of spacecraft. ***Launch Vehicles*** **-** Basic launch vehicle performance and operation. Spacecraft launch phases and mission planning. Crewed launch systems. Small launchers and reusable vehicles. Re-entry into Earth's atmosphere.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to aircraft and spacecraft design (outcomes a to d).

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

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√	√	√
Tutorial	√	√	√	√
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
1. Examination	50%	√	√	√	√
2. Assignments	30%	√	√	√	√
3. Mini-project	20%	√	√	√	√
Total	100%				

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 continuous assessment including assignments and closed-book tests. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus. Continuous assessment will also be used to assess the students' capacities of self-learning and problem-solving and effective communication skill in English so as to fulfill the requirements of being aircraft design engineers. The mini-project concerns design and analysis of a new aerial vehicle.

All assigned homework inclusive of any computer problems should be worked independently. It is the students' responsibilities to work out the problems individually and to ask questions on those problems they have difficulty with. Unless stated otherwise, no group submission or copies are permitted. If a copy is detected, a zero score will be assigned.

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Course work including project	52 Hrs.
▪ Self-study	26 Hrs.
Total student study effort	117 Hrs.

Reading List and References	1. S.A. Brandt, *et al*., Introduction to Aeronautics: A Design Perspective, American Institute of Aeronautics and Astronautics Inc., latest edition. 2. D.P. Raymer, Aircraft Design: A Conceptual Approach, American Institute of Aeronautics and Astronautics Inc., latest edition. 3. P. Fortescue, *et al.* Spacecraft Systems Engineering, Wiley, latest edition.

May 2016

Subject Description Form

Subject Code	ME49002
Subject Title	Environmental Noise
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics
Objectives	To teach students the practical aspects in environmental noise; the techniques for the measurement, assessment and prediction of transportation and industrial noise.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the simple sound fields and identify the noise sources and their respective mitigation measures for road traffic noise. b. Understand basic concept of room acoustics. c. Elucidate the various terms and factors involved in the evaluation of environmental and occupational noise. d. Understand the noise assessment methodology which correlate with human perception in the context of legal requirements and comply with local noise regulations.
Subject Synopsis/ Indicative Syllabus	***Fundamentals of Noise*** **-** Sound Pressure Levels and Sound Power Levels; L_{eq} and Sound Exposure Level of Noise Events; Prediction and Measurement of a Simple Noise Source; Directivity effects. Basic Concepts of Sound Propagation Outdoors: Refraction, Scattering, Diffraction, and Absorption of Sound in Air; Attenuation of Sound over Ground; Noise Reduction by Barriers. Models for Room Acoustics; Reverberation time; Random incidence absorption coefficients; Noise from ventilation and air-conditioning systems; Fundamentals and techniques of sound insulation; Measurement and prediction of airborne and impact sound insulation; Noise ingression and emission from buildings. ***Transportation Noise*** **-** Sources of noise and their method of mitigation for road and railway vehicles; Models for predicting road, rail and aircraft noise; Use of the Calculation of Road Traffic Noise (CRTN) in the noise impact assessment for large infrastructure projects. ***Noise Assessment*** **-** Speech inference and noise annoyance criteria; Risks of hearing damages due to noise exposure; Noise criteria and noise ratings; Descriptors for determining human response to noise; Standards and legislations of controlling environmental noise in Hong Kong; Application of control noise permit in Hong Kong.

Laboratory Experiment
There are two 2-hour laboratory sessions.
Typical Experiments:
1. Outdoor traffic noise measurement
2. Classroom reverberation time measurement

Teaching/Learning Methodology

Lectures are aimed at providing students with the knowledge of environmental noise and transportation noise for achieving the subject outcomes. (Outcomes a, b, c and d)

Tutorials are aimed at enhancing students' skills necessary for analyzing noise assessment method and legal requirement in Hong Kong. (Outcomes a, b, c and d)

Experiments, Project/Case Study are conducted to improve students' ability to apply their knowledge to implement real engineering systems. (Outcomes b, c and d)

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√	√	√
Tutorial	√	√	√	√
Project/Case Study			√	√
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	20%	√	√	√	
2. Homework	10%	√	√	√	
3. Lab report	10%		√	√	√
4. Project report	10%			√	√
5. 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

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. Written reports on specific projects/case studies are used to assess the students' knowledge in contemporary road noise traffic prediction method and control, and room noise control.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial/Laboratory	6 Hrs.
	Other student study effort:	
	▪ Reading and review	40 Hrs.
	▪ Homework assignment	15 Hrs.
	▪ Laboratory report/ Project Report	22 Hrs.
	Total student study effort	116 Hrs.
Reading List and References	1. M.J. Crocker, (Ed.), Handbook of Acoustics, John Wiley & Sons, latest edition. 2. P.M. Nelson, (Ed.), Transportation Noise Reference Book, Butterworths, latest edition. 3. The Open University Press, Unit 11-13, T234 Environmental Control and Public Health, The Open University, latest edition. 4. The Open University Press, Noise Block, T334 Environmental Monitoring and Control, The Open University, latest edition. 5. Engineering noise control: theory and practice**,** Spon Press/Taylor & Francis, latest edition. 6. Calculation of road traffic noise**,** Harlow, England: Addison Wesley Longman, latest edition. 7. http://www.epd.gov.hk/epd/noise_education/web/ENG_EPD_HTML/m3/ordinance_7.html	

Revised July 2014

SUBJECT DESCRIPTION FORM

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

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

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

Objectives:

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

Syllabus:

Complex Number: Basic concept. Algebra. Roots

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

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

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

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

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

Method of Assessment:

Overall Assessment: 1 ×Continuous Assessment

Reference books:

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

March 2012

Subject Description Form

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

Teaching/Learning Methodology

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

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

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

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

Assessment Methods in Alignment with Intended Learning Outcomes

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

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

Overall Assessment:

0.60 × End of Subject Examination + 0.40 × 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 July 2017