THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

Department of
Aeronautical and Aviation Engineering
航空及民航工程學系

Department of
Aeronautical and Aviation Engineering

Bachelor of Engineering (Honours) in Aviation Engineering

Programme Code: 48402
Full-time Credit-based

Programme Requirement Document
2021 cohort

August 2021

CONTENTS

PART A PROGRAMME SCHEME

1. General Information

1.1 Introduction

Programme Title	Bachelor of Engineering (Honours) in Aviation Engineering 航空工程學(榮譽)工學士學位
Host Department	The programme is hosted by the Department of Aeronautical and Aviation Engineering (AAE).
Programme Structure	Credit-based
Mode of Attendance	Full-time
Normal Duration of Study	4 years
Final Award	Bachelor of Engineering (Honours) in Aviation Engineering 航空工程學(榮譽)工學士學位
Credits Required for Graduation	(a) Academic Credits: Exact number of credits depends on the academic background of students: • **124 credits** for HKDSE students who have Level 2 or above in HKDSE Physics (or Combined Science with a component in Physics); non-local students from the Chinese Mainland who have a Pass (a pass is taken as 60% of the total marks of the subject) in the Physics or Integrated Science subject in the Joint Entrance Examination for Universities and; other students who possess the equivalent qualifications. • **127 credits** for students who do not possess the above background. (b) Training Credits: **10** (c) Work-Integrated Education Training Credit: **1**
Implementation Year	The first intake started in September 2016

1.2 Characteristics

The programme has the following characteristics:

(a) A four-year degree programme in Hong Kong to train students to become engineers in the aviation industry.
(b) Some subjects are co-taught by PolyU academics and industry professionals to give students first-hand information on the aviation industry.
(c) Summer internships, technical visits and on-site experience sharing may be arranged to enhance students' learning and work experience in the industry.

In this programme, students receive a broad-based knowledge of science and engineering in the first year which will prepare them to lay a strong foundation to learn aviation engineering related subjects in the upper years. In the second year, they will acquire basic knowledge in aircraft and aviation systems and also have hands-on experience in aircraft component manufacturing processes. In the third year, students will embark on more advanced subjects such as aircraft design, safety, control, and propulsion systems. In the final year (ie. the fourth year of the normal study pattern), they have the opportunity to focus study on a chosen stream to acquire specialized knowledge in a specific area of aviation engineering. Students can also freely choose the four elective subjects from the different streams to broaden their knowledge on aviation engineering. Possible study streams include (a) Aviation Services Engineering, (b) Aeronautical Engineering, (c) Aircraft Maintenance Engineering, and (d) Introduction to Pilot Ground Theory.

Industrial Centre (IC) training which aims at providing students with basic hands-on engineering skills and practice for modern aircraft design through workshop and project training. Students may join an internship programme during the summer to gain a real-life working experience and to enhance their competitiveness in the future. Industrial-based final year projects may be provided to students to enhance their skills and knowledge to solve real life problems.

1.3 Minimum Entrance Requirements

For entry with HKDSE qualifications

The general minimum entrance requirements are as follows:

HKDSE Subjects	Core Subjects				Elective Subjects (including M1/M2)	
	Chinese Language	English Language	Mathematics	Liberal Studies	1st Elective	2nd Elective
Level Requirement	3	3	2	2	3	3

There is no compulsory subject requirement. Preferred elective subjects for the programme include:

- Information and Communication Technology;
- Physics, Chemistry and combined science subjects with Physics; and
- Extended modules of Mathematics.

Satisfactory performance in preferred subjects will have a positive influence on admission selection. However, applicants who have not taken the preferred subjects will still be

considered for admission but they may need to take relevant underpinning subjects after admission to PolyU to gain the necessary foundation knowledge.

For those who are applying on the basis of A-Level qualifications

- E in 3 A-Level subjects *OR* E in 2 A-Level and 2 AS-Level subjects;
  AND
- Satisfy the English Language Requirement.

For those who are applying on the basis of IB

- A minimum score of 24 with at least grade 4 in 2 Higher Level (HL) subjects;
  AND
- Satisfy the English Language Requirement.

For those who are applying on the basis of other qualifications

- An appropriate Diploma passed with credit or an appropriate Higher Certificate from a recognized institution;
  OR
- An appropriate Associate Degree / Higher Diploma from a recognized institution.

Note: Credit transfer may be granted to applicants with A-Level / IB qualification / Higher Diploma / Associate Degree, or the equivalent.

1.4 Student Exchanges

Exchanges to universities overseas for a semester or an academic year are possible through various exchange schemes organised by the University, Faculty or Department. While the number of exchanges is limited, students are encouraged to participate to enhance their all-roundedness and broaden their experience.

Block credit transfer may be given to exchange-out students. However, in order to ensure attaining the pre-requisite knowledge for smooth integration of study in the programme, students will be counselled on subject selection in the visited Universities before they leave for the exchange.

1.5 External Recognition

The programme has been granted full accreditation by the Hong Kong Institution of Engineers (HKIE).

1.6 Summer Term Teaching

Usually, there will be no summer term teaching. Industrial Centre Training or External Training may take place during summers.

1.7 Daytime and Evening Teaching

Subjects will be offered predominantly during weekdays/Saturdays. Some subjects may be made available only in evenings or Saturdays/Sundays.

2. Rationale, Objectives and Intended Learning Outcomes of the Programme

2.1 Rationale

The global aviation industry is growing at a rapid pace. Asia, especially China, is the key contributor and stakeholder in this growth. The worldwide demand for qualified engineers for this industry is enormous and imminent. Different forecast reports worldwide have expressed the concern for the serious shortage of pilots and engineers that will affect the growth of this industry. The serious shortage of qualified engineers for the aviation industry has become a bottleneck for the sustainable growth of the aviation industry, which is a critical industry for Hong Kong. Unfortunately, there is yet a comprehensive academic programme in the field of aviation engineering offered by any university in Hong Kong that covers both hard and soft core knowledge of the aviation discipline. The launching of the proposed 4-year programme by PolyU is definitely a timely move to address the needs of the industry. The programme aims at training students to become engineers with a broad understanding of both the engineering and management operation in the aviation industry. If there are sufficient number of students who are interested to join pilot training programmes, special training subjects in relation to pilot ground theory training may be offered during summer semesters to prepare them to enter into the pilot training institutes. Graduates of this programme can find employment as professional engineers in maintenance, repair and operations organisations, and in the areas of air transportation, logistics, airline and airport operations, and aircraft component design and manufacture. The last but not the least, graduates can join the training of professional flying school if they fulfilled all the standard and sponsored by airlines.

2.2 Programme Objectives

This programme aims at producing graduates with:

1. In-depth understanding of the operation of aviation engineering including aircraft and aviation systems, airworthiness and up-to-date technologies, as well as specialized knowledge in a chosen stream of study.
2. Competence to handle different engineering problems academically and practically in the aviation industry.
3. Sufficient knowledge to manage and solve problems through effective and efficient project management and planning.
4. Confidence in communication with different stakeholders by the use of state-of-the arts technologies and aviation language (both English and Chinese).

2.3 Relationship of Programme Objectives to University Mission

The University has the following mission:

(a) To pursue impactful research that benefits the world.

(b) To nurture critical thinkers, effective communicators, innovative problem solvers and socially responsible global citizens.

(c) To foster a University community in which all members can excel in their aspirations with a strong sense of belonging and pride.

The following table illustrates the relationship between programme objectives and University mission:

Programme Objectives	University Mission		
	(a)	(b)	(c)
1	√	√	√
2	√	√	√
3	√	√	√
4		√	√

2.4 Institutional Learning Outcomes

The institutional learning outcomes are:

1. **Competent professional:** Graduates should be able to integrate and to apply in-depth discipline knowledge and specialised skills that are fundamental to functioning effectively as an entry-level professional (professional competence); understand the global trends and opportunities related to their professions (global outlook); and demonstrate entrepreneurial spirit and skills in their work, including the discovery and use of opportunities, and experimentation with novel ideas (entrepreneurship).
2. **Critical thinker:** Graduates should be able to examine and critique the validity of information, arguments, and different viewpoints, and to reach sound judgments on the basis of credible evidence and logical reasoning.
3. **Innovative problem solver:** Graduates should be able to identify and define problems in both professional and day-to-day contexts, and produce innovative solutions to solve problems.
4. **Effective communicator:** Graduates should be able to comprehend and communicate effectively in English, and Chinese where appropriate, orally and in writing, in professional and day-to-day contexts.
5. **Lifelong learner:** Graduates should be able to recognise the need for continual learning and self-improvement, and be able to plan, manage and evaluate their own learning in pursuit of self-determined goals.
6. **Ethical leader:** Graduates should have an understanding of leadership and be prepared to serve as a leader and a team player (leadership and teamwork); demonstrate self-leadership and psychosocial competence in pursuing personal and professional development (intrapersonal competence); be capable of building and maintaining relationship and resolving conflicts in group work situations (interpersonal competence); and demonstrate ethical reasoning in professional and day-to-day contexts (ethical reasoning).
7. **Socially responsible global citizen**: Graduates should have the capacity for understanding different cultures and social development needs in the local, national and global contexts (interest in culture and social development); and accept their responsibilities as professionals and citizens to society, their own nation and the world (social, national, and global responsibility).

2.5 Intended Learning Outcomes of the Programme

The programme aims to achieve 11 learning outcomes. On successful completion of the BEng(Hons) in Aviation Engineering programme, students are expected to achieve the following abilities, which are classified into two groups.

Professional/academic knowledge and skills (PAK):

(a) To identify, formulate and solve problems in aviation engineering by applying knowledge of mathematics, science and engineering.
(b) To design and conduct experiments, as well as to analyze and interpret data.
(c) To design systems, components or processes to meet desired needs.
(d) To use the techniques, skills and modern engineering tools, including the computational tools necessary for engineering practice.
(e) To work professionally in aviation systems and understand aircraft regulations.
(f) To understand the function and manufacturing of aviation and aircraft components.

Professional outlook and workplace skills (POW):

(a) To have knowledge of contemporary issues and the broad education necessary to understand the impact of engineering solutions in a global and societal context.
(b) To function professionally in multidisciplinary teams.
(c) To understand professional and ethical responsibility.
(d) To communicate effectively and professionally with appropriate languages and tools.
(e) To recognize the need to engage in life-long learning.

The following table illustrates the relationship between programme outcomes and programme aims:

Programme Outcomes	Programme Aims			
	1	2	3	4
PAK a	√	√	√	
PAK b	√	√	√	
PAK c		√		
PAK d	√	√	√	
PAK e	√	√		
PAK f	√	√	√	
POW a	√	√	√	
POW b			√	√
POW c	√	√	√	√
POW d			√	√
POW e	√	√	√	√

2.6 Relationship of Intended Learning Outcomes of the Programme to Institutional Learning Outcomes

Programme Outcomes	Institutional Learning Outcomes of PolyU						
	1	2	3	4	5	6	7
PAK(a)	√	√	√		√		
PAK(b)	√	√	√		√		
PAK(c)	√	√	√		√		√
PAK(d)		√		√	√		
PAK(e)			√	√		√	√
PAK(f)	√	√	√		√		
POW(a)	√	√	√			√	√
POW(b)		√	√	√	√	√	
POW(c)		√	√	√	√	√	√
POW(d)		√	√	√	√	√	
POW(e)					√	√	√

2.7 Relationship of Intended Learning Outcomes of the Programme to the Desired Learning Outcomes of The Hong Kong Institution of Engineers (HKIE)

The Hong Kong Institution of Engineers (HKIE) adopts 12 desired learning outcomes for an engineering degree *[referenced to the "Professional Accreditation Handbook (Engineering Degrees)", issued by the HKIE Accreditation Board in February 2013, Pages 10-11]*. A comparison between the desired learning outcomes for an engineering degree programme as proposed by the HKIE and the intended learning outcomes of the current programme is given below:

Learning Outcomes	Desired Learning Outcomes Proposed by HKIE for Engineering Degrees	ILOs of the Current Programme
a	An ability to apply knowledge of mathematics, science and engineering appropriate to the degree discipline	PAK: a
b	An ability to design and conduct experiments, as well as to analyse and interpret data	PAK: b
c	An ability to design a system, components or process to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability	PAK: c, f
d	An ability to function on multi-disciplinary teams	POW: b
e	An ability to identify, formulate and solve engineering problems	PAK: a
f	An ability to understand professional and ethical responsibility	POW: c
g	An ability to communicate effectively	POW: d
h	Ability to understand the impact of engineering solutions in a global and societal context, especially the importance of health, safety and environmental considerations to both workers and the general public	POW: a

Learning Outcomes	Desired Learning Outcomes Proposed by HKIE for Engineering Degrees	ILOs of the Current Programme
i	An ability to stay abreast of contemporary issues	POW: a
j	An ability to recognize the need for, and to engage in life-long learning	POW: e
k	An ability to use the techniques, skills and modern engineering tools necessary for engineering practice appropriate to the degree discipline	PAK: d, e
l	An ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations	PAK: d POW: d

3. Curriculum

3.1 Programme Specified Subjects

To satisfy the graduation requirements, students are required to complete a minimum of 124 *[30 credits for General University Requirements (GUR) and 94 credits for Discipline-Specific Requirements (DSR)]* or more academic credits and 10 training credits. The exact number of academic credits required will depend on the academic background of students.

Unless specified otherwise, all subjects in the curriculum are of standard credit value carrying 3 credits each. A student is expected to spend about 35 to 45 hours of study (inclusive of class contact and other study effort) to earn a credit. The following table lists the subjects, their credit values, pre-requisite requirements (if any) and the category to which they belong (Compulsory or Elective). All subjects shown as compulsory are non-deferrable and must be taken in accordance to the progression pattern. The subjects offered will be updated from time to time according to the needs of society and the profession.

Compulsory Subjects

Subject Code	Subject Title	Credit	Pre-requisites (if any)
General University Requirements (GUR)			
- -	Cluster-Area Requirement I (CAR I)	3	
- -	Cluster-Area Requirement II (CAR II)	3	
- -	Cluster-Area Requirement III (CAR III)	3	
- -	Cluster-Area Requirement IV (CAR IV)	3	
- -	Language and Communication Requirement I (LCR I) – English *	3	
- -	Language and Communication Requirement II (LCR II) – English *	3	
- -	Language and Communication Requirement III (LCR III) – Chinese *	3	
APSS1L01	Tomorrow's Leaders	3	
- -	Service-Learning	3	
ENG1003	Freshman Seminar for Engineering	3	
- -	Healthy Lifestyle	0	
Discipline-Specific Requirements (DSR)			
AAE2001	Introduction to Aircraft and Aviation Systems	3	
AAE3001	Fundamentals of Aerodynamics	3	AMA2111/AMA2112
AAE3002	Aircraft Structures and Materials	3	ENG2001/ME23001/ME33001
AAE3003	Aircraft Propulsion Systems	3	
AAE3004	Dynamical Systems and Control	3	AMA2111/AMA2112
AAE3006	Safety, Reliability and Compliance	3	
AAE4002	Capstone Project	6	Refer to SDF in Part B
AAE4004	Airworthiness and Regulations	3	
AAE4006	Flight Mechanics and Control Systems	3	AAE3004
AMA4301	Avionics Systems	3	
AF3625	Engineering Economics	3	
AMA1110	Basic Mathematics I – Calculus and Probability & Statistics	3	
AMA1120	Basic Mathematics II – Calculus and Linear Algebra	3	AMA1110
AMA2111	Mathematics I	3	AMA1120
AMA2112	Mathematics II	3	AMA2111

Subject Code	Subject Title	Credit	Pre-requisites (if any)
AP10001	Introduction to Physics (1)	3	
AP10005	Physics I	3	
AP10006	Physics II	3	
CLC3243P	Chinese Communication for Aviation*	2	
EE2902S	Fundamentals of Electrical and Electronic Engineering	3	
ELC3531	Professional Communication in English for Engineering Students*	2	LCR-English
ENG2001	Fundamentals of Materials Science and Engineering/Chemistry/Biology (2)	3	
ENG2002	Computer Programming	3	
ENG2003	Information Technology	3	
ENG3003	Engineering Management	3	
ENG3004	Society and the Engineer	3	
ME23001	Engineering Mechanics	3	AP10005
ME33001	Mechanics of Materials	3	ME23001 **and** ENG2001
AAE2101/ IC2105	Engineering Communication and Fundamentals	4 (TRN)	
AAE2102/ IC2133	Aircraft Manufacturing and Maintenance Fundamentals	4 (TRN)	
AAE3103/ IC381	Appreciation of Aircraft Manufacturing Processes	3 (TRN)	
AAE3104/ IC388	Aircraft Manufacturing and Maintenance Practice	3 (TRN)	

Electives

Subject Code	Subject Title	Credit	Pre-requisites (if any)
Aviation Services Engineering			
AAE4001	Aviation Project Management	3	
AAE4003	Airport Services Engineering	3	
AAE4007	Aircraft Leasing and Finance	3	
AAE4008	Aviation Finance, Taxation and Insurance	3	
AAE4009	Data Science and Data-driven Optimisation in Airline and Airport Operations	3	
ISE3004	Systems Modeling and Simulation	3	
ISE3013	Data Management in Aviation Industries	3	
ISE4014	Aircraft Service Engineering and Logistics	3	
Aeronautical Engineering			
AAE4105	Engineering Composites	3	AAE3002
AAE4111	Compressive Aerodynamics	3	AAE3001
AAE4201	Flight Control Systems	3	AAE3004
AAE4202	Electronics & Information Technologies for Unmanned Aerial Systems	3	
AAE4203	Guidance and Navigation	3	AAE3004/AAE4301
AAE4304	Advanced Positioning and Navigation Systems	3	
Aircraft Maintenance Engineering			
AAE4107	Aircraft Gas Turbine Engine Systems	3	AAE3003 and IC2133
AAE4108	Aircraft Inspection and Testing	3	IC2133
AAE4109	Aircraft Maintenance Practices	3	IC2133

Subject Code	Subject Title	Credit	Pre-requisites (if any)
AAE4110	Aircraft Propeller	3	IC2133
Introduction to Pilot Ground Theory			
AAE4304	Advanced Positioning and Navigation Systems	3	
AAE4902	Pilot Ground Theory	3	
AAE4903	Human Factor in Aviation	3	
AAE4904	Meteorology in Aviation	3	

Table 3.1

Note:

AAE Department of Aeronautical and Aviation Engineering
AF School of Accounting and Finance
AMA Department of Applied Mathematics
AP Department of Applied Physics
CLC Chinese Language Centre
EE Department of Electrical Engineering
ELC English Language Centre
ENG Faculty of Engineering
IC Industrial Centre
ISE Department of Industrial and Systems Engineering
ME Department of Mechanical Engineering
TRN Training credits

* *Details of the Language and Communication Requirements (LCR) are set out in para. 5.15.3 – 5.15.7.*

(1) This subject is required only for HKDSE students who do not have Level 2 or above in HKDSE Physics (or Combined Science with a component in Physics); non-local students from the Chinese Mainland who do not have a Pass (a pass is taken as 60% of the total marks of the subject) in the Physics or Integrated Science subject in the Joint Entrance Examination for Universities; and other students who do not possess the equivalent qualifications.

(2) Students must choose <u>one</u> subject from (a) to (f) listed below:

Engineering Materials:	*(a) ENG2001 Fundamentals of Materials Science and Engineering*
Biology#:	*(b) ABCT1101 Introductory Life Science*
	(c) ABCT1303 Biotechnology and Human Health
	(d) BME11101 Bionic Human and the Future of Being Human
Chemistry#:	*(e) ABCT1301 Chemistry and Modern Living*
	(f) ABCT1314 Chemistry and Sustainable Development

 # <u>Double fulfilment of DSR and CAR</u>

Students choosing any one subject in the "Biology" and "Chemistry" areas will have the subject double-counted towards the fulfilment of both the Discipline Specific Requirement (DSR) and CAR-D (Science, Technology and Environment). They are required to choose any 3-credit subject (except for Level-0 subjects and training subjects (including clinical/field training)) to make up for the total credit requirement.

3.2 Normal Progression Pattern

Tables A and B present two typical progression patterns. They are only indicative and by no means mandatory; students may take slightly different plans provided that the credit requirements of the intended award are fulfilled within the maximum period of registration. Each subject carries 3 credits, unless specified otherwise.

Table A - Normal Progression Pattern
(Total 124 academic credits + 10 training credits)

(a) For students who have Level 2 or above in HKDSE Physics (or Combined Science with a component in Physics), or the equivalent qualifications.

(b) For non-local students from the Chinese Mainland who have a Pass (a pass is taken as 60% of the total marks of the subject) in the Physics or Integrated Science subject in the Joint Entrance Examination for Universities.

Year 1 (33 + 4 training credits)	
Semester 1 (15 + 2 training credits)	**Semester 2 (18 +2 training credits)**
AAE2001 Introduction to Aircraft and Aviation Systems	AMA1120 Basic Mathematics II
AMA1110 Basic Mathematics I	AP10006 Physics II
AP10005 Physics I	APSS1L01 Tomorrow's Leaders
ENG1003 Freshman Seminar for Engineering	ENG2003 Information Technology
LCR I (English)	LCR II (English)
	CAR I ^
Healthy Lifestyle (non-credit bearing) ^	
AAE2101/ IC2105Engineering Communication and Fundamentals (4 training credits) ***or*** AAE2102/ IC2133Aircraft Manufacturing and Maintenance Fundamentals (4 training credits)	
Year 2 (30 + 3 training credits)	
Semester 1 (15 + 3 training credits)	**Semester 2 (15 credits)**
AMA2111 Mathematics I	AMA2112 Mathematics II
ENG2001 Fundamentals of Materials Science and Engineering / Biology / Chemistry	EE2902S Fundamentals of Electrical and Electronic Engineering
ENG2002 Computer Programming	ME33001 Mechanics of Materials
ME23001 Engineering Mechanics	LCR III (Chinese)
CAR II^	CAR III^
AAE3103/ IC381 Appreciation of Aircraft Manufacturing Processes (3 training credits)	
Year 3 (32 + 3 training credits)	
Semester 1 (17 + 1.5 training credits)	**Semester 2 (15 + 1.5 training credits)**
AAE3001 Fundamentals of Aerodynamics	AAE3003 Aircraft Propulsion Systems
AAE3002 Aircraft Structures and Materials	AAE4006 Flight Mechanics and Control Systems
AAE3004 Dynamical Systems and Control	AAE4301 Avionics Systems
ELC3531 Professional Communication in English for Engineering Students *(2 credits)*	AF3625 Engineering Economics
CAR IV ^	AAE3006 Safety, Reliability and Compliance
Service Learning ^	
AAE3104/ IC388 Aircraft Manufacturing and Maintenance practice (3 training credits)	
Year 4 (29 credits)	
Semester 1 (14 credits)	**Semester 2 (15 credits)**
AAE4004 Airworthiness and Regulations	ENG3003 Engineering Management
CLC3243P Chinese Communication for Aviation *(2 credits)*	ENG3004 Society and the Engineer
Elective Subject (1)	Elective Subject (3)
Elective Subject (2)	Elective Subject (4)
AAE4002 Capstone Project (6 credits)	

^ *The study pattern for these GUR subjects is indicative only. Students may take the subjects at their own schedule.*

Table B - Normal Study Pattern
(Total 127 academic credits + 10 training credits)

(a) For students who do not have Level 2 or above in HKDSE Physics (or Combined Science with a component in Physics), or the equivalent qualifications.

(b) For non-local students from the Chinese Mainland who do not have a Pass (a pass is taken as 60% of the total marks of the subject) in the Physics or Integrated Science subject in the Joint Entrance Examination for Universities.

Year 1 (36 + 4 training credits)	
Semester 1 (18 + 2 training credits)	**Semester 2 (18 +2 training credits)**
AAE2001 Introduction to Aircraft and Aviation Systems	AMA1120 Basic Mathematics II
AMA1110 Basic Mathematics I	AP10005 Physics I
AP10001 Introduction to Physics	AP10006 Physics II
ENG1003 Freshman Seminar for Engineering	APSS1L01 Tomorrow's Leaders
CAR I ^	ENG2003 Information Technology
LCR I (English)	LCR II (English)
Healthy Lifestyle (non-credit bearing) ^	
AAE2101/ IC2105Engineering Communication and Fundamentals (4 training credits) ***or*** AAE2102/ IC2133Aircraft Manufacturing and Maintenance Fundamentals (4 training credits)	
Year 2 (30 + 3 training credits)	
Semester 1 (15 + 3 training credits)	**Semester 2 (15 credits)**
AMA2111 Mathematics I	AMA2112 Mathematics II
ENG2001 Fundamentals of Materials Science and Engineering / Biology / Chemistry	EE2902S Fundamentals of Electrical and Electronic Engineering
ENG2002 Computer Programming	ME33001 Mechanics of Materials
ME23001 Engineering Mechanics	LCR III (Chinese)
CAR II^	CAR III^
AAE3103/ IC381 Appreciation of Aircraft Manufacturing Processes (3 training credits)	
Year 3 (32 + 3 training credits)	
Semester 1 (17 + 1.5 training credits)	**Semester 2 (15 + 1.5 training credits)**
AAE3001 Fundamentals of Aerodynamics	AAE3003 Aircraft Propulsion Systems
AAE3002 Aircraft Structures and Materials	AAE4006 Flight Mechanics and Control Systems
AAE3004 Dynamical Systems and Control	AAE4301 Avionics Systems
ELC3531 Professional Communication in English for Engineering Students *(2 credits)*	AF3625 Engineering Economics
CAR IV ^	AAE3006 Safety, Reliability and Compliance
Service Learning ^	
AAE3104/ IC388 Aircraft Manufacturing and Maintenance practice (3 training credits)	
Year 4 (29 credits)	
Semester 1 (14 credits)	**Semester 2 (15 credits)**
AAE4004 Airworthiness and Regulations	ENG3003 Engineering Management
CLC3243P Chinese Communication for Aviation *(2 credits)*	ENG3004 Society and the Engineer
Elective Subject (1)	Elective Subject (3)
Elective Subject (2)	Elective Subject (4)
AAE4002 Capstone Project (6 credits)	

^ *The study pattern for these GUR subjects is indicative only. Students may take the subjects at their own schedule.*

Elective Subjects^

Students are required to select four subjects from a pool of electives as shown in the table below. Through the choice of electives, students will acquire specialized knowledge in a specific area of aviation engineering.

Streams	Elective Subjects
1. Aviation Services Engineering	1. AAE4001 Aviation Project Management 2. AAE4003 Airport Services Engineering 3. AAE4007 Aircraft Leasing and Finance 4. AAE4008 Aviation Finance, Taxation and Insurance 5. AAE4009 Data Science and Data-driven Optimisation in Airline and Airport Operations 6. ISE3004 Systems Modeling and Simulation 7. ISE3013 Data Management in Aviation Industries 8. ISE4014 Aircraft Service Engineering and Logistics
2. Aeronautical Engineering	1. AAE4105 Engineering Composites 2. AAE4111 Compressible Aerodynamics 3. AAE4201 Flight Control Systems 4. AAE4202 Electronics & Information Technologies for Unmanned Aerial Systems 5. AAE4203 Guidance and Navigation 6. AAE4304 Advanced Positioning and Navigation Systems
3. Aircraft Maintenance Engineering *[Priority will be given to students who opt for HKAR-147 training]*	1. AAE4107 Aircraft Gas Turbine Engine Systems 2. AAE4108 Aircraft Inspection and Testing 3. AAE4109 Aircraft Maintenance Practices 4. AAE4110 Aircraft Propeller
4. Introduction to Pilot Ground Theory	1. AAE4304 Advanced Positioning and Navigation Systems 2. AAE4902 Pilot Ground Theory 3. AAE4903 Human Factors in Aviation 4. AAE4904 Meteorology in Aviation

^^ The elective subjects are updated from time to time to cope with the needs of the industry. Not all subjects will be offered in each semester. Since there is a minimum planned class size for each subject, the subject hosting departments have the discretion to cease the offering of subjects which fail to enrol students up to the minimum class size.

3.3 Work-Integrated Education (WIE)

In accordance with the University regulations, all full-time UGC-funded undergraduate degrees should fulfil the mandatory requirement of Work-integrated Education (WIE). WIE is "work-based learning experiences which take place in an organizational context relevant to a student's future profession, or the development of generic skills that will be valuable in that profession." It offers students the opportunity to learn to connect classroom theory with practical workplace applications through on-the-job work placements. In order to graduate from this programme, students are required to spend at least 2 weeks of full-time WIE training before graduation. Following the Faculty of Engineering's guideline, students will be awarded one WIE training credit for acquiring every two weeks' full-time training. WIE training credit will not be counted towards the Grade Point Average (GPA) or the Weighted GPA (WGPA).

Possible activities, subject to prior approval by the Programme Leader, to fulfil WIE requirements are as follows:

- Internship opportunities organized by the Department/ Careers and Placement Section (CPS) of the Student Affairs Office (SAO);
- Summer placement in industrial/commercial sector;
- Placement in industrial /commercial sector during the period of deferment of study/zero-subject enrolment;
- Final Year Capstone Project which involves an external client or industrial partner; and
- Conduct in a form proposed by students with the prior approval of the Programme Leader.

3.4 Industrial Centre (IC) Training

Industrial Centre (IC) training is aimed at providing students hands-on experience on dealing with different engineering projects under the supervision of academic and technical staff at the Industrial Centre (IC) of the University. They are graded in the same manner as other taught subjects from A+ to F and will be counted in the Grade Point Average (GPA). However, they will not be counted towards the credit requirement of the award or contribute to the Award/Weighted GPA. Students must pass the IC training stipulated in the curriculum in order to be considered for the award.

3.5 Summer Internship

The University encourages students to take summer internship offered by relevant industrial sectors to acquire practical insights on how the industry works and practices in a specific aviation sector. The internship programme normally takes place for three months starting from June to August. Some students may spend this period to attend training arranged by the industry or prepare for licensed paper examination if necessary. Continued works done by the students may be possible to proceed to their final year capstone project if approval is sought from the Programme Leader.

3.6 Capstone Project

All students are required to complete a final year project (group-based) which is counted for 6 academic credits. The aim of the project is to provide students an opportunity to utilize and integrate their knowledge of aviation engineering to solve real life problems related to the aviation industry.

3.7 Curriculum Map

The following matrix shows the contribution of each discipline-specific subject to the programme outcomes through teaching (T), practice (P) and measurement (M).

Curriculum Map for Core Subjects with PLOs

Subject Code	Intended Learning Outcomes (ILOs) of the Programme										
	PAK						POW				
	a	b	c	d	e	f	a	b	c	d	e
AAE2001			TPM		TPM	TPM					
AAE3001	TPM			TPM							
AAE3002	TP	TPM	TPM			TPM					
AAE3003				TP			TPM		TPM		
AAE3004	TPM	TPM					TPM				
AAE3006							TPM		TPM		TPM
AAE4004					TPM		TPM	TPM			
AAE4002	TPM	TPM	TP	TPM	TP	TP	TP	TPM	TP	TPM	TPM
AAE4006			TPM	TPM				TPM			
AAE4301		TP		TPM	TP	TPM				TPM	
AF3625				TP	TP						
AMA1110	TP										
AMA1120	TP										
AMA2111	TP										
AMA2112	TP										
AP10005	TP										
AP10006	TP										
CLC3243P					TP					TPM	
EE2902S	TP	TP									
ELC3531										TPM	
ENG2001	TP	TP									
ENG2002				TPM						TPM	
ENG2003				TP			TP				
ENG3003					TPM			TPM			TPM
ENG3004							TPM		TPM		TPM
ME23001	TP					TP					
ME33001	TPM				TPM			TP		TP	
IC2105			TP			TP					
IC2133				TP		TP				TP	
IC381					TP	TPM					
IC388			TPM			TPM			TPM		

T – TEACH; P – PRACTICE; M – MEASURED

Curriculum Map for Elective Subjects with PLOs

Subject Code/Title	Programme Learning Outcomes of the AE Programme										
	PAK						POW				
	a	b	c	d	e	f	a	b	c	d	e
Aviation Services Engineering											
AAE4001				TP	TP				TP		
AAE4003				TP	TP				TP		
AAE4007		TP			TP			TP	TP		TP
AAE4008					TP			TP		TP	TP
AAE4009		TP		TP			TP				
ISE3004		TP	TP	TP						TP	
ISE3013	TP					TP		TP		TP	
ISE4014	TP			TP					TP		
Aeronautical Engineering											
AAE4105	TP	TP				TP			TP		TP
AAE4111	TP			TP							
AAE4201					TP	TP					TP
AAE4202	TP		TP	TP		TP	TP				
AAE4203	TP			TP		TP				TP	TP
AAE4304	TP			TP			TP		TP		
Aircraft Maintenance Engineering											
AAE4107	TP				TP	TP	TP				
AAE4108	TP			TP				TP	TP		
AAE4109	TP			TP				TP	TP		
AAE4110	TP				TP	TP	TP				
Introduction to Pilot Ground Theory											
AAE4304	TP			TP			TP				
AAE4902					TP				TP	TP	TP
AAE4903			TP		TP		TP		TP		
AAE4904	TP			TP				TP		TP	

4. Management and Operation

4.1 Departmental Undergraduate Programme Committee

The Departmental Undergraduate Programme Committee (DUPC) will exercise the overall academic and operational responsibility for the programmes and their development within defined policies, procedures and regulations.

4.2 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 reports back to the DUPC.

4.3 Student-Staff Consultative Group

A Student-Staff Consultative Group (SSCG) is set up as the formal channel for soliciting student feedback. It consists of student representatives and teaching colleagues of the programme. The Group is normally chaired by the Programme Leader/Deputy Programme Leader. It meets on a need basis and should meet at least once every semester to discuss student workload, teaching and learning methods, balance between subject areas, training matters and other areas of mutual concern, and to report and make recommendations to the DUPC when necessary.

4.4 Academic Advising

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

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

All full-time undergraduate students will be assigned to one full-time academic staff from his Major Department who will act as his academic advisor throughout his course of study at PolyU.

The main responsibilities of the academic advisor will include:

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

- Being accessible and available to students, and responding to their questions and concerns;
- Helping student to consider and clarify their intellectual, professional and personal goals;
- Clarifying to students academic regulations and requirements, particularly those relating to the Major; and
- Identifying students with special learning needs or early signs of learning problems, and referring/encouraging them to seek help or support.

Effective academic advising requires an active participation of student advisees in the processes. It is important that students understand it is their responsibilities to:

- Understand the academic regulations and requirements of their chosen Major/programme, as well as the GUR requirements;
- Actively obtain information and seek out advisors and resources on a regular basis and as needed; and
- Take the final responsibility for making decisions and choices regarding their academic study based on the information and advice given.

5. Academic Regulations

The academic regulations described below are based on the information known as of July 2021. 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' studies is also published in the Student Handbook *(website: http://www.polyu.edu.hk/as/webpage/for-student/student-handbook)*.

5.1 Subject Registration and Withdrawal

5.1.1 In addition to programme registration, students need to register for the subjects at specified periods prior to the commencement of the semester. An add/drop period will also be scheduled for each semester/term. Students may apply for withdrawal of their registration on a subject after the add/drop period and before the commencement of the examination 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 teacher 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.

5.1.2 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.

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

5.2 Study Load

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

5.2.2 The normal study load is 15 credits in a semester for full-time study. The maximum study load to be taken by a student in a semester is 21 credits, unless exceptional approval is given by the Head of the programme offering department. For such cases, students should be reminded that the study load approved should not be taken as grounds for academic appeal.

5.2.3 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.

5.2.4 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 total period of registration.

5.2.5 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 of 15 credits in a semester should seek advice from the department concerned before the selection of subjects.

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 (except for exemptions granted at admission stage). It will therefore be necessary for the students to consult the programme offering department and take another subject in order to satisfy the credit requirements for the award.

5.4 Credit Transfer

5.4.1 Students may be given credits for recognised previous studies including mandatory General University Requirements (GUR) subjects; and the credits will be counted towards meeting the requirements for award. Transferred credits may not normally be counted towards more than one award. The granting of credit transfer is a matter of academic judgment.

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

5.4.3 The validity period of credits previously earned, is 8 years after the year of attainment. Normally, not more than 50% of the credit requirement for award may be transferable from approved institutions outside the University. For transfer of credits from programmes offered

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

5.4.4 If a student is waived from a particular stage of study on the basis of advanced qualifications held at the time of admission, the student concerned will be required to complete fewer credits for award. For these students, the exempted 'deducted' credits at admission stage will be counted towards the maximum limit for credit transfer when students apply for further credit transfer after their admission. This also applies to students admitted to an Articulation Degree or Senior Year curriculum when they claim further credit transfer after admission.

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

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

5.4.7 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.

5.4.8 Students should not be granted credit transfer for a subject which they have attempted and failed in their current study unless the subject was taken by the student as an exchange-out student in his current programme.

5.4.9 For 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.

5.5 Deferment of study

5.5.1 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 total period of registration.

5.5.2 Application for deferment of study from students who have not yet completed the first year of a full-time programme will only be considered in exceptional circumstances.

5.5.3 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.

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

5.6 General Assessment Regulations

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

5.6.2 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.

5.6.3 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 *Programme Requirement Document*.

5.6.4 The language of assessment shall be English, unless approval is given for it to be otherwise.

5.7 Principles of Assessment

5.7.1 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.

5.7.2 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.

5.7.3 The ultimate authority in the University for the confirmation of academic decisions is the Senate, but for practical reasons, the Senate has delegated to the Faculty/School Boards the authority to confirm the decisions of Boards of Examiners (BoE) 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 Planning and Regulations Committee (APRC) and reported to the Senate as necessary.

5.8 Assessment Methods

5.8.1 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 Programme Requirement 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 Programme Requirement Document. Learning outcome should be assessed by continuous assessment and/or examination appropriately, in line with the outcome-based approach.

5.8.2 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.

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

5.8.4 At the beginning of each semester, the subject teacher should inform students of the details of the methods of assessments to be used, within the assessment framework as specified in the Programme Requirement Document.

Assessment Rubrics

5.8.5 Rubrics must be specified for all major assessment items at the subject level, made available to students before the assessment, and used for grading the assessment. Departments have the flexibility to determine what is 'major'. As a rule of thumb:

- For subjects without examinations, rubrics should be required for single assessment items with a weighting of 30% or above of the subject's overall assessment.
- For subjects with examinations, rubrics should be required for single assessment items with a weighting of 20% or above of the subject's overall assessment.

5.8.6 There is no fixed format for rubrics. Any format (e.g., analytic, holistic) is acceptable as long as it clearly defines the main grades (i.e. A, B, C, D, Fail for subjects using letter grades or "pass" or "fail" for subjects which are assessed on a pass/fail basis) in a way that is understandable to students and is adhered to by teachers in grading.

5.9 Progression/Academic Probation/Deregistration

5.9.1 The Board of Examiners shall, at the end of each semester (except for Summer Term unless there are students who are eligible to graduate after completion of Summer Term subjects or the 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) (see para. 5.13.3 below) lower than 1.70, he will be put on academic probation in the following semester. If a student is able to pull his GPA up to 1.70 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.

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

(i) the student has reached the final year of the normal period of registration for the programme, as specified, *Programme Requirement Document,* unless approval has been given for extension; or

(ii) the student has reached the maximum number of retakes allowed for a failed compulsory subject; or

(iii) the student's GPA is lower than 1.70 for two consecutive semesters and his Semester GPA in the second semester is also lower than 1.70; or

(iv) the student's GPA is lower than 1.70 for three consecutive semesters.

When a student falls within the categories as stipulated above, except for category (i) with approval for extension, the Board of Examiners shall de-register the student from the programme without exception.

5.9.3 A student may be de-registered from the programme enrolled before the time frame specified in para. 5.9.2(iii) and (iv) above if his academic performance is poor to the extent that the Board of Examiners deems that his chance of attaining a GPA of 1.70 at the end of the programme is slim or impossible.

5.9.4 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 *Programme Requirement Document*.

5.10 Retaking of Subjects

5.10.1 Students may only retake a subject which they have failed (i.e. Grade F or S or U). Retaking of subjects is with the condition that the maximum study load of 21 credits per semester is not exceeded.

5.10.2 The number of retakes of a subject should be restricted to two, i.e. a maximum of three attempts for each subject is allowed.

5.10.3 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 fulfil 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*)

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.

5.11 Appeal Against Assessment Results/De-registration Decisions by the Board of Examiners

A student may appeal against the decision of the Board of Examiners within a stipulated period after the public announcement of the examination results (this refers to the date when results are announced to students via the web). Students should refer to the Student Handbook for details on the appeal procedures.

5.12 Exceptional Circumstances

Absence from an assessment component

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

5.12.2 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 teacher concerned, in consultation with the Programme Leader.

Assessment to be completed

5.12.3 For cases where students fail marginally in one of the components within a subject, the BoE can defer making a decision until the students concerned have completed the necessary remedial work to the satisfaction of the subject examiner(s). The remedial work must not take the form of re-examination.

Aegrotat award

5.12.4 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.

5.12.5 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.

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

5.12.7 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

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

5.13 Grading

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

Subject grade	***Short description***	***Elaboration on subject grading description***
A+ A A-	Excellent	Demonstrates excellent achievement of intended subject learning outcomes by being able to skillfully use concepts and solve complex problems. Shows evidence of innovative and critical thinking in unfamiliar situations, and is able to express the synthesis or application of ideas in a logical and comprehensive manner.
B+ B B-	Good	Demonstrates good achievement of intended subject learning outcomes by being able to use appropriate concepts and solve problems. Shows the ability to analyse issues critically and make well-grounded judgements in familiar or standard situations, and is able to express the synthesis or application of ideas in a logical and comprehensive manner.
C+ C C-	Satisfactory	Demonstrates satisfactory achievement of intended subject learning outcomes by being able to solve relatively simple problems. Shows some capacity for analysis and making judgements in a variety of familiar and standard situations, and is able to express the synthesis or application of ideas in a manner that is generally logical but fragmented.
D+ D	Pass	Demonstrates marginal achievement of intended subject learning outcomes by being able to solve relatively simple problems. Can make basic comparisons, connections and judgments and express the ideas learnt in the subject, though there are frequent breakdowns in logic and clarity.
F	Fail	Demonstrates inadequate achievement of intended subject learning outcomes through a lack of knowledge and/or understanding of the subject matter. Evidence of analysis is often irrelevant or incomplete.

'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.

Indicative descriptors for modifier grades

Main Grade (solid)	The student generally performed at this level, indicating mastery of the subject intended learning outcomes at this level.
+ (exemplary)	The student consistently performed at this level and exceeded the expectations of this level in some regards, but not enough to claim mastery at the next level.
- (marginal)	The student basically performed at this level, but the performance was inconsistent or fell slightly short in some regards.

Note: The above indicative descriptors for modifier grades are not applicable to the pass grades D and D+

5.13.2 A numeral grade point is assigned to each subject grade, as follows:

Grade	*Grade Point*
A+	4.3
A	4.0
A-	3.7
B+	3.3
B	3.0
B-	2.7
C+	2.3
C	2.0
C-	1.7
D+	1.3
D	1.0
F	0.0

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

$$\text{GPA} = \frac{\sum_{n=1}^{N} \text{Subject Grade Point}_n \times \text{Subject Credit Value}_n}{\sum_{n=1}^{N} \text{Subject Credit Value}_n}$$

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[1]
(v) Subjects from which a student has been allowed to withdraw (i.e. those with the code 'W')

Subject which has been given an "S" code, i.e. absent from all assessment components, 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 ranges from 0.00 to 4.30 from 2020/21.

5.13.4 For programmes with training components, whether these training credits[2] will be counted in the GPA calculation will be decided by the programme offering department.

5.14 Different Types of GPA's

5.14.1 GPA 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.

5.14.2 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.

5.14.3 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.

5.14.4 When a student has satisfied the requirements for award, an award GPA will be calculated to determine his award classification.

5.14.5 For students taking the Major/Minor study route (see para. 5.19 for details), a separate GPA will be calculated for their Major and Minor programmes. The Major GPA will be used to determine their award classification, which will be so reflected on the award parchment. The Minor GPA can be used as a reference for Board of Examiners to moderate the award classification for the Major, as explained further in para. 5.16.

5.15 University Graduation Requirements

5.15.1 To be eligible for the award of BEng(Hons) in Aviation Engineering under the 4-year full-time undergraduate curriculum, a student must:

(i) Complete successfully the requisite number of credits, including the 'compulsory' and 'elective' requirements as defined in para. 3.1.
(ii) Earn a cumulative GPA of 1.70 or above at graduation.

---

[1] *Subjects taken in PolyU or elsewhere and with grades assigned, and for which credit transfer has been approved, will be included in the GPA calculation.*

[2] *"Training credits" is used as a generic term only, and also includes clinical/field credits for programmes in different study disciplines. Laboratory experiments done as a subject/an integral part of a subject to satisfy the academic requirements is not considered to be practical training.*

(iii) Complete successfully the mandatory WIE component.
(iv) Satisfy the residential requirement for at least one-third of the credits required for the award.
(v) Satisfy the following GUR requirements:

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

(vii) Satisfy any other requirements as specified in the *Programme Requirement Document* of the award and as specified by the University.

5.15.2 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. Level-0 subjects and training subjects (including clinical/field training) will not be counted to fulfil free elective requirement for graduation purpose.

Language and Communication Requirements (LCR)

5.15.3 LCR comprises four major components of the overall English and Chinese language requirements as described below in order to be eligible for graduation:

(i) Language and Communication Requirements (LCR) in English (6 credits) and Chinese (3 credits), as stated in 5.15.4 below;
(ii) Writing Requirement, as stated in 5.15.5 below;
(iii) Reading Requirement, as stated in 5.15.6 below; and
(iv) Discipline-Specific Language Requirement, as stated in 5.15.7 below.

English

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

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

Students entering the University with specified attainment grades in certain public examinations can be given credit transfer or exemption for one or both English LCR subjects. Please refer to the following link for details on English LCR credit transfer and exemption arrangement: https://www.polyu.edu.hk/ogur/staff/resources/credit-transfer

Table 1:English LCR subjects (each 3 credits)

English language competence level / Subject	Practical English for University Studies	English for University Studies	Any LCR Proficient level elective subject in English (Table 2)
HKDSE Level 4 and above or equivalent	--	Subject 1	Subject 2
HKDSE Level 3 or equivalent	Subject 1	Subject 2	--

Table 2:Proficient level elective subjects for DSE Level 4 students and above (or equivalent) (each 3 credits)

	Subject Title
LCR Proficient level elective subjects	Advanced English for University Studies
	Advanced English Reading and Writing Skills
	English in Literature and Film
	Persuasive Communication

Chinese

All undergraduate students (admitted in/after 2018/19) are required to successfully complete one 3-credit Chinese language subject as stipulated by the University, according to their Chinese language proficiency level.

Table 3:Chinese LCR subjects (each 3 credits)

Categories of students	Subject Title
For Chinese speaking students	University Chinese (Cantonese or Putonghua version)
For non-Chinese speakers or students whose Chinese standards are at junior secondary level or below	One subject from Table 4

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

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

Students who have obtained verified qualifications or certain results in some public examinations *[e.g. HKDSE, HKALE, JEE, GSAT(Taiwan)]* may be granted credit transfer/exemption for the Chinese LCR subject. Please refer to the following link for details on Chinese LCR credit transfer and exemption arrangement:
https://www.polyu.edu.hk/ogur/staff/resources/credit-transfer

Writing Requirement

5.15.5 In additional to the LCR in English and Chinese explained above, all students must also, among the Cluster Areas Requirement (CAR) subjects they take (see para. 5.15.12 below), pass one subject that includes the requirement for a substantial piece of writing in English and one subject with the requirement for a substantial piece of writing in Chinese.

Reading Requirement

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

A list of approved CAR subjects for meeting the Writing Requirement (with a "W" designation) and for meeting the Reading Requirement (with an "R" designation) is available at: https://www.polyu.edu.hk/ogur/GURSubjects/

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

Discipline-Specific Language Requirement

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

Students who are 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, i.e. *CLC3243P Chinese Communication for Aviation*. These students must take another subject (except Level-0 subjects and training subjects (including clinical/field training)) to make up for the total credit requirement.

Freshman Seminar

5.15.8 All students must successfully complete, normally in their first year of study, one 3-credit Freshman Seminar offered by their chosen Discipline. The purpose is to (1) introduce students to their chosen discipline and enthuse them about their major study, (2) foster students' creativity, problem-solving ability and global outlook, (3) give students an exposure to the concepts and an understanding of their discipline-based professional career development with the incorporation of entrepreneurship, and (4) engage students, in their first year of study, in desirable forms of university learning that are conductive to smooth adjustment to University life, self-regulation, and autonomous learning.

A list of Freshman Seminars can be found at: https://www.polyu.edu.hk/ogur/GURSubjects/

Leadership and Intra-Personal Development

5.15.9 All students must successfully complete one 3-credit subject in the area of Leadership and Intra-Personal Development, which is designed to enable students to (1) understand and integrate theories, research and concepts on the qualities (particularly intra-personal and interpersonal qualities) of effective leaders in the Chinese context, (2) develop greater self-awareness and a better understanding of oneself, (3) acquire interpersonal skills essential for functioning as an effective leader, (4) develop self-reflection skills in their learning, and (5) recognise the importance of the active pursuit of knowledge on an intra-personal and interpersonal level and its relationship to leadership qualities.

A list of designated subjects for meeting the leadership and intra-personal development requirement is available at: https://www.polyu.edu.hk/ogur/GURSubjects/

Service-Learning

5.15.10 All students must successfully complete one 3-credit subject designated to meet the Service-Learning Requirement, in which they are required to (i) participate in substantial community service or civic engagement activities that will benefit the service users or the community at large in a meaningful way, (ii) apply the knowledge and skills acquired from their Major or other learning experiences at the University to the community service activities, and (iii) 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.

These subjects may take the form of:

- An open-to-all GUR service-learning subject
- A GUR service-learning subject targeted at a particular student group (e.g. a Broad Discipline), or
- A customised DSR subject (core or elective) within the Major/Minor with all the required features and components to meet the Service-Learning Requirement.

Students who have satisfied the Service-Learning Requirement via a customised DSR subject will be required to take another 3-credit subject to make up for the total credit requirement.

A list of designated subjects for meeting the service-learning requirement is available at: https://www.polyu.edu.hk/ogur/GURSubjects/

Cluster Areas Requirement (CAR)

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

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

A list of CAR subjects under each of the four Cluster Areas is available at: https://www.polyu.edu.hk/ogur/GURSubjects/

China Studies Requirement

5.15.12 Of the 12 credits of CAR described in para. 5.15.11 above, students are required to successfully complete a minimum of 3 credits on CAR subjects designated as "China-related". The purpose is to enable students to gain an increased understanding of China (e.g. its history, culture and society, as well as emerging issues or challenges).

A list of approved CAR subjects for meeting the China Studies Requirement is available at: https://www.polyu.edu.hk/ogur/GURSubjects/

Healthy Lifestyle

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

Students will be required to complete the following components: (i) sports training/participation, (ii) e-learning modules, and (iii) lectures/talks. The syllabus covers physical health, mental health, social health, spiritual health, values and priorities on health behaviour with reference to competing priorities in life, reflection on healthy living and plans for self-improvement or maintaining healthy behaviour.

Students taking the Major/Minor option

5.15.14 Students taking the Major/Minor option (also see details in para. 5.19) will be considered for an award when they have satisfied the requirements for both the Major and Minor studies (i.e. having a GPA of 1.70 or above and have also submitted an application for graduation. If the 18 credits taken for the approved Minor study can meet the requirements for that Minor, the Major students may apply to graduate with a specific Minor, in addition to their Major. Otherwise, students will graduate with a Major only.

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

Students taking the Double Majors option

5.15.16 Students are required to obtain an overall GPA of at least 1.70 in order to satisfy the requirement for graduation with Double Majors (also see details in para. 5.19). They will not be allowed to graduate with one of the 2 Majors.

5.16 Guidelines for Award Classification

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

5.16.2 The Weighted GPA will be used as a guide to help determine award classifications. It is calculated as follows:

$$\text{Weighted GPA} = \frac{\sum_{n=1}^{N} \text{Subject Grade Point}_n \times \text{Subject Credit Value}_n \times W_n}{\sum_{n=1}^{N} \text{Subject Credit Value}_n \times W_n}$$

where Wn = weighting to be assigned according to the level of the subject

N = number of all subjects counted in GPA calculation as set out in para. 5.13.3, except those exclusions specified in para. 5.13.3.

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, and 4 subjects. Same as for GPA, Weighted GPA ranges from 0.00 to 4.30 from 2020/21.

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), except for subjects which are selected by students to fulfill the free electives requirement for graduation, 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).

Students taking the Major/Minor studies

5.16.3 For students who have completed a Major/Minor programme, a single classification will be awarded and their award classification will mainly be based on the "Major GPA", but it can be moderated by the Board of Examiners with reference to the "Minor GPA". For students who have completed a Major programme combined with free electives, their award classification will be determined by their "Major GPA" and the grades obtained for the free electives.

5.16.4 "Major GPA" is derived based on all subjects of the Major programme, including those meeting the mandatory General University Requirements (GUR) and programme-specific language requirement, but not necessarily including the training credits.

5.16.5 "Minor GPA" is derived based on the 18 credits of specific Minor programme. “Minor GPA” is unweighted.

5.16.6 The "Major GPA" and the "Minor GPA" will be presented separately to the Board of Examiners for consideration. The guidelines for determining award classification as stipulated in para. 5.17 below are applicable to programmes with Major/Minor studies.

5.17 Classification of Awards

5.17.1 For Honours degree programmes, the awards will be classified as follows:

First Class Honours
Second Class Honours (Division 1)
Second Class Honours (Division 2)
Third Class Honours

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

Honours degrees	***Guidelines***
First Class Honours	The student's performance/attainment is outstanding, and identifies him as exceptionally able in the field covered by the programme in question.
Second Class Honours (Division 1)	The student has reached a standard of performance/ attainment which is more than satisfactory but less than outstanding.
Second Class Honours (Division 2)	The student has reached a standard of performance/ attainment judged to be satisfactory, and clearly higher than the 'essential minimum' required for graduation.
Third Class Honours	The student has attained the 'essential minimum' required for graduation at a standard ranging from just adequate to just satisfactory.

5.17.3 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 1.70 or more, but his Weighted GPA is less than 1.70, 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.

5.17.4 Students who have committed academic dishonesty or non-compliance with examination regulations 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.

5.17.5 The following are the award GPA ranges for determining award classifications:

Honours classification	**Award GPA**
First Class Honours	3.60 - 4.30
Second Class Honours (Division 1)	3.00 - 3.59
Second Class Honours (Division 2)	2.40 - 2.99
Third Class Honours	1.70 - 2.39

Decisions by the Boards of Examiners on award classifications to be granted to each student on completion of the programme shall be ratified by the Faculty Board. For cases the decisions of which do not conform to the above indicative GPA range, they should be referred by the Faculty Board, to the APRC for ratification.

5.18 Recording of Disciplinary Actions in Students' Records

5.18.1 Disciplinary actions against students' misconducts will be recorded in students' records.

5.18.2 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.

5.18.3 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.

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

5.19 Minor Study and Double Majors

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

Minor Study

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

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

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

(c) Subject to approval by the Minor-offering Department, students may count up to 6 credits from their Major/GUR subjects *[including Language Communication Requirement (LCR) subjects at proficiency level]* towards their chosen Minor. Nevertheless, students must take at least 6 credits from their chosen Minor programme in order to satisfy the residential requirement of their chosen Minor. In addition, to be eligible for the Major and Minor awards, the total number of credits taken by the students for their Major-Minor studies must not be lower than the credit requirement of the single discipline Major programme.

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

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

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

(g) Students are required to obtain a GPA of at least 1.70 in order to satisfy the requirement for graduation with a Major plus a Minor.

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

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

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

<u>Double Majors</u>

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

(a) Completion of Double Majors requires more than the normative study period of 4/5 years and extra credits on self-financed basis (i.e. higher tuition fee). The total credit requirements of a Double Major will depend on the degree of commonality between the 2 Majors, but should be more than 120 in all instances. Apart from the 30 credits of GUR subjects, up to 1/3 of the Discipline-Specific Requirements (DSR) of the First Major which are common to the Second Major can be double-counted towards the Second Major.

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

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

(d) Students will be put on academic probation if they fail to obtain a GPA of 1.70 or above.

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

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

(g) Students are required to obtain an overall GPA of at least 1.70, in order to satisfy the requirement for graduation with Double Majors. They will not be allowed to graduate with one of the 2 Majors.

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

5.20 Graduation

A student is required to graduate as soon as he satisfies the graduation requirements as stipulated in para. 5.15 above. The student concerned is required to apply for graduation, in the semester in which he is able to fulfil all his graduation requirements, and after the add/drop period for that semester has ended.

PART B SUBJECT SYLLABI

General University Requirement (GUR)

The Hong Kong Polytechnic University

Subject Description Form

<table>
<tr><td>Subject Code</td><td>APSS1L01</td></tr>
<tr><td>Subject Title</td><td>Tomorrow’s Leaders</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>1</td></tr>
<tr><td>GUR Requirements Intended to Fulfill</td><td>This subject intends to fulfill the following requirement(s):

☐ Healthy Lifestyle
☐ Freshman Seminar
☐ Languages and Communication Requirement (LCR)
☒ Leadership and Intra-Personal Development
☐ Service-Learning
☐ Cluster-Area Requirement (CAR)
☐ Human Nature, Relations and Development
☐ Community, Organization and Globalization
☐ History, Cultures and World Views
☐ Science, Technology and Environment
☐ China-Study Requirement
☐ Yes or ☐ No
☐ Writing and Reading Requirements
☐ English or ☐ Chinese</td></tr>
<tr><td>Pre-requisite / Co-requisite/ Exclusion</td><td>Nil</td></tr>
<tr><td>Assessment Methods</td><td>
<table>
<tr><th>100% Continuous Assessment</th><th>Individual Assessment</th><th>Group Assessment</th></tr>
<tr><td>1. Class Participation</td><td>20%</td><td>--</td></tr>
<tr><td>2. Group Project</td><td>--</td><td>30%</td></tr>
<tr><td>3. Term Paper</td><td>50%</td><td>--</td></tr>
</table>

The grade is calculated according to the percentage assigned;
The completion and submission of all component assignments are required for passing the subject; and
Student must pass all component(s) if he/she is to pass the subject.

</td></tr>
</table>

Objectives	The course is designed to enable students to learn and integrate theories, research and concepts of the basic personal qualities (particularly intrapersonal and interpersonal qualities) of effective leaders. This subject also intends to help students develop and reflect on their intrapersonal qualities, interpersonal qualities and connection of learning to oneself. Finally, the subject cultivates students' appreciation of the importance of intrapersonal and interpersonal qualities in effective leadership.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a. understand and integrate theories, research and concepts on the basic qualities (particularly intrapersonal and interpersonal qualities) of effective leaders; b. develop self-awareness and self-understanding c. demonstrate self-leadership in pursuit of continual self-improvement; d. apply intrapersonal and interpersonal skills in daily lives; e. appreciate the importance of intrapersonal and interpersonal qualities in effective leadership, particularly the connection of learning in the subject to one's professional development and personal growth; f. recognize and accept their responsibility as professionals and citizens to the society and the world
Subject Synopsis/ Indicative Syllabus *(Note 2)*	1. An overview of the personal attributes of effective leaders: roles of intrapersonal and interpersonal qualities in effective leadership and university graduates' employability in the service economy. 2. Self-leadership in effective leaders; the importance of self-understanding and self-management; life-long learning and leadership. 3. Social emotional competence I (intrapersonal domain): awareness and understanding of emotions; emotional management, roles of emotional awareness and management in effective leadership and career development. 4. Social emotional competence II (interpersonal domain): social awareness, relationship management, the application of social emotional competence in daily lives and in effective leadership. 5. Resilience and stress-coping: stresses faced by youth; resilience and life adversities; coping with life stresses; role of resilience in effective leadership. 6. Morality and integrity: moral competence; role of morality in effective leadership; ethical leadership; importance of moral competence in different professions. 7. Spirituality: connectedness to others, personal beliefs and values, meaning of life, spirituality and professional development, role of spirituality in effective leadership; spiritual practices in daily lives. 8. Cultural competence and global citizenship: cultual competence in a globalized world, global citizenship and effective leadership,

responsibilites of university students as both professionals and citizens of the society.

9. Effective communication: basic communication skills, importance of effective communication to daily life and leadership, care and compassion in effective leadership.
10. Team building: theories, concepts, skills and blocks of team building, role of team building in effective leadership, application of team building in different professions.
11. Law-abidance as a quality of leadership: basic concepts and theories related to law-abiding leadership and socially responsible leadership; importance of law-abiding leadership and socially responsible leadership to professionals and the general public; basic knowledge on national security and the Hong Kong National Security Law.

Note: For the topic on law abidance and the Hong Kong National Security Law, students are required to pass an online assessment with multiple-choice questions. Students can take the assessment with multiple attempts. The assessment does not carry any mark.

Teaching/Learning Methodology

(Note 3)

Students taking this course are expected to be sensitive to their own behavior in intrapersonal and interpersonal contexts. Intellectual thinking, reflective learning, experiential learning and collaborative learning are emphasized in the course. Case studies on successful and fallen leaders will also be covered in the course. The teaching/learning methodology includes:

1. Lectures (including e-learning modules)
2. Experiential classroom activities;
3. Group project presentation;
4. Written assignment.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	f
1. Class Participation^	20%	✓	✓	✓	✓	✓	✓
2. Group Project*	30%	✓	✓	✓	✓	✓	✓
3. Term Paper^	50%	✓	✓	✓		✓	
4. Quiz on law abidance and National Security Law	0%	✓	✓	✓	✓	✓	✓
Total	100 %						

	*assessment is based on group effort ^assessment is based on individual effort Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: 1. Assessment of Class Participation (20%): It is expected that both online and classroom activities and preparation for lectures can help students understand the subject matter and oneself, develop social skills, connect learning to oneself and promote an appreciation of the importance of intrapersonal and interpersonal leadership qualities. Hence, marks for class participation (including the participation in e-learning modules) and preparation for lectures will be given. Students will be assessed by: a) preparation for class (e.g., complete e-learning modules, online assignment, and dig up materials before class), b) participation in class and online learning activities (e.g., completion of worksheets and sharing in class, participation in online discussion forum) and c) volunteering to answer questions and join discussions. Also, students will be invited to rate the performance and learning of other group members in an honest and authentic manner. The marks will reflect the mastery of knowledge, self-reflection and quality of interpersonal skills (such as collaboration with other members and contribution to the group) of the group members. Peer assessment will contribute to marks in class participation. 2. Assessment of Group Project (30%): Group project presentation can give an indication of the students' understanding and integration of theories and concepts on personal qualities in effective leadership, personal and group reflections, interpersonal skills and degree of recognition of the importance of active pursuit of knowledge covered in the course. 3. Assessment of Term Paper (50%): Individual paper can give an indication of the students' understanding and integration of theories and concepts on the personal qualities in effective leadership, self-assessment, self-reflection, connection of the subject matter to oneself and degree of recognition of the importance of active pursuit of knowledge covered in the course. Based on the implementation of this subject in the past seven academic years (2012-2019), evaluation findings consistently showed that this subject was able to achieve the intended learning outcomes in the students. The positive evaluation findings are documented as follows: Leung, H. (2016). Levels of reflection on teaching a leadership and positive youth development subject. *International Journal on Disability and* Human *Development 15*(2)*,* 211-220. Leung, H., Shek, D. T. L., & Mok, B. P. W. (2016). Post-lecture subjective outcome evaluation of a university subject on

leadership and intrapersonal development. *International Journal of Child and Adolescence Health, 9*(2)*,* 223-234.

Li, X., & Shek, D. T. (2020). Objective outcome evaluation of a leadership course utilising the positive youth development approach in Hong Kong. *Assessment & Evaluation in Higher Education, 45*(5), 741-757.

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<tr><td></td><td colspan="2">Shek, D. T. L., & Yu, L. (2014). Post-course subjective outcome evaluation of a subject on leadership and intrapersonal development for university students in Hong Kong. International Journal on Disability and Human Development. doi:10.1515/ijdhd-2014-0342

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4. Quiz on National Security Law: Students are required to pass a quiz with multiple-choice questions. Students can have multiple attempts in taking the quiz.</td></tr>
<tr><td rowspan="6">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures and experiential/online learning activities</td><td>39 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Group project preparation</td><td>20 Hrs.</td></tr>
<tr><td>▪ Reading and writing term paper</td><td>76 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>135 Hrs.</td></tr>
<tr><td>Reading List and References</td><td colspan="2">Basic References
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Rycek, R. F., Stuhr, S. L., McDermott, J., Benker, J., & Swartz, M. D. (1998). Adolescent egocentrism and cognitive functioning during late adolescence. *Adolescence, 33*(132), 745-749.

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Note 1: Intended Learning Outcomes

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

Note 2: Subject Synopsis/ Indicative Syllabus

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

Note 3: Teaching/Learning Methodology

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

Note 4: Assessment Method

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

Subject Description Form

Subject Code	ENG1003
Subject Title	Freshman Seminar for Engineering
Credit Value	3
Level	1
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	The objectives of this subject are to: (1) Introduce students to the engineering broad discipline and enthuse them about their major study (2) Cultivate students' creativity and problem-solving ability, and global outlook (3) Introduce students to the concept of entrepreneurship (4) Engage the students in desirable forms of learning at university that emphasizes self-regulation, autonomous learning and deep understanding
Intended Learning Outcomes	Upon completion of the subject, students will: (a) Be able to demonstrate an understanding and an enthusiasm about the engineering broad discipline and their major study (b) Develop their problem-solving ability and global outlook (c) Be able to demonstrate an understanding of entrepreneurship (d) Be able to research for information, formulate a project plan, and manage a project with initiative (e) Be able to demonstrate an understanding of academic integrity.
Subject Synopsis/ Indicative Syllabus	***1. Online Tutorial on Academic Integrity (4 hours*)*** Students will be required to complete successfully an Online *Tutorial on Academic Integrity* on or before week 5 of the first semester. The students will understand the importance of academic integrity by completing the Online Tutorial. ***2. Seminars (15 hours*)*** There will be seminars given by various speakers on various topics to introduce to students the engineering broad discipline, to enthuse them about their major study, to arouse students' interests in engineering and to cultivate their understanding of and sense of belonging to the discipline and the engineering profession, and to cultivate students' global outlook. The formats of the seminars may be, but not limited to, Departmental Seminars, and Renowned Speaker Seminar. ***3. Freshman Project (45 hours*)*** There will be practical workshops, presentation and demonstration sessions for the Freshman Project. The freshman project aims at developing students' creativity, problem-solving skills, research for information, and project management abilities through practical and hands-on tasks at a level commensurate with their first-year engineering backgrounds. Students will work in small groups under the guidance of teachers/instructors to design and implement an engineering solution to some given problems.

	4. Entrepreneurship Project (45 hours*) The entrepreneurship project is designed to develop students' appreciation and understanding about entrepreneurship and the commercialization process by attending lectures, workshops and tutorials. In the course of the Entrepreneurship Project, students will identify technology opportunities and learn the skills of preparing a simple business plan. (* Note: hours indicate total student workload)
Teaching/Learning Methodology	***Online Tutorial on Academic Integrity*** The *Online Tutorial on Academic Integrity (OTAI)* is developed by the University to help the students understand the importance of academic integrity. By going through the Online Tutorial, students will be aware of the importance of upholding academic integrity during University study. They will also learn good practices by which to stay clear of dishonest behaviors and academic plagiarism. Completing the OTAI is a completion requirement of Freshman Seminar. For successful completion of the OTAI, the students need to attempt the pre-test in the Tutorial, read all four modules in the Tutorial, obtain at least 75% in the post-test in the Tutorial and sign the Honour Declaration before the completion deadline. Students who fail to complete the OTAI before the completion deadline will fail the Freshman Seminar for Engineering. ***Seminars*** The seminars (such as renowned speaker seminars and departmental seminars) are designed to arouse students' interest about engineering. The delivery mode will be *interactive* and *engaging*. Students will be motivated to search for information and do background reading. They will be encouraged to raise questions and discuss with the presenters. Assessment tasks (quizzes) will be designed to measure students' learning outcomes as well as to encourage participation and interaction. ***Freshman Project*** For the Freshman Project, students will work collaboratively with their group members to design and implement an engineering solution to a given problem under the guidance of instructors. There will be close staff-students and students-students *interaction*. Students will be given opportunities to develop creativity, problem-solving skills, research for information and project management abilities. Assessment tasks will consist of demonstration, presentation, reports, and reflective essay writings. These are designed to evaluate individual student's performance and achievement of the relevant intended learning outcomes as well as to encourage active participation. Appropriate pedagogies will also be used to promote the "Learning to Learn" ability of students. ***Entrepreneurship Project*** There will be lectures, workshops, and tutorials. A general overview of the concepts required to conduct the project will be provided to students through lectures. They will then work in small groups in a workshop to appreciate the essential elements in the development of a business plan and subsequently to produce a simple business plan and to present it to fellow classmates. Assessment will focus towards students' understanding about entrepreneurship, innovation and creativity.

Assessment Methods in Alignment with Intended Learning Outcomes

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

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

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

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

Pass Conditions

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

Student Study Effort Expected	Class contact:	
	▪ Introduction and Seminars (such as Departmental Seminars, Renowned Speaker Seminar)	9 hours
	▪ Freshman project: 3 hours per week for 5 weeks	15 hours
	▪ Entrepreneurship project: 3 hours per week for 5 weeks	15 hours
	▪ Other student study effort: 4 hours for Online Tutorial on Academic Integrity; 6 hours for seminars quizzes preparation; 60 hours for Freshman project and Entrepreneurship project: background information search, project work preparation, meeting and	70 Hours

	discussion, presentation and demonstration, and report writing.	
	▪ Total student study effort	109 Hours
Reading and References List	H. Scott Fogler, Steven E. LeBlanc, Benjamin R. Rizzo, *Strategies for creative problem solving*, Upper Saddle River, N.J. : Prentice Hall, 2014 (3rd Edition) N.G. Siegel, *Engineering project management*, Hoboken, New Jersey: Wiley, 2019 (1st Edition) Gene Moriaty, *The engineering project: its nature, ethics, and promise*, University Park, Pa.: Pennsylvania State University Press, 2008. P. Swamidass, *Engineering Entrepreneurship from idea to business plan: a guide for innovative engineers and scientists*, New York: Cambridge University Press, 2016. The Hong Kong Institution of Engineers, "Engineering Our City", Youtube clip ref. no. nYMmI6vlVeQ HKIE Corporate Video, Youtube clip ref. no. lNMVl8MuNEY	

(revised) June 2021

Discipline-Specific Requirements (DSR)

- Compulsory subjects

Subject Description Form

Subject Code	AAE2001
Subject Title	Introduction to Aircraft and Aviation Systems
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To develop students' knowledge of the basic components and operating principles of essential mechanical and electrical systems in transport aircraft; and 2. To provide a broad understanding of major aviation systems and their operations in the aviation industry.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate good understanding of the design principles and manufacturing processes of key systems in civil transport aircraft (e.g., control system, fuel system, engine system, hydraulic system, electrical system, pneumatic system, environmental control system and emergency system); and b. Gain the basic technical and professional knowledge of aviation systems and regulations, and their functions in the aviation industry including the roles; and c. Understand the interrelationships among civil aviation administration, airlines and airport operations; air traffic control; maintenance scheduling and aviation associated environmental issues.
Subject Synopsis/ Indicative Syllabus	**Fundamentals and Structure of Aviation System** - An overview of the operations among civil aviation authorities, airlines, airports and aviation organizations including: • **Civil Aviation Administration** - Air services agreements. Air traffic management. Flight standards. Aviation safety and accident investigation. • **Airline Operations** - Flight planning and operations. Training of flight crew, aircraft engineers and supporting staff. Management of engineering operations. Flight simulator training. • **Airport Operations** – Basic anatomy of airport. Passenger and air cargo terminal operations. Airport security Operations. **Flight Control Systems** - Principles of flight control. Operation and effect of primary and secondary flight control systems, including ailerons and spoilers, elevators, stabilators, variable incidence stabilizers and canards, rudder, rudder limiter, high lift devices, drag inducing devices, trim tabs, servo tabs and control surface bias.

	Powerplant - Constructional arrangement and operation of turbojet, turbofan, turboshaft and turbo-prop engines; Types and basic performance of Inlet, compressors, combustion section, turbine section and exhaust. Fuel efficiency. Effect of specific thrust. Specific fuel consumption and flight speed. Engine cycle and performance. **Propeller –** Fundamentals of Blade element theory. High / low blade angle, reverse angle, angle of attack, rotational speed; Propeller slip; Aerodynamic, centrifugal, and thrust forces; Torque; Relative airflow on blade angle of attack; Vibration and resonance. Speed control and pitch change methods. **Landing Gear** - Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and auto braking; Tires; Steering; Air-ground sensing **Fuel Systems** - Characteristics of aircraft fuel systems. Fuel system components. Aircraft mass and payload. System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; **Hydraulic Systems** - Flight control and utility functions. Emergency power sources. Landing-gear system. Braking and anti-skid. System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Filters; Pressure Control; Power distribution; **Electrical Systems** - Characteristics of civil aircraft electrical system. Batteries Installation and Operation; DC power generation; AC power generation, Electrical loads and Voltage regulation, Emergency power generation. Power distribution; Inverters, transformers, rectifiers; Circuit protection; External / Ground power. **Pneumatic Systems** - Pitot-static systems. Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services. Use of engine bleed air. Bleed air control. Thrust reversers. **Environmental Control Systems** - The need for cabin and equipment conditioning. Pressurization systems and Environmental control system design; Control and indication including control and safety valves; Cabin pressure controllers. Air distribution systems. **Fire and Oxygen Emergency Systems** - Warning systems. Fire and smoke detection and warning systems; Fire extinguishing systems; Portable fire extinguisher. Emergency oxygen- System lay-out: cockpit, cabin; Sources, Indications and warnings. **Ice and Rain Protection Systems** - Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical; De-icing systems: electrical, hot air pneumatic and chemical. **Air Conditioning System** - Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system.

Teaching/Learning Methodology

1. Lectures are used to deliver the fundamental knowledge in relation to various aircraft and aviation systems (outcomes a to c).

2. Tutorials are used to illustrate the applications of fundamental knowledge to practical situations (outcomes a to c).

3. 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 c).

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lecture	✓	✓	✓
2. Tutorial	✓	✓	✓
3. 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		
		a	b	c
1. Examination	60%	✓	✓	✓
2. Assignments and Quizzes	40%	✓	✓	✓
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 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/Seminar/Tutorial	39 Hrs.
	Other student study effort:	
	▪ Assignment/Min-Project/Report	22 Hrs.
	▪ Self-study/Preparation	44 Hrs.
	Total student study effort	**105 Hrs**.
Reading List and References	1. I. Moir amd A.G. Seabridge, Design and Development of Aircraft Systems – An Introduction, latest edition, AIAA Education Series, latest edition. 2. Alexander T. Wells and Seth B. Young, Airport Planning and Management, McGraw-Hill, latest edition. 3. Jon D. Fricker and Robert K. Whitford, Fundamentals of Transportation Engineering: A Multimodel Systems Approach, Prentice-Hall, latest edition. 4. Wittmer, Andreas, Bieger, Thomas, Müller, Roland (Eds.), Aviation Systems – Management of the Integrated Aviation Value Chain, Springer, latest edition. 5. Alan J. Stolzer, Carl D. Halford, John Joseph Goglia, Safety Management Systems in Aviation, Ashgate, latest edition. 6. Harry Kinnison, Aviation Maintenance Management, McGraw Hill, latest edition. 7. LeRoy Paine, Commercial Aviation—An Insider's Story, LifeRich, latest edition.	

November 2020

Subject Description Form

Subject Code	AAE3001
Subject Title	Fundamentals of Aerodynamics
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AMA2111 Mathematics I **OR** AMA2112 Mathematics II
Objectives	This subject will provide students with 1. To develop students' knowledge in the fundamentals of aerodynamics; and 2. To provide student's insight on airflow characteristics flowing through the aircraft; and 3. To develop the students' capability in designing aerofoil with the consideration of different wind factors.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Identify, formulate and solve problems in aviation engineering by applying knowledge of fundamentals of aerodynamics (including aerodynamics primarily in inviscid and incompressible flow); and b. Use the techniques, skills and modern computational and information technology necessary to analyze aerodynamics, lift and drag on simple geometries and thin airfoils.
Subject Synopsis/ Indicative Syllabus	**Introduction to Aerodynamics** - Aerodynamic variables, forces and moments. **Review of Fluid Mechanics** - • **Basic Concepts of Fluid Mechanics** – Properties of a fluid; Streamlines, streaklines, and pathlines; Angular velocity, vorticity, and strain; Compressibility; Types of flow – continuum versus free molecule flow, inviscid versus viscous flow, incompressible versus compressible flow, and Mach number regimes; An introduction to viscous boundary layers. • **Fluid Statics** – Fluid pressure; Pascal's law and pressure-height relation; Buoyancy. • **Fundamental Principles and Equations** – Control volumes and fluid elements; Substantial derivative; Reynolds transport theorem; Continuity equation; Momentum equation; Energy equation; Euler's equation. • **Dimensional Analysis** – Buckingham Pi theorem; Flow similarity; Dimensionless numbers: Mach, Reynolds, Prandtl, and Froude numbers. **Inviscid, Incompressible Flow** - Bernoulli equation; Flow in a duct – Venturi and low- speed wind tunnel; Pitot tube measurement of airspeed; Irrotational flow; Circulation; Stream function and velocity potential; Laplace equation and elementary solutions – uniform flow, source, sink, doublet, non-lifting and lifting flow over cylinder, vortex flow; Kutta-Joukowski theorem on circulation and lift.

Incompressible Flow over Airfoils - Airfoil nomenclature and characteristics; Kutta condition; Circulation and lift; Kelvin's circulation theorem and starting vortex; Thin airfoil theory; Viscous airfoil drag.

Incompressible Flow over Finite Wings - Downwash and induced drag; Vortex system on finite wing; Laws on vortex motion; Prandtl's lifting-line theory.

Viscous, Incompressible Flow - Boundary-layer properties; Boundary-layer equations; Blasius solution.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures, projects, tutorials, and homework assignments.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for aerodynamics.
3. Technical/practical examples and problems are raised and discussed in class.
4. Experiments or projects are used to evaluate the lift and drag of streamline objects and airfoils.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered	
	a	b
1. Lectures	✓	✓
2. Projects	✓	✓
3. Tutorials	✓	✓
4. Homework assignments	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed	
		a	b
1. Homework assignments	20%	✓	✓
2. Tests	20%	✓	✓
3. Projects	20%	✓	✓
4. Examination	40%	✓	✓
Total	100%		

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

Overall Assessment:

0.4 × End of Subject Examination + 0.6 × 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 and

	assignments which provide timely feedbacks to both lecturers and students on various topics of the syllabus.	
Student Study Effort Expected	Class contact:	
	▪ Lectures	33 Hrs.
	▪ Tutorials	6 Hrs.
	Other student study effort:	
	▪ Self-study	67 Hrs.
	Total student study effort	**106 Hrs.**
Reading List and References	1. Munson, B.R, Young, D. F., Okiishi, T. H., Huebsch, W. W., Fundamentals of Fluid Mechanics, John Wiley & Sons, 7th edition, 2012. 2. Anderson, J. D., Fundamentals of Aerodynamics, McGraw-Hill, 6th edition, 2016. 3. Bertin, J. J., Cummings, R. M., Aerodynamics for Engineers. Pearson, 6th edition, 2013.	

April 2021

Subject Description Form

Subject Code	AAE3002
Subject Title	Aircraft Structures and Materials
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	**Pre-requisite:** ENG2001 Fundamentals of Materials Science and Engineering **OR** ME23001 Engineering Mechanics **OR** ME33001 Mechanics of Materials
Objectives	1. To provide students key knowledge relevant to aircraft structures and materials; and 2. To provide students an overview of the composites used in modern aircraft; and 3. To provide students with stress analysis tools to formulate and solve engineering problems related to aircraft structures and materials.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate a good understanding of key aspects of aircraft structures; and b. Analyze and assess aircraft structures subject to various types of loading using stress analysis tools and failure criteria; and c. Comprehend characteristics of various materials used in aircraft; and d. Understand mechanical behaviors of composite materials used in aircraft.
Subject Synopsis/ Indicative Syllabus	**Characteristics of Aircraft Structures -** Aircraft structural elements. Wing, fuselage, tail and landing gear. **Fundamentals of Aircraft Materials and Joints -** Material fundamentals. Metallic alloys. Composites. Riveting. Aircraft fasteners. Adhesive joint. **Stress Analysis -** Stress and strain. Equations of equilibrium. Principal stresses. Linear stress-strain relations. **Loads Applied on Aircraft -** Compression and tension. Torsion. Bending. Membrane stresses in pressure vessels. Flexural shear in closed thin-walled sections. Buckling of columns. Loads and stresses on ribs and frames. Aircraft structures under combined loading. **Failure Criteria for Isotropic Materials -** Strength criteria for brittle materials. Yield criteria for ductile materials. Stress concentration. Fatigue. Fractures. Corrosion of materials and prevention. **Heat Treatment Processes -** Heat treatment of metals. Surface treatment. **Fundamentals of Aircraft Composites -** Mechanical behavior of composite materials. Processing and Fabrication techniques for aircraft composites.

Teaching/Learning Methodology

Lectures and tutorials are used to deliver the fundamental knowledge in relation to aircraft structures and materials (outcomes a to d).

Teaching / Learning Methodology	Intended subject learning outcomes to be covered			
	a	b	c	d
1. Lectures	✓	✓	✓	✓
2. Tutorials	✓	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be covered			
		a	b	c	d
1. Examination	60%	✓	✓	✓	✓
2. Assignments and quiz	30%	✓	✓	✓	✓
3. Laboratory	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. It is supplemented by the tests and assignments 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	6 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	**105 Hrs.**

Reading List and References	1. C.T. Sun, Mechanics of Aircraft Structures, John Wiley & Sons, latest edition. 2. T.H.G. Megson, Aircraft Structures for Engineering Students, Elsevier, latest edition. 3. R.F. Gibson, Principles of Composite Material Mechanics, McGraw-Hill International Editions, latest edition.

December 2019

Subject Description Form

Subject Code	AAE3003
Subject Title	Aircraft Propulsion Systems
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with knowledge of advanced aerodynamics and application in modern gas-turbine engines.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Work professionally in aviation systems and understand aircraft regulations (including the understanding of state-of-the-art aerodynamics, propulsion systems, skills and hand-on experience to the design and analysis of propulsion systems).extend their knowledge of mechanical engineering to different situations of engineering context and professional practice in propulsions systems; and b. Function professionally in multidisciplinary teams (including the knowledge of aviation engineering to different situation of engineering context and professional practices in propulsions systems).
Subject Synopsis/ Indicative Syllabus	**Introduction to Propulsion -** fluid momentum, reaction force, rockets, propellers, turbojets, turboprop, turbofans. **Review of Thermodynamics -** mass, momentum and energy conservation laws; first and second laws; entropy equation; and perfect gas. • **Basic Concepts of Thermodynamics** – Thermal Properties. The First Law of Thermodynamics. p-v-T Relation. Ideal Gas Model. • **The Second Law of Thermodynamics** – The Kelvin-Planck and Clausius Statements. Reversible and Irreversible Processes. Carnot Cycle. The Clausius Inequality. Entropy. Isentropic Processes. Isentropic Efficiencies. • **Vapour and Gas Power Systems** – Rankine Cycle. Superheat and Reheat. Air Standard Otto and Diesel cycles. Air-Standard Brayton Cycle. **Steady-state, One-dimensional (1D), Compressible Flow -** Quasi-1D flow of perfect gas; isentropic and non-isentropic flow; stagnation concept. **Propulsion Basics -** thrust equations, thermal and propulsion efficiencies, fuel consumption rate and specific thrust, engine performance, aircraft range. **Cycle Analysis and Engine Performances -** ramjet, turbojet, turbofan, turboprop, and turbo-shaft engines. **Subsystems –** 1. Inlets, 2. Turbomachinery - basics of compressors and turbines, 3. combustors, and nozzles. **Modern Aircraft Engines -** High-by-pass engines.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures, homework assignments, test, and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for propulsion systems.
3. Technical/practical examples and problems are raised and discussed in class.
4. Experiments or CFD projects are designed to evaluate the propulsion system.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered	
	a	b
1. Lectures	✓	✓
2. Homework assignments	✓	✓
3. Experiments/Projects	✓	✓
4. Tests	✓	✓
5. Exam	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed	
		a	b
1. Projects/Experiments	15%		✓
2. Homework assignments	10%	✓	
3. Tests	25%	✓	✓
4. 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

The continuous assessment consists of homework assignments. 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.

The examination is 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.
	▪ Lab/Project	6 Hrs.
	Other student study effort:	
	▪ Self-study	67 Hrs.
	Total student study effort	**106 Hrs.**
Reading List and References	1. Thermodynamics: An Engineering Approach, 8th Edition, 2014, by Yunus A. Cengel and Michael A. Boles. McGraw-Hill Education 2. Mechanics and Thermodynamics of Propulsion, 2nd Ed., 1992. Philip Hill & Carl Peterson. Pearson/Addison-Wesley Publishing Co. 3. Aircraft Engines and Gas Turbines, 2nd Edition, 1992. Jack Kerrebrock. MIT Press. 4. Elements of Propulsion: Gas Turbine and Rockets, 2nd Edition, 2006. Jack Mattingl., AIAA. 5. Elements of Gas Turbine Propulsion, (1st Edition) 1996. Jack Mattingly. McGraw-Hill. 6. Jet Engines: Fundamentals of Theory, Design and Operation, 2005. Klaus Huenecke. Zenith Press. 7. Aircraft Gas Turbine Engine Technology, 3rd ed., 1997. Irwin E. Treager. McGraw-Hill.	

November 2020

Subject Description Form

Subject Code	AAE3004
Subject Title	Dynamical Systems and Control
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AMA2111 Mathematics I **OR** AMA2112 Mathematics II
Objectives	1. To introduce basic concepts and methods of feedback control and automatic control systems; and 2. To introduce the mathematical modeling of physical elements in dynamic systems; and 3. To provide with a basic understanding of behaviour of first- and second-order systems due to typical inputs, and concepts of time-domain specifications; and 4. To introduce the basic concepts of frequency response and frequency domain specifications; and 5. To introduce feedback control and its application to improve the overall system behaviour; and 6. To present the basic concepts of proportional-and-integral-and-derivative control, and the setting of control parameters to meet the system goals.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Identify, formulate and solve problems in aviation engineering by applying knowledge of dynamical system and control (including transfer function and response of a first- or second-order system both in time and frequency domains); and b. Design and conduct experiments, as well as to analyze the system dynamic behavior is related to system specifications and its improvements according to the specifications (including Routh-Hurwitz stability criterion); and c. Have knowledge of contemporary issues of dynamical system and control (including applications of proportional, integral and derivative feedbacks in control systems) to understand the impact of engineering solutions in a global and societal context.
Subject Synopsis/ Indicative Syllabus	**Dynamic Responses of First-Order and Second-Order Systems -** Mathematical modeling of dynamic systems (elements or interconnection of elements) by differential equations, critical parameters of first-order and second-order systems, system response analysis due to step, ramp and impulse inputs using Laplace transform. **Frequency Response of First-Order and Second-Order Systems -** Harmonic response, Bode diagrams, frequency domain specifications, frequency response applications. **Fundamental Methods of Feedback Control -** Analysis of open-loop and closed-loop systems, transfer functions, block diagrams, time-domain specifications, time-domain analysis of control systems, system stability, Routh-Hurwitz stability

criterion.

Basic Feedback Controller- Automatic controllers, P, PD, PID controllers, Steady state error.

Lab sessions:

There are two 2-hour lab sessions. Typical tasks:

1. Control systems analysis and design using time-domain method
2. Control systems analysis and design using frequency-response method
3. Control systems design using PID

Teaching/Learning Methodology

The teaching and learning methods include lectures, tutorials and laboratory experiments.

The lectures aim at providing students with an integrated knowledge required for understanding and analyzing dynamic systems and fundamental feedback control.

The tutorials aim at enhancing the analytical skills of the students. Examples on system modelling, dynamic response of linear 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.

The experiments will provide the students with hand-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.

Teaching/Learning Methodology	Intended subject learning outcomes to be cover		
	a	b	c
1. Lecture	✓	✓	✓
2. Laboratory	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Home work	25%	✓	✓	
2. Class tests and reports	25%	✓	✓	✓
3. 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

	Assessment: Assignments, laboratory reports, and tests are adopted in continuous assessment on students' timely feedback to and on-going understanding of the course. The 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	35 Hrs.
	▪ Laboratory	4 Hrs.
	Other student study effort:	
	▪ Self-study	42 Hrs.
	▪ Homework assignment	15 Hrs.
	▪ Laboratory report	6 Hrs.
	Total student study effort	**102 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.	

November 2020

Subject Description Form

Subject Code	AAE3006
Subject Title	Safety, Reliability and Compliance
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject will provide students to 1. Gain fundamental knowledge of aviation safety and compliance; and 2. Develop students' understanding of methods and techniques used in evaluating the safety, reliability and compliance of aviation operations and services.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Work professionally in aviation systems and understand aircraft regulations (including the understanding of the safety, quality and reliability provisions and infrastructure in aviation administration and service providers and the mathematical concepts used in reliability and safety analysis of aviation); and b. Function professionally in multidisciplinary teams (including the assessment processes for compliance to certificates in aviation trade); and c. Understand professional and ethical responsibility (including the identification of major cases of aviation errors and violations).
Subject Synopsis/ Indicative Syllabus	**Introduction -** Safety. Product and Service Quality. Reliability. Assurance. Compliance. Total Care: Airlines; airports, air traffic control, MRO, OEM and stakeholders. **Aviation Errors and violations -** Accident and incident investigation models; Maintenance error decision models; Root cause analysis. **Certification and Compliance -** Roles of aviation authorities and administrations. Important certificates and specifications in aviation industry. Documentation and Implementation. Auditing. Non-Compliance and Follow up. **Reliability Concepts and applications -** Failures. Failure rate. MTBF. Reliability distributions. Series and parallel redundancy. Imperfect maintenance. Reliability assessment. Failure prevention tools. **Performance Measurement -** Safety Management System. Hazard analysis and control. Performance indicators. Statistical control techniques. Safety Culture.
Teaching/Learning Methodology	Lectures are used to deliver the fundamental knowledge in relation to various aspects of aviation system safety and reliability (outcomes a to d).

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

Group mini-projects are used to help students to deepen their knowledge on a specific topic through search of information, analysis of data and report writing (outcomes a to c).

Special seminar(s) delivered by invited industrial professionals may be used to relate the concepts learnt in class to engineering practices. Students are expected to achieve better understanding of aviation safety through this activity (outcomes a and c).

Teaching/Learning Methodology	Intended subject learning outcomes to be cover		
	a	b	c
1. Lectures	✓	✓	✓
2. Tutorials	✓	✓	✓
3. Mini-project	✓	✓	✓
4. Special seminar	✓		✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Assignments	15%		✓	✓
2. Group mini-project	15%	✓	✓	✓
3. Tests	15%	✓	✓	✓
4. Examinations	55%	✓	✓	✓
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. It is supplemented by seminars and continuous assessment including assignments, group mini-project, and tests. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus. In particular, group mini-project is 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 working in the aviation industry.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	30 Hrs.
	▪ Tutorial	9 Hrs.
	Other student study effort:	
	▪ Course work	25 Hrs.
	▪ Self-study	46 Hrs.
	Total student study effort	**110 Hrs.**
Reading List and References	1. Redrigues, C.C. and Cusick, S.K., Commercial Aviation Safety, McGraw Hill, latest edition. 2. Ferguson, M. and Nelson, S., Aviation Safety: a balanced industry approach, Delmar Cengage Learning, latest edition. 3. Reason, J. and Hobbs, A., Managing Maintenance Error, Ashgate, latest edition. 4. O'Connor, P.D.T., Practical Reliability Engineering, Wiley, latest edition. 5. International Journal of Reliability, Quality and Safety Engineering.	

November 2020

Subject Description Form

Subject Code	AAE4002
Subject Title	Capstone Project
Credit Value	6
Level	4
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: The student should have completed most of the subjects required in previous years of the programme before taking this subject. The enrollment of this subject is subjected to the approval of the Project Coordinator.
Objectives	To provide students an opportunity to utilize and integrate their knowledge of air transport engineering in a team effort to solve real life problems related to the aviation industry.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Identify, formulate and solve problems in aviation engineering by applying knowledge of mathematics, science and engineering (including the understanding of the work of airport/airline/aircraft engineering operations); and b. Design and conduct experiments, as well as to analyze and interpret data (including designing and solving engineering problems in the aviation industry); and c. Use the techniques, skills and modern engineering tools, including the computational tools necessary for engineering practice (including applying knowledge and up-to-date technologies designing); and d. Function professionally in multidisciplinary teams; and e. Communicate effectively and professionally with appropriate languages and tools; and f. Recognize the need to engage in life-long learning.
Subject Synopsis/ Indicative Syllabus	A project team consisting normally of three students will be expected to complete an industry-related project or an academic-related project in the field of air transport engineering, which may cover the areas of aircraft maintenance engineering, aircraft design and modification, logistics engineering, flight planning and scheduling, system design and modification. The team of students is 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 project is trained through guided studies. Each team of students is allocated a project title, objectives, description, and a project supervisor and an industrial supervisor (if applicable), who guide the team through the various stages of the project. For industrial-related projects, one academic and one industrial supervisor will be assigned to each student team.

Student team working on industrial-related projects may be eligible for fulfilling WIE requirement. To be eligible, student shall demonstrate frequent contact and close involvement with the industrial supervisor and/or industrial organization, and submit the necessary WIE required documentations.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered					
	a	b	c	d	e	f
1. Site visit	✓					
2. Guided study	✓	✓	✓	✓	✓	
3. Oral presentation					✓	
4. Report writing			✓		✓	✓

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	f
1. Individual Reflective Essay	10	✓	✓	✓	✓	✓	✓
2. Interim report	20	✓	✓	✓	✓	✓	
3. Final report	50	✓	✓	✓	✓	✓	
4. Oral examination	20	✓	✓			✓	
Total	100 %						

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

Overall Assessment: 1.0 x continuous assessment

Performance of each student is individually assessed together with the team's overall performance by the supervisor(s), an independent assessor, and their team members, based on their working attitude, quality of works, and report writing. Their communication skill is assessed through the oral presentation by an oral examination panel of at least two academic staff.

	As a part of the assessment process, each group member is required to specify his/her own contribution to the project, and estimate and compared to the contribution of his/her teammates via peer assessment. The supervisor conducts continuous monitoring of the project team as a whole and of each group member. The supervisor monitors and assesses the overall and individual progresses through regular meetings and guided studies. In case of an industrial-based project, comments from the industrial supervisor is invited, but he/she is not be required to perform the formal assessment. Both the project supervisor and the independent assessor assess the interim report and the final report. Based on the peer assessment, due consideration of each student's individual contribution to the project at these two stages will be taken into account. In case of an industrial-based project, comments from the industrial supervisor may be invited but he/she is not be required to perform the formal assessment. In the oral examination, every team member is required to present the project especially on his/her significant contributions, and address the questions by the oral examination panel. Marks for oral examination is awarded to individual student by taking into account the group's overall performance.	
Student Study Effort Expected	Class contact:	
	▪ Guided study	52 Hrs.
	Other student study effort:	
	▪ Conducting project	99 Hrs.
	▪ Literature review and private study	66 Hrs.
	▪ Training (Report writing)	26 Hrs.
	Total student study effort	**243 Hrs.**
Reading List and References	To be advised by supervisor	

November 2020

Subject Description Form

Subject Code	AAE4004
Subject Title	Airworthiness and Regulations
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject aims at providing students with the fundamental concepts and principles of airworthiness; and the associated regulations from an international perspective in aircraft design, production, operation and maintenance. As airworthiness has to be considered as a coherent process from the design of aircraft to the monitoring of its technical condition in airline service, this subject covers topics on both initial airworthiness and continuing airworthiness. In addition, the economical, ethical and sustainability challenges of contemporary airworthiness issues will also be introduced. Based on the ICAO framework, this subject covers the airworthiness related regulations and requirements of European Union, the U.S.A. and Hong Kong. As such, the students understand the relationship and legal obligations pertaining to the stakeholders of the airworthiness processes.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate an understanding and knowledge of the essential facts, concepts and principles associated with airworthiness and the underpinning regulations and requirements (including that of the ICAO, European Union, U.S.A., and Hong Kong for initial and continuing airworthiness); and b. Demonstrate a knowledge of the contemporary airworthiness issues; and understanding of the economical, ethical and sustainability challenges facing initial and continuing airworthiness; and c. Function professionally in multidisciplinary teams.
Subject Synopsis/ Indicative Syllabus	**General** – Contemporary Global Safety Level; Commercial Air Transport; Evolution of Airworthiness Standards, Lessons Learned from Civil Aviation Accidents; Initial Airworthiness; Continuing Airworthiness; and Airworthiness vs Flight Safety. **Air Legislation** – ICAO; Chicago Convention; Annexes 1, 6, 7, 8, 16 and 19; State of Design, State of Manufacture, State of Registry and State of the Operator; Hard Law; Soft Law; EASA Regulation Structure; FAA Regulation Structure; Hong Kong Air Legislation System; and Trade & Professional Associations. **Type Certification –** Initial Airworthiness; FAA; FAR Parts 21, 23, 25, 27, 29, 33, 34, 35 & 36; JAA; JAR; EASA; EASA Part-21, AMC-20, CS-23, CS-25, CS-27, CS-29, CS-36, CS-E, CS-P; Type Design; Type-Certificates; Type-Certificate Data Sheets; Type-Certificate Data Sheets for Noise; Type Certification Process; Certification Programme; Type Certification Basis; Compliance Demonstration; Means of Compliance; Compliance Verification; Changes to Type-Certificates; Supplemental Type-Certificates; System Safety Assessment; and CS-25 vs FAR Part 25. **Part-21 Approvals –** EASA Part-21 vs FAR Part 21; FAR Part 183 Organization Designation Authorization; EASA Part-21 Subpart J Design Organisation Approval; EASA Part-21 Subpart D Changes to Type-Certificates; Classification

	of Changes to a Type-Certificate; Changed Product Rule 21.A.101; EASA Part-21 Subpart E Supplemental Type-Certificate ; EASA Part-21 Subpart G Production Organisation Approval; EASA Form 52; EASA Form 1; and EASA Part-21 Subpart O European Technical Standard Order; and HKAR-21. **Certificate of Airworthiness –** Export Airworthiness Approval; Export Certificate of Airworthiness; FAA Form 8130-3, Type-Certificate Validation; AN(HK)O 1995 Article 8; HKAR-21 Subpart H; HKAR-1 Sections 1.1 & 1.3; Hong Kong Airworthiness Notices; HKAR-183; CAD Design Requirements; Circumstances of Flight; Aircraft Report; Categories of Aircraft; Types of Aircraft; Approved Flight Test Schedule; and CAD Form 183-3. **Operator Responsibilities –** ICAO Annex 6; Airworthiness Aspects of Air Operator Certificate; European Union Regulation for Air Operations; U.S.A. Air Carrier Certification; AN(HK)O 1995 Article 6; CAD 360; CAD361; Maintenance Support Arrangement; Contracting-out Maintenance; Maintenance Management Exposition; Airworthiness Aspects of Operational Approvals; Master Minimum Equipment List; Minimum Equipment List; Configuration Deviation List. **Continuing Airworthiness Management –** EASA Part-M; Continuing Airworthiness; Continuing Airworthiness Tasks; EASA Part-M Subpart G Continuing Airworthiness Management Organisation; EASA Airworthiness Review Certificate; AN(HK)O 1995 Article 9; HKAR-181; HKAR 1.3-4 Renewal of Certificate of Airworthiness; Certificate of Maintenance Review; Renewal; Maintenance Programme; Reliability Programme; and Airworthiness Directives. **Maintenance Organisation Approval –** ICAO Annex 8, EASA Part-145, FAR Part 145, FAR Part 43; AN(HK)O Article 11; HKAR-145; Safety & Quality System; Maintenance Organisation Exposition; Line Maintenance; Base Maintenance; Component Maintenance; Specialised Services; Certifying Staff, Support Staff, Human Factors in Maintenance; Occurrence Reporting; Certificate of Return to Service; CAD Form One; FASA Form 1, FAA Form 337, and FAA Form 8130-3. **Licensing of Maintenance Personnel** – ICAO Annex 1; EASA Part-66; EASA Part-147; FAR Part 65; FAR Part 147; HKAR-66; HKAR-147; Hong Kong Airworthiness Notices; Licence Categories; Licence Privileges; Complex Maintenance Tasks; Maintenance Training Organisation Exposition; Approved Basic Training Course; and Aircraft Type/Task Training.
Teaching/Learning Methodology	Lectures are used to deliver the knowledge of airworthiness topics to the students. Case study will be used to foster students' understanding of the subject matters. Industrial experts will be invited to share their experience and provide case studies to the students.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Examination	60%	✓		✓
2. Assignment	20%	✓		
3. Reports and presentation (Case Study)	20%		✓	
Total	100 %			

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

Overall Assessment:

0.6 x End of Subject Examination + 0.4 Continuous Assessment

Examination is adopted to assess students' understanding on aircraft regulations, maintenance process and procedure and basic airworthiness related information. Site visits are used to provide the students real insight on aircraft maintenance process and opportunities to communicate with aviation professionals in the field. Case study report provides the students self-study opportunity to study and analyze different cases of aircraft problems related to airworthiness.

Student Study Effort Expected

Class contact:	
▪ Lecture	30 Hrs.
▪ Tutorials	9 Hrs.
▪ Other student study effort:	
▪ Assignments	20 Hrs.
▪ Report	60 Hrs.
Total student study effort	**119 Hrs.**

Reading List and References

1. De Florio, Filippo, Airworthiness: An Introduction to Aircraft Certification and Operations, Third edition. Butterworth-Heinemann is an imprint of Elsevier, 2016.
2. Kritzinger, Duane, Aircraft System Safety: Assessments for Initial Airworthiness Certification. Woodhead Publishing is an imprint of Elsevier, 2017.
3. Cusick, Stephen, Commercial Aviation Safety, Sixth edition. McGraw Hill Professional, 2017.
4. Kinnison, Harry, Aviation Maintenance Management, Second edition. McGraw Hill Professional, 2012.
5. Friend, C. H., Aircraft Maintenance Management. Longman Aviation

	Technology, 1992. 6. Fielder, John, The DC-10 Case: A Study in Applied Ethics, Technology, and Society. State University of New York State, 1992.

November 2020

Subject Description Form

Subject Code	AAE4006
Subject Title	Flight Mechanics and Control Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AAE3004 Dynamical Systems and Control
Objectives	To provide students with a deep understanding of flight dynamics, static and dynamic stability and feedback control systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Design systems, components or processes to meet desired needs (including the basic modes of motion, related mechanism of fixed-wing aircraft and formulation of motion of a rigid systemic aircraft); and b. Use the techniques, skills and modern computational and information technology necessary for engineering practice (including analysis of equilibrium and stability for fixed-wing aircraft); and c. Function professionally in multidisciplinary teams.
Subject Synopsis/ Indicative Syllabus	**Introduction –** Mathematical tools for flight mechanics and control, configuration aerodynamics, flight performance, components of an automatic flight control system. **Flight Dynamics –**Reference frames, aircraft equation of motion, static equilibrium and trim, lift and pitching moment, control force, static longitudinal and lateral stability, linearized equation of motion, longitudinal dynamics, lateral-directional dynamics, maneuvering flight. **Aerodynamic Stability and Control** – Flying qualities requirements, stability and control derivatives, stability of longitudinal dynamics, stability of lateral-directional dynamics. **Flight Control Systems Design and Analysis –** Design of a flight control system based on linearized equations of motion, analyze the open loop response of the flight control system, analyze the closed-loop response of the flight control system, analyze the closed-loop stability.

Teaching/Learning Methodology

Lectures aim at providing students with an integrated knowledge required for understanding aircraft performance, static stability, dynamic stability and-feedback control. Theories and examples will be presented to cover the syllabus on general equations of motion for aircraft, models of aircraft, and conditions for equilibrium, linearization and solution of equations of motion. This forms the basis for analysis of trajectories, modes of motion as well as control analysis and synthesis.

Tutorials aim at enhancing the analytical skills of the students. Examples will be provided to teach students the skills of solving different flight mechanics and control problems using the knowledge of dynamic system and feedback control techniques. Students will be able to solve real-life problems using the knowledge they acquired in the class.

Experiments will provide students with experience in simulating the aircraft motion and how its configuration affects stability and control. The students are motivated to make assumptions to simplify a flight mechanics problem and then develop an automatic flight control system. These experiments are designed to train students how to apply theories to practical applications, how to analyze and present experimental data.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lecture	✓	✓	✓
2. Laboratory		✓	✓
3. Tutorial	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Homework	20%	✓	✓	
2. Class test	10%	✓	✓	
3. Laboratory report	20%		✓	✓
4. 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 to apply the concepts. It is supplemented by tests, homework and laboratory reports which provided timely feedback to both lecturers and the students on various topics of the syllabus.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Laboratory/Tutorial	6 Hrs.
	Other student study effort:	
	▪ Self-study	45 Hrs.
	▪ Homework assignment	12 Hrs.
	▪ Laboratory report	12 Hrs.
	Total student study effort	**108 Hrs.**
Reading List and References	1. Stevens, B. L. and Lewis F. L., Aircraft Control and Simulation, John Wiley & Sons, latest edition. 2. Mclean, D. Automatic Flight Control Systems, Prentice Hall International 3. Etkin, B and Reid, L.D., Dynamics of Flight, John Wiley, latest version	

December 2020

Subject Description Form

Subject Code	AAE4301
Subject Title	Avionics Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with knowledge of communications, electronics aspects of avionics, including aircraft instruments and integrated systems, and navigation systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the function and possess essential knowledge and skills the components of avionics systems; and b. Use the techniques, skills and modern computational and information technology necessary for engineering practice; and c. Extend the knowledge of avionics systems to different situations of professional engineering context to communicate effectively and professionally with appropriate languages and tools in avionics system.
Subject Synopsis/ Indicative Syllabus	**Regulatory Agencies & related documents -** ICAO Annex 10, F AA, RTCA; Concept of TSO; ARINC; DO-160. **Airborne Communications Systems -** VHF & HF transceivers, VDL modes; NAVCOM; EPIRB. **Terrestrial Radio Navigation & Landing Aids -** NDB; VOR; DVOR; DME; ILS & GP; Radar altimeters & AID. **Satellite Navigation -** Introduction to GNSS and its impacts on Performance-based navigation – RNAV & RNP. **Surveillance Systems -** Primary & Secondary Radars; ATCRBS replies; TCAS; ADS-B. **Cockpit Integration -** Display technologies; Instrument Placement. **On Board Data Buses -** ARINC 429; ARINC 629; ARINC 825 CAN Bus. **Electronic Flight Control -** FBW flight control features. Control laws. Safety and integrity. Redundancy and failure survival. Digital implementation and problems. Flight control software functions. **Case study -** Case study on an avionics system/avionics subsystem/avionics component

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.

2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for avionics systems.

3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcome to be covered		
	a	b	c
1. Lecture	✓	✓	
2. Tutorial	✓	✓	✓
3. Homework assignment	✓	✓	
4. Case study report	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Homework assignment	20%		✓	
2. Test	20%	✓	✓	
3. Case study report	20%			✓
4. Examination	40%	✓	✓	
Total	100 %			

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

Overall Assessment:

0.40 × End of Subject Examination + 0.60 × Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report. 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.

The examination is 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.

Class contact:	
▪ Lecture/Tutorial	39 Hrs.

Student Study Effort Expected	Other student study effort:	
	▪ Self Study	44 Hrs.
	▪ Case Study	22 Hrs.
	Total student study effort	**105 Hrs.**
Reading List and References	1. Helfrick A, Principles of Avionics, 9th Edition, Avionics Communications, 2015. 2. Tooley M, and Wyatt, Aircraft Electrical and Electronic Systems: Principles, Maintenance and Operation, Elsevier Ltd, 2009. 3. Collinson R.P.G., Introduction to Avionics Systems, Third Edition, Springer, Feb 2011. 4. Kayton Myron Walter R. Fried, Avionics Navigation Systems, Second Edition, John Wiley and Son, Published online 2007. 5. Pilot's Handbook of Aeronautical Knowledge, U.S. Department of Transportation, FAA, Flight Standards Service, 2008. 6. Advanced Avionics Handbook, U.S. Department of Transportation, FAA, Flight Standards Service, 2009. 7. Alexander V. Nebylov, Aerospace sensors, Momentum Press, 2013.	

November 2020

Subject Description Form

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

<table>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="3">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Continuous Assessment</td><td>50%</td><td></td><td></td><td></td></tr>
<tr><td>1. In-class activities</td><td>15%</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Written assignments</td><td>15%</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Quiz</td><td>20%</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Final Examination</td><td>50%</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="3"></td></tr>
</table>
</td></tr>
<tr><td>Student Study Effort Required</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>• Lecture</td><td>26 Hours</td></tr>
<tr><td>• Tutorial</td><td>13 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Study and self-learning</td><td>48 Hours</td></tr>
<tr><td>• Presentation preparation and written assignments</td><td>18 Hours</td></tr>
<tr><td>Total student study effort:</td><td>105 Hours</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>Recommended Textbooks

1. Parkin and Bade, Foundations of Microeconomics, 8th ed., Pearson, 2018.
2. Sullivan, Wicks and Koelling, Engineering Economy, 16th ed., Pearson, 2014.

References

1. Robert H. Frank, The Economic Naturalist: Why Economics Explain Almost Everything?, Basic Books, 2007.</td></tr>
<tr><td>Last Updated</td><td>July 2021</td></tr>
<tr><td>Prepared by</td><td>School of Accounting and Finance</td></tr>
</table>

Subject Description Form

<table>
<tr><td>Subject Code</td><td>AMA1110</td></tr>
<tr><td>Subject Title</td><td>Basic Mathematics I – Calculus and Probability & Statistics</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>1</td></tr>
<tr><td>Pre-requisite</td><td>Nil</td></tr>
<tr><td>Objectives</td><td>This subject aims to introduce students to the basic concepts and applications of elementary calculus and statistics. Emphasis will be on the understanding of fundamental concepts and the use of mathematical techniques in handling practical problems in science and engineering.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
(a) apply analytical reasoning to solve problems in science and engineering;
(b) make use of the knowledge of mathematical/statistical techniques and adapt known solutions to various situations;
(c) apply mathematical modeling in problem solving;
(d) demonstrate abilities of logical and analytical thinking.</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td><u>Elementary calculus</u>: Limit and continuity, derivatives and their geometric meaning, rules of differentiation including chain rule, Leibniz's rule and L'Hopital's rule, exponential and logarithmic functions, trigonometric functions and their inverses, hyperbolic and inverse hyperbolic functions, applications of differential calculus.

<u>Elementary Probability and Statistics</u>: Descriptive statistics, random variables, probability and probability distributions, binomial, Poisson and normal distributions, applications.

Population and random samples. Sampling distributions related to sample mean, sample proportions, and sample variances. Concepts of a point estimator and a confidence interval. Point and interval estimates of a mean and the difference between two means.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Basic concepts and elementary techniques of differential and integral calculus and elementary statistics will be taught in lectures. These will be further enhanced in tutorials through practical problem solving.</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.Assignments and mid-term tests</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td></tr>
</table>
</td></tr>
</table>

	Continuous Assessment comprises of assignments, in-class quizzes, online quizzes and a mid-term test. An examination is held at the end of the semester. Questions used in assignments, quizzes, tests and examinations are used to assess students' level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering. Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: *The subject focuses on understanding of basic concepts and application of techniques in differential/integral calculus, elementary statistics. As such, an assessment method based mainly on examinations/tests/quizzes is considered appropriate. Furthermore, students are required to submit homework assignments regularly in order to allow subject lecturers to keep track of students' progress in the course.*	
Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Homework and self-study	81 Hrs.
	Total student study effort	120 Hrs.
Reading List and References	Chung, K.C. *A Short Course in Calculus and Matrices*, McGraw Hill 2013 Hung, K.F., Kwan, Wilson, Pong, T.Y. *Foundation Mathematics & Statistics*, McGraw Hill 2013 Larson, R., Edwards, B. *Single Variable Calculus*, Brooks/Cole 2012 Walpole, R.E., Myers, R.H., Myers, S.L. Ye, K. *Probability and Statistics for Engineers and Scientists*, Prentice Hall, 2012	

Last Update: June 2019

Subject Description Form

<table>
<tr><td>Subject Code</td><td>AMA1120</td></tr>
<tr><td>Subject Title</td><td>Basic Mathematics II –Calculus and Linear algebra</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>1</td></tr>
<tr><td>Pre-requisite</td><td>Basic Mathematics I – Calculus and Probability & Statistics (AMA1110)</td></tr>
<tr><td>Objectives</td><td>This subject aims to introduce students to the basic concepts and applications of elementary calculus and statistics. Emphasis will be on the understanding of fundamental concepts and the use of mathematical techniques in handling practical problems in science and engineering.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
(a) apply analytical reasoning to solve problems in science and engineering;
(b) make use of the knowledge of mathematical/statistical techniques and adapt known solutions to various situations;
(c) apply mathematical modeling in problem solving;
(d) demonstrate abilities of logical and analytical thinking.</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td>Elementary calculus: Mean Value Theorem with applications to optimization and curve sketching. Definite and indefinite integrals, fundamental theorem of calculus, methods of integration (integration by substitution, integration by parts, integration of rational functions using partial fractions and integration of trigonometric and hyperbolic functions), reduction formulas, applications to geometry and physics. Improper Integrals.

Linear algebra: Basic properties of matrices and determinants, linear systems, Gaussian elimination, inverse of a square matrix, Cramer’s rule, vectors in 2-space or in 3-space, applications to geometry.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Basic concepts and elementary techniques of differential and integral calculus and linear algebra will be taught in lectures. These will be further enhanced in tutorials through practical problem solving.</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.Assignments and tests</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td></tr>
</table>

Continuous Assessment comprises of assignments and tests. An examination is held at the end of the semester.</td></tr>
</table>

	Questions used in assignments, 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. Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: *The subject focuses on understanding of basic concepts and application of techniques in differential/integral calculus, elementary statistics and elementary linear algebra. As such, an assessment method based mainly on examinations/tests is considered appropriate. Furthermore, students are required to submit homework assignments regularly in order to allow subject lecturers to keep track of students' progress in the course.*	
Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Homework and self-study	81 Hrs.
	Total student study effort	120 Hrs.
Reading List and References	Chung, K.C. *A Short Course in Calculus and Matrices*, McGraw Hill 2013 Hung, K.F., Kwan, Wilson, Pong, T.Y. *Foundation Mathematics & Statistics*, McGraw Hill 2013 Larson, R., Edwards, B. *Single Variable Calculus*, Brooks/Cole 2012 Larson, R. *Elementary Linear Algebra*, Brooks/Cole 2013	

Subject Description Form

Subject Code	AMA2111
Subject Title	Mathematics I
Credit Value	3
Level	2
Pre-requisite	Calculus and Linear Algebra (AMA1007) or Calculus I (AMA1101) or Calculus IA (AMA1102) or Basic Mathematics II – Calculus and Linear Algebra (AMA1120) or Calculus for Engineers (AMA1130) or Foundation Mathematics for Accounting and Finance (AMA1500)
Exclusion	Intermediate Calculus and Linear Algebra (AMA2007) Mathematics for Engineers (AMA2308) Engineering Mathematics (AMA2380) Applied Mathematics I (AMA2511) Mathematics for Scientists and Engineers (AMA2882) Engineering Mathematics (AMA290)
Objectives	This subject aims to introduce students to the basic principles and techniques of engineering mathematics. Emphasis will be on the understanding of fundamental concepts as well as applications of mathematical methods in solving practical problems in science and engineering.
Intended Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. apply mathematical reasoning to analyze essential features of different problems in science and engineering; 2. extend their knowledge of mathematical and numerical techniques and adapt known solutions in various situations; 3. develop and extrapolate the mathematical concepts in synthesizing and solving new problems 4. demonstrate abilities of logical and analytical thinking; 5. search for useful information in the process of problem solving.
Subject Synopsis/ Indicative Syllabus	1. <u>Algebra of complex numbers</u> Complex numbers, geometric representation, complex exponential functions, n-th roots of a complex number. 2. <u>Linear algebra</u> Systems of linear equations, vector spaces, inner product and orthogonality, eigenvalues and eigenvectors, applications. 3. <u>Ordinary differential equations</u> ODE of first and second order, linear systems, Laplace transforms, Convolution theorem, applications to mechanical vibrations and simple circuits.

<table>
<tr><td></td><td>4. <u>Differential calculus of functions of several variables</u>

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

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

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

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.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>• Lecture</td><td>26 Hours</td></tr>
<tr><td>• Tutorial</td><td>13 Hours</td></tr>
<tr><td>• Mid-term test and examination</td><td></td></tr>
<tr><td>Other student study effort</td><td></td></tr>
<tr><td>• Assignments and Self study</td><td>78 Hours</td></tr>
<tr><td>Total student study effort:</td><td>117 Hours</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>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.</td></tr>
</table>

	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

Subject Description Form

Subject Code	AMA2112
Subject Title	Mathematics II
Credit Value	3
Level	2
Pre-requisite	Mathematics I (AMA2111)
Exclusion	Intermediate Calculus and Linear Algebra (AMA2007) Introduction to Differential Equations (AMA2008)
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. <u>Multiple integrals</u> Double and triple integrals, change of variables, applications to problems in geometry and mechanics. 2. <u>Vector calculus</u> 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. <u>Series expansion</u> Infinite series, Taylor's expansion, Fourier series expansion of a periodic function. 4. <u>Partial differential equations</u> Formulation of PDE of mathematical physics, separation of variables, initial-boundary value problems, introduction to Fourier transforms.

<table>
<tr><td>Teaching/Learning Methodology</td><td>The subject will be delivered mainly through lectures and tutorials. The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. Tutorials will mainly be used to develop students' problem solving ability.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific assessment methods/tasks</th><th rowspan="2">% weighting</th><th colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr>
<tr><td>1. Assignments, quizzes and mid-term test</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="5"></td></tr>
</table>
Continuous Assessment comprises of assignments, in-class quizzes, online quizzes and a mid-term test. An examination is held at the end of the semester.
Questions used in assignments, quizzes, tests and examinations are used to assess students' level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering.
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.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>• Lecture</td><td>26 Hours</td></tr>
<tr><td>• Tutorial</td><td>13 Hours</td></tr>
<tr><td>• Mid-term test and examination</td><td></td></tr>
<tr><td>Other student study effort</td><td></td></tr>
<tr><td>• Assignments and Self study</td><td>78 Hours</td></tr>
<tr><td>Total student study effort:</td><td>117 Hours</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>

C.K. Chan, C.W. Chan and K.F. Hung, Basic Engineering Mathematics, McGraw-Hill, 2015.
Anton, H. Elementary Linear Algebra (11th edition). Wiley, 2014.
Kreyszig, E. (2011). Advanced Engineering Mathematics, 10th ed. Wiley.
James, G. (2015). Modern Engineering Mathematics, 5th ed. Pearson Education Limited

</td></tr>
</table>

	5. Thomas, G. B., Weir, M. D. & Hass, J. R. *Thomas' Calculus*, 14th ed. Pearson Education 2017

Subject Description Form

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

relation to daily life phenomena or experience.

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

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						
		a	b	c	d	e	f	g
(1) Continuous assessment	40	✓	✓	✓	✓	✓	✓	✓
(2) Examination	60	✓	✓	✓	✓	✓	✓	✓
Total	100							

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

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

Student Study Effort Expected

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

Reading List and References

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

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

Radi, Hafez A., and John O. Rasmussen. **Principles of Physics for Scientists and Engineers**. Berlin ; New York: Springer, 2013. Undergraduate Lecture Notes in Physics. Web.

Subject Description Form

Subject Code	AP10005
Subject Title	Physics I
Credit Value	3
Level	1
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This course provides a broad foundation in mechanics and thermal physics to those students who are going to study science, engineering, or related programmes.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. solve simple problems in single-particle mechanics using calculus and vectors; 2. solve problems in mechanics of many-particle systems using calculus and vectors; 3. define simple harmonic motion and solve simple problems; 4. explain the formation of acoustical standing waves and beats; 5. use Doppler's effect to explain changes in frequency received. 6. explain ideal gas laws in terms of kinetic theory; 7. apply the first law of thermodynamics to simple processes; and 8. solve simple problems related to the Carnot cycle.
Contribution of the Subject to the Attainment of the Programme Outcomes	**Programme Outcomes:** <u>Category A: Professional/academic knowledge and skills</u> • Programme Outcome 1 and 4.
Subject Synopsis/ Indicative Syllabus	<u>Mechanics</u> Calculus-based kinematics, dynamics and Newton's laws; calculus-based Newtonian mechanics, involving the application of impulse, momentum, work and energy, etc.; conservation law; gravitation field; systems of particles; collisions; rigid body rotation; angular momentum; oscillations and simple harmonic motion; pendulum; statics; longitudinal and transverse waves; travelling wave; Doppler effect; acoustics. <u>Thermal physics</u> Conduction, convection and radiation; black body radiation and energy quantization; ideal gas and kinetic theory; work, heat and internal energy; first law of thermodynamics; entropy and the second law of thermodynamics; Carnot cycle; heat engine and refrigerators.
Teaching/ Learning Methodology	**Lecture**: Fundamentals in mechanics, waves and electromagnetism will be explained. Examples will be used to illustrate the concepts and ideas in the lecture. Students are free to request help. Homework problem sets will be given. **Student-centered Tutorial: S**tudents will work on a set of problems in tutorials. Students are encouraged to solve problems and to use their own knowledge to verify their solutions before seeking assistance. These problem sets provide them opportunities to apply their knowledge gained from the lecture. They also help the students to consolidate what they have learned. Furthermore, students can develop a deeper understanding of the subject in relation to daily life phenomena or experience.

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

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)							
		1	2	3	4	5	6	7	8
1. Continuous assessment	40%	✓	✓	✓	✓	✓	✓	✓	✓
2. Examination	60 %	✓	✓	✓	✓	✓	✓	✓	✓
Total	100%								

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

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

Student Study Effort Expected		
	Class contact (time-tabled):	
	• Lecture	36 Hours
	• Tutorial	6 Hours
	Other student study effort:	
	• Self-study	78 Hours
	Total student study effort:	**120 Hours**

Reading List and References

1. John W. Jewett and Raymond A. Serway, *Physics for Scientists and Engineers*, 8th ed., Brooks/Cole Cengage Learning, 2010.
2. W. Bauer and G.D. Westfall, *University Physics with Modern Physics*, McGraw-Hill, 2011.

Last Updated: Aug 2013

Prepared by: AP Department

Subject Description Form

Subject Code	AP10006
Subject Title	Physics II
Credit Value	3
Level	1
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with fundamental knowledge in physics focusing on the topics of waves and electromagnetism. This course prepares students to study science, engineering or related programmes.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. apply simple laws in optics to explain image formation; 2. explain phenomena related to the wave character of light; 3. define electrostatic field and potential; 4. use Gauss' law in solving problems in electrostatics; 5. solve problems on interaction between current and magnetic field; 6. apply electromagnetic induction to various phenomena; and 7. solve simple problems in AC circuits.
Contribution of the Subject to the Attainment of the Programme Outcomes	**Programme Outcomes:** <u>Category A: Professional/academic knowledge and skills</u> • Programme Outcome 1 and 4.
Subject Synopsis/ Indicative Syllabus	<u>Waves and optics</u> Nature of light, reflection and refraction; image formation by mirrors and lenses; compound lens; microscope and telescope; superposition of waves; Huygen's principle; interference and diffraction; interferometers and diffraction grating; polarization. <u>Electromagnetism</u> Charge and Field; Coulomb's law and Gauss' law; electrostatic field and potential difference; capacitors and dielectric; current and resistance; Ohm's law; electromotive force, potential difference and RC circuits; magnetic force on moving charges and current; Hall effect; Biot-Savart law and Ampere's law; Faraday's law and Lenz's law; self-inductance and mutual inductance; transformers; AC circuits and applications.
Teaching/ Learning Methodology	**Lecture**: The fundamentals in optics and electromagnetism will be explained. Examples will be used to illustrate the concepts and ideas in the lecture. Students are free to request help. Homework problem sets will be given. **Student-centered Tutorial:** Students will work on a set of problems in tutorials. Students are encouraged to solve problems and to use their own knowledge to verify their solutions before seeking assistance. These problem sets provide them opportunities to apply their knowledge gained from the lecture. They also help the students to consolidate what they have learned. Furthermore, students can develop a deeper understanding of the subject in relation to daily life phenomena or experience. **e-learning**: In order to enhance the effectiveness of teaching and learning processes, electronic means and multimedia technologies would be

<table>
<tr><td></td><td>adopted for presentations of lectures; communication between students and lecturer; delivery of handouts, homework and notices etc.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Subject Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific assessment methods/tasks</th><th rowspan="2">% weighting</th><th colspan="7">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th></tr>
<tr><td>(1) Continuous assessment</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>(2) Examination</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="7"></td></tr>
</table>
Continuous assessment:
The continuous assessment includes assignments, quizzes and test(s) which aim at checking the progress of students study throughout the course, assisting them in fulfilling the learning outcomes.
Assignments in general include end-of-chapter problems, which are used to reinforce and assess the concepts and skills acquired by the students; and to let them know the level of understanding that they are expected to reach.
At least one test would be administered during the course of the subject as a means of timely checking of learning progress by referring to the intended outcomes, and as means of checking how effective the students digest and consolidate the materials taught in the class.

Examination: This is a major assessment component of the subject. It would be a closed-book examination. Complicated formulas would be given to avoid rote memory, such that the emphasis of assessment would be put on testing the understanding, analysis and problem solving ability of the students.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact (time-tabled):</td><td></td></tr>
<tr><td>• Lecture</td><td>36 Hours</td></tr>
<tr><td>• Tutorial</td><td>6 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Self-study</td><td>78 Hours</td></tr>
<tr><td>Total student study effort:</td><td>120 Hours</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>1. John W. Jewett and Raymond A. Serway, “Physics for Scientists and Engineers”, 2010, 8th edition, Brooks/Cole Cengage Learning.
2. W. Bauer and G.D. Westfall, “University Physics with Modern Physics”, 2011, McGraw-Hill.</td></tr>
<tr><td>Last Updated</td><td>Aug 2013</td></tr>
<tr><td>Prepared by</td><td>AP Department</td></tr>
</table>

The Hong Kong Polytechnic University

Subject Description Form

Subject Code	CLC3243P (2019-20 onward) CBS3243P (2018-19 and before)
Subject Title	Chinese Communication for Aviation
Credit Value	2
Level	3
Pre-requisite / Co-requisite	
Objectives	This is a discipline-specific Chinese subject which aims at developing the students' language competence in Putonghua and written Chinese for professional communication necessary for them to communicate effectively with various parties and stakeholders in the sector of aviation.
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. read and write professional reports / manuals for specific purposes; b. understand and use the terminology of Aviation and Aeronautics in Chinese; c. produce discipline-related Chinese genres (e.g. notices, guidelines, Aeronautical circulars, other formal letters / emails) with appropriate text structures, interactive strategies and language expressions for different intended readers; d. communicate in Putonghua for various speech functions in professional context of Aviation such as introducing, clarifying and explaining.
Subject Synopsis/ Indicative Syllabus	1. Reports in Chinese in the Aviation area • Planning and organizing reports • Explaining the background, rationale, objectives, scope and significance of a report • Referring to the literature to substantiate reports 2. The Chinese Vocabulary and Terminology in Air Transportation • Reading of various profession-related manuals, such as Aircraft

	Maintenance Manual (AMM, 飛機維修手冊), Illustrated Parts Catalog（IPC, 飛機件號手冊）, Fault Reporting Manual（FRM, 故障報告手冊）, Fault Isolation Manual（FIM, 故障隔離手冊）and Tool and Equipment Manual（TEM, 工具設備手冊 ） etc. • Analyzing the Chinese lexical structure of the frequently used terms from the linguistic viewpoint. 3. Specific Chinese writing in a wide range of genres • Profession-related literacy in written Chinese for both internal and external purposes, such as writing of notices, guidelines and Aeronautical circulars, etc. 4. Oral presentations • Giving formal presentations and engaging in formal discussions in Putonghua • Selecting contents for audience-focused presentations • Choosing language and style appropriate to the intended audience
Teaching/Learning Methodology	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 aviation-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 report which will engage students in proposing on an aviation-related report to different intended readers/audiences. During the course, students will be involved in: - planning and researching - writing and reporting - giving oral presentations to intended stakeholders in Putonghua

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. Group Report in Chinese	30%	✓	✓				
2. Assignment on practical writing	20%	✓	✓	✓			
3. Situational oral presentation (individual)	20%		✓		✓		
4. PPT presentation on the report (group)	20%		✓		✓		
5. Formal discussions and Class participation	10%		✓		✓		
Total	100 %						

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

Subject assessment 100% coursework

For the course work, students will be assessed by the final products of the assigned exercises.

Each assignment will be assessed in terms of criterion reference assessing.

The overall achievement is obtained by formative assessment.

Student Study Effort Expected		
	Class contact:	
	▪ Seminars	26 Hrs.
	Other student study effort:	
	▪ Outside class practice, e.g. planning, discussing, and writing assignments and report.	56 Hrs.

	▪ Researching and self-study	
	Total student study effort	82 Hrs.
Reading List and References	1. 民用航空術語編輯組（2002）《民用航空旅客運輸術語》。中國標準出版社。 2. 民用航空術語編輯組（2002）《民用航空貨物運輸術語》。中國標準出版社。 3. 國際民航組織（1997）《國標民航運輸管理手冊（國際民航組織第9626號文件）》。中國民航出版社，第1版。 4. 于成鯤主編（2003）《現代應用文》。復旦大學出版社。 5. 于成鯤等主編（2011）《當代應用文寫作規範叢書》。復旦大學出版社。 6. 邵敬敏（2007）《現代漢語通論》。上海教育出版社。 7. 姜波（2009）《飛機檢測與維修實用手冊》（第1-4卷）。吉林：吉林科學技術出版社。 8. 鄭笑平（2005）《科技寫作》。河南人民出版社。	

Subject Description Form

Subject Code	EE2902S (Co-taught by EE and EIE)
Subject Title	Fundamentals of Electrical and Electronic Engineering
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To introduce students the basic concepts and fundamental principles of electrical circuits and analysis. 2. To introduce students the basic concepts and fundamental principles of electronic devices and circuits.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. Understand the basic concepts and fundamental principles of electrical circuits and analysis. 2. Understand the basic concepts and fundamental principles of electronic devices and circuits.
Subject Synopsis/ Indicative Syllabus	**DC Electrical Circuits —** How electricity works. Electromechanical analogies. Common Prefixes. Atoms and atomic structure. Basic electric quantities: charge, potential, current, voltage, power, and energy. Resistance, Ohm's law, and resistors. Resistors in series and in parallel. Sign convention. Practical, ideal, independent, and dependent voltage and current sources. Voltage and current dividers. Use of basic test meters: voltmeters, ammeters, ohmmeters, and multimeters. Lumped circuit elements. Network description: branch, node, loop, and mesh. Kirchhoff's voltage and current laws. Tellegen's theorem. Mesh-current and node-voltage methods. Thévenin's and Norton's theorems. Loading effect and maximum power transfer. **AC Electrical Circuits —** The war of the currents. AC versus DC. Time-dependent, periodic, and sinusoidal signals. Sinusoidal sources. Worldwide mains electricity. Peak, average, and root-mean-square values. Inductors and capacitors. Sinusoidal steady-state analysis by time-domain method. Complex number. Euler's identity. Phasors and phasor diagrams. Impedance and admittance. Sinusoidal steady-state analysis by phasor–impedance method. Power, energy, and electricity bill. Instantaneous and average powers. Power in resistive, inductive, capacitive, and complex loads. Complex power and power factor. Power generation, transmission, and distribution. Three-phase power basics. Single (split)-phase three-wire source. Star (wye)-connected three-phase four-wire source. Star–star and star–delta source–load connections. Star–delta transformations. **Diodes and Diode Circuits —** P–N junction diodes: symbol, ideal *I–V* characteristics, forward and reverse biases, ON and OFF states, ideal diode equation, DC model, load line and graphical analysis techniques, piecewise linear model, small-signal diode model, breakdown characteristics, Zener diodes. Diode circuits: half-wave rectifiers, full-wave rectifiers, filters and ripple voltages, Zener diode circuits, source regulation, load regulation, clipping circuits, clamping circuits. **Transistors and Transistor Amplifiers —** Bipolar junction transistors (BJTs) and field-effect transistors (FETs): symbols, modes of operation, input and output

<table>
<tr><td></td><td>characteristics. BJT and FET circuits: DC analysis, load line, Q-point, various DC biasing schemes, bias stability. BJT and FET amplifiers: small-signal parameters, basic amplifier configurations, operations, characteristics, AC analysis, load line, design techniques, small-signal equivalent circuits and circuit parameters, small-signal voltage gain, small-signal current gain, input resistance, output resistance, loading effect, maximum symmetrical swing.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>The key concepts, principles, and techniques covered in this subject are discussed in lectures and tutorials. Emphases on fundamental understanding and practical problem-solving techniques are balanced. To strengthen understanding, students will have chances to make discussions and to do hands-on exercises both in the lectures and tutorials. Individual assignments, quizzes and/or tests consisting of descriptive and analytical problems are involved to allow students to recognize their level of understanding and to create self-confidence in learning.</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="2">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td>1. Examination</td><td>60%</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Continuous assessment</td><td>40%</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="2"></td></tr>
</table>
The students will be assessed with two main components: examination and continuous assessment to consolidate their knowledges and techniques acquired in lectures and tutorials. Examination (60%) is in form of a three-hour, closed-book, end-of-subject written examination. Continuous assessment (40%) contains Assignment (Electrical) (10%), Assignment (Electronic) (10%), Test (Electrical) (10%), and Test (Electronic) (10%). They are appropriate in assessing intended learning outcomes 1 and 2.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture/Tutorial</td><td>39 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Self-study</td><td>66 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>105 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>Textbooks:
1. Giorgio Rizzoni and James Kearns, Principles and Applications of Electrical Engineering, 6th Edition, Boston: McGraw-Hill (2018).
2. Donald A. Neamen, Microelectronics: Circuit Analysis and Design, 4th Edition, Boston: McGraw-Hill (2010).
Reference books:
1. W. H. Hayt, J. E. Kemmerly, and S. M. Durbin, Engineering Circuit Analysis, 8th Edition, New York: McGraw-Hill (2012).
2. A. H. Robbins and W. C. Miller, Circuit Analysis: Theory and Practice, 5th Edition, Thomson Learning (2013).</td></tr>
</table>

The Hong Kong Polytechnic University

Subject Description Form

Subject Code	ELC3531
Subject Title	Professional Communication in English for Engineering Students
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 Effort Expected

Class contact:	
Seminars	26 Hrs.

	Other student study effort:	
	Researching, planning and writing the project Rehearsing the presentation	52 Hrs.
	Total student study effort:	78 Hrs.
Reading List and References	1. D. F. Beer, Ed., *Writing and Speaking in the Technology Professions: A practical guide*, 2nd ed. Hoboken, NJ: Wiley, 2003. 2. R. Johnson-Sheehan, *Writing Proposals*, 2nd ed. New York: Pearson/Longman, 2008. 3. S. Kuiper and D. Clippinger, *Contemporary Business Reports*, 5th ed. Mason, OH: South-Western, 2013. 4. M. H. Markel, *Practical Strategies for Technical Communication*, 2nd ed. New York: Bedford/St. Martin's, 2016. 5. D. C. Reep, *Technical Writing: Principles, strategies, and readings*, 8th ed. Boston: Pearson/Longman, 2011. 6. E. D. Zanders and L. Macleod, *Presentation Skills for Scientists: A practical guide*, 2nd ed. Cambridge: Cambridge University Press, 2018.	

Subject Description Form

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

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

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

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

Teaching/Learning Methodology

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

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d		
1. Assignments	15%	√	√	√	√		
2. Test	20%		√	√	√		
3. Laboratory report	5%		√	√			
3. Examination	60%		√	√	√		
Total	100 %						

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

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

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

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

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

Revised (April 2014)

Subject Description Form

Subject Code	ENG2002
Subject Title	Computer Programming
Credit Value	3
Level	2
Pre-requisite / Co-requisite / Exclusion	Nil
Objectives	(i) To introduce the fundamental concepts of computer programming (ii) To equip students with sound skills in C/C++ programming language (iii) To equip students with techniques for developing structured and object-oriented computer programs (iv) To demonstrate the techniques for implementing engineering applications using computer programs.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. Familiarize themselves with at least one C/C++ programming environment. 2. Be proficient in using the basic constructs of C/C++ to develop a computer program. 3. Develop a structured and documented computer program. 4. Understand the fundamentals of object-oriented programming and be able to apply it in computer program development. 5. Apply computer programming techniques to solve practical engineering problems.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction to programming - Components of a computer; Programming environment; Process of application development. 2. Bolts and Nuts of C/C++ - Preprocessor; Program code; Functions; Comments; Variables and constants; Expressions and statements; Operators. 3. Program Flow Control - Branching and looping; Function parameters passing; Return values; Local and global variables; Scope of variables. 4. Program Design and Debugging - Structured program design; Debugging a program. Case study: Using the Visual C++ debugger. 5. Basic Object Oriented Programming - Objects and classes; Private versus public; Implementing class methods; Constructors and destructors. 6. Pointer and Array - Stack and Free store; Create and delete objects in the free store; Pointer arithmetic; Passing function arguments by pointer; Returning values by pointer; Array of objects; Array and pointer; Array of pointers; Pointer of array; Character array; Command-line processing. 7. Stream I/O - Input and output as streams; File I/O using streams.

Teaching/Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures, supplemented with short quizzes	2,3,4	Students are introduced to the knowledge of computer programming through explanation and illustrative examples. Comprehension of the knowledge is strengthened with short quizzes. Students will be able to monitor the skills of using C/C++ and apply the techniques of developing structured object-oriented applications.
Laboratories/tutorials where problems are given to students for them to solve	1,2,3,4	Students apply what they have learnt in lectures and solve problems in exercises. The purpose is to ensure students have captured the important points. Tutors will aid the lecturer in helping the students finishing the exercises, and interactive Q&A will take place.
Assignment, tests and final examination	1,2,3,4,5	By doing assignment, students will develop a firm understanding and comprehension of the knowledge taught. They will analyse given C/C++ applications and apply knowledge to solve problems. They will have to design solutions by evaluating different alternatives. To enhance the students' problem solving skill in a given programming environment, open-book programming tests are arranged regularly. To assure students' understanding of fundamental concepts, a closed-book final examination is arranged.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		1	2	3	4	5
1. In-class exercises	10	✓	✓	✓	✓	
2. Short-quizzes	10		✓	✓	✓	
3. Programming tests	30	✓	✓	✓	✓	✓
4. Assignment	20	✓	✓	✓	✓	✓
5. Final examination	30	✓	✓	✓	✓	✓
Total	100 %					

	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: The short-quizzes are for assessing the understanding of fundamental concepts. The in-class exercises are conducted to help students familiarized with the programming language and skills. The programming tests are for assessing the ability of students on solving computer problems through programming within a specified period. Through doing assignment, students will be able to experience how to solve computer problems and design solutions by using a systematic approach. The final examination is for assessing the students' ability on using the programming language and analysing computer programs.	
Student Study Effort Expected	**Class contact:**	39 Hours
	▪ Lectures, Tests and Quizzes	26 Hours
	▪ Laboratory/Tutorial	13 Hours
	Other student study effort:	69 Hours
	▪ Self-studying	57 Hours
	▪ Homework	12 Hours
	Total student study effort	108 Hours
Reading List and References	**Reference Books:** 1. S. Rao, *Sams Teach Yourself C++ in One Hour a Day*, 8th ed. Indianapolis, IN: Sams, 2017. 2. P. Deitel and H. Deitel*, C++ How to Program : Introducing the New C++14 Standard*, 10th ed. Boston, MA: Pearson, 2017. 3. R. Cadenhead and J Liberty, *Sams Teach Yourself C++ in 24 hours,* 6th ed. Indianapolis, IN: Sams, 2017.	

(revised) July 2018

Subject Description Form

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

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		A1	**A2**	**A3**	**A4**	**B1**
1. Quizzes (in tutorials)	3%	√	√	√		√
2. Quizzes (in lectures)	14%	√	√	√	√	√
3. Workshops	14%	√	√	√	√	√
4. Mid-term Test	11%	√	√	√		√
5. Assignment	8%				√	√
6. Examination	50%	√	√	√	√	√
Total	100 %					

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

The assessment methods include an end-of-subject 2-hour written examination (total 50%) and other assessment methods (total 50%), including quizzes, a mid-term test, workshops, and an assignment, which cover intended subject learning outcomes A1, A2, A3, A4, and B1.

Student Study Effort Expected		
	Class contact:	
	• Lectures (18), tutorials (6), and workshops (15)	39 Hours
	Other student study effort:	
	• Workshops preparation (6/workshop)	30 Hours
	• Self study (3/week)	39 Hours
	Total student study effort	**108 Hours**

Reading List and References

1. B. Williams and S. Sawyer, *Using Information Technology: A Practical Introduction to Computers and Communications*, 11th ed., McGraw-Hill, 2014.
2. J. F. Kurose and K. W. Ross, *Computer Networking: A Top-Down Approach*, 7th ed., Pearson, 2016.
3. D. E. Comer, *Computer Networks and Internets*, 6th ed., Pearson, 2015.
4. B. A. Forouzan, *TCP/IP Protocol Suite*, 4th ed., Tmh, 2010.
5. W. Stalling, *Data and Computer Communications*, 10th ed., Pearson, 2013.
6. S. Morris and C. Coronel, *Database Systems: Design, Implementation, and Management*, 11th Edition, Course Technology, 2014.
7. M. Mannino, *Database Design, Application Development, & Administration*. 6th ed., Chicago Business Press, 2014.

(revised) July 2018

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. <u>Impact of Technology on Society</u> 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 Labor 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 in-class discussions, case studies, and seminars to develop students' in-depth analysis of the relationships. Each student will submit two assignments based on their weekly learning activities, which will be part of the subject's evaluation. The assignments will deal with important issues of social, cultural, economic, legal, health, safety, and environmental dimensions of society. 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. Individual Reflections 3. Final oral presentation

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Continuous assessment	70%			
• Group weekly learning activities	(20%)	✓	✓	✓
• Individual Assignments (2)	(20%)	✓	✓	
• Individual final presentation	(15%)	✓	✓	
• Individual reflection statement	(5%)	✓	✓	
• Group project	(10%)	✓	✓	✓
2. Take-home Assignment	30%	✓	✓	
Total	100%			

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

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

The take-home assignment is used to assess students' critical thinking and problem-solving skills when working on their own and give students more time and flexibility to complete an assignment. It provides students the opportunity to review and extend what they have learnt in class and to check their understanding and progress.

Student Study Effort Expected		
	Class contact:	
	▪ Lectures and review	27 Hrs.
	▪ Presentation	12 Hrs.
	Other student study efforts:	
	▪ Research and preparation	55 Hrs.
	▪ Report and Assignments writing	25 Hrs.
	Total student study effort	119 Hrs.

Reading List and References	**Reference Books & Articles:** 1. Education for Sustainable Development - An Expert Review of Processes and Learning, UNESCO, 2011 2. Poel, Ibo van de, and Lambèr M. M. Royakkers. Ethics, Technology, and Engineering : an Introduction. Wiley-Blackwell, 2011 3. Engineering-Issues, Challenges and Opportunities for Development, USECO, 2010 4. Engineering for Sustainable Development: Guiding Principles, Royal Academy of Engineering, 2005 5. Securing the future: delivering UK sustainable development strategy, 2005 6. 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 7. Hjorth, L, Eichler, B, and Khan, A, 2003, *Technology and Society A Bridge to the 21st Century*, Upper Saddle River, N.J.:Prentice Hall 8. The Council for Sustainable Development in Hong Kong, http://www.enb.gov.hk/en/susdev/council/ 9. 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) June 2021

Subject Description Form

Subject Code	ME23001
Subject Title	Engineering Mechanics
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AP10005 Physics I
Objectives	To provide students the fundamental mechanics concepts of equilibrium and motion for rigid structural systems.
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 in 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 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 of force vectors; Two and three-dimensional force systems; Moment of a force about a point; Moment of a force about a line. ***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; Internal forces developed in structural members; Shear and moment equations and diagrams in structural members; 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. ***Dynamics*** **-** Kinematics and kinetics of particles; rectilinear motion; plane curvilinear motion; relative motion; equation of motion.

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/Projects			√	√

Assessment Methods in Alignment with Intended Learning Outcomes

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

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

Overall Assessment:

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

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the tests, assignments and laboratory/project 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/Projects	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 June 2020

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

Industrial Centre (IC) Training

Subject Description Form

Subject Code	AAE2101/IC2105
Subject Title	Engineering Communication and Fundamentals
Credit Value	4 Training Credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject offers a wide spectrum of fundamental engineering practice that are essential for a professional engineer. This subject includes Engineering Drawing and CAD, Industrial Safety and Electronic Product Safety Test and Practice, Basic Mechatronic Practice and Basic Scientific Computing that aims at providing fundamental and necessary technical skills to all year 1 students interested in engineering.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Describe the principles and conventional representation of engineering drawings according to engineering standards and be able to use it as a medium in technical communication and documentation with CAD application, modelling and practice with application in mechanical, industrial systems and electrical engineering; and b. Interpret basic occupational health and industrial safety requirements for engineering practice; and c. Explain common electronic product safety tests; and d. Design and implement simple mechatronic systems with programmable controller, software, actuation devices, sensing devices and mechanism; and e. Apply scientific computing software for computing in science and engineering including visualization and programming.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. <u>(TM8059) Engineering Drawing and CAD</u> 1.1. Fundamentals of Engineering Drawing and CAD Principles of orthographic projection; sectioning; dimensioning; sketching; general tolerances; conventional representation of screw threads and fasteners; types of drawings including part drawing and assembly drawing. Introduction to CAD; features of 2D CAD system (layer; draw; modify; block & attributes; standard library); techniques for the creation of title block; setup of 2D plotting; general concepts on 3D computer modeling; parametric feature based solid modeling; construction and detailing of solid features; solid model modification

	and its limitations; concepts of assembly modeling including bottom up and top down approaches for the generation of parts, subassemblies, and final assembly; virtual validation and simulation, generation of 2D drawings from 3D parts and assemblies; drawing annotation including dimensioning,tolerancing, and part list. 1.2. Electrical Drawing Wiring diagram and wiring table for electronic and electrical installation, functional representation of circuit, system block diagram, electrical and electronic device symbols and layout, architectural wiring diagram with reference to the architectural symbols for electrical drawings in Hong Kong and international standards. 2. <u>(TM2009) Industrial Safety</u> 2.1. Safety Management: Overview, essential elements of safety management, safety training, accident management, and emergency procedures. 2.2. Safety Law: F&IU Ordinance and principal regulations, OSH Ordinance and principal regulations. 2.3. Occupational Hygiene and Environmental Safety: Noise hazard and control; dust hazard and control; ergonomics of manual handling. 2.4. Safety Technology: Mechanical lifting, fire prevention, dangerous substances and chemical safety, machinery hazards and guarding, electrical safety, first aid, job safety analysis, fault tree analysis, personal protective equipment. 3. <u>(TM1116) Electronic Product Safety Test and Practice</u> 3.1. Use of basic electronic test instruments, current and voltage measurements, waveform measurement, power supply and signal sources; 3.2. Electronic product safety test method; High Voltage Isolation Test, Insulation Resistance Test, Continuity Test, Leakage Current Measurement, Electrostatic Discharge (ESD) Test. 4. <u>(TM0510) Basic Mechatronic Practice</u> 4.1. Definitions of mechatronics; design and operation of typical mechatronic systems; appreciation of measurement system, actuator system, motor drives, mechanical drives, gear train and linkage, pneumatic and hydraulic systems, signal conditioning, and human-machine interfaces. 4.2. Integration of system components using appropriate controller hardware and software such as PLC, PAC, and Microcontroller system; use of simulation software packages for pneumatic and hydraulic circuit design. **One of the followings as decided by hosting programme** 5. <u>(TM3014) Basic Scientific Computing with MATLAB</u> 5.1. Overview to scientific computering; introduction to MATLAB; interactive calculations, random number generators, variables, vectors, matrices and string; mathematical operations, polynomial operation, data analysis and curve fitting, file I/O functions. Basic 2D

<table>
<tr><td></td><td>and 3D plots.
5.2. M-file programming & debugging; scripts, functions, logic operations, flow control, introduction to graphical user interface.
6. <u>(TM3300) Basic Scientific Computing with Python</u>
6.1. Basic data structures and data operations; script programming and debugging; logic operations, flow control and graphical user interfaces.
6.2. Use of functions and popular Python packages, such as Numpy, Panda and Matplotlib.
6.3. Data visualization by using graphics packages; such as basic plotting, formatting, 2D and 3D plots and modifying colormap.</td></tr>
<tr><td>Learning Methodology</td><td>The teaching and learning methods include lectures, workshop tutorials, and practical works. The lectures are aimed at providing students with an overall and concrete background knowledge required for understanding key issues in engineering communication, use of standard engineering components and systems, and importance of industrial safety. The workshop tutorials are aimed at enhancing students' in-depth knowledge and ability in applying the knowledge and skills to complete specific tasks. The practical works aim at facilitating students to review the diverse topics covered in this course and perform active learning with research, practice, questioning, and problem solving in a unified activity.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="5">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td colspan="7">Continuous Assessment</td></tr>
<tr><td>1. Assignment / Project</td><td rowspan="3">Refer to individual Module Description Form</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Test</td><td></td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>3. Report / Logbook</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Total</td><td>100%</td><td colspan="5"></td></tr>
</table>
</td></tr>
</table>

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

Student Study Effort Expected

Class Contact	**TM8059**	**TM2009**	**TM1116**	**TM0510**	**TM 3014 or TM3300**
• Mini-lecture	11 Hrs.	7 Hrs.	2 Hrs.	6 Hrs.	6 Hrs.
• In-class Assignment / Hands-on Practice	40 Hrs.	8 Hrs.	4 Hrs.	21 Hrs.	15 Hrs.
Other Study Effort					
• Nil					
Total Student Study Effort	**120 Hrs.**				

Reading List and References

Reference Software List:

1. AutoCAD from Autodesk Inc.
2. SolidWorks from Dassault Systèmes Solidworks Corp.
3. MATLAB from The Mathworks Inc.
4. Python from Python Software Foundation

Reference Standards and Handbooks:

1. BS8888 Technical Product Specification (TPS) Specification.
2. Cecil H. Jensen, et al, Engineering Drawing and Design, McGraw-Hill, 2008.
3. Warrendale, SAE fastener standards manual, Society of Automotive Engineers, 1997.
4. Timothy H Wentzell, et al, Machine Design, Delmar Learning, 2004.
5. Czernik, Daniel, Gaskets: Design, Selection, and Testing, McGraw-Hill, 1995.

	6. Michael M. Khonsari, E. Richard Booser, Applied Tribology: Bearing Design and Lubrication, Wiley-Interscience, 2001. 7. IEEE Standard 315 / ANSI Y32.2 / CSA Z99 Graphic Symbols for Electrical and Electronics Diagrams. 8. IEC 61082 Preparation of Documents used in Electrotechnology. **Reference Books:** Training material, manual and articles published by Industrial Centre.

September 2020

Subject Description Form

Subject Code	AAE2102/IC2133
Subject Title	Aircraft Manufacturing and Maintenance Fundamentals
Credit Value	4 Training Credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The subject provides opportunity for students to gain practical and hands- on training experiences in the following fundamental aircraft engineering and maintenance procedures and practices: • Safety Precautions, • Use of hand tools and bench fitting, • Engineering Drawing, • Electronic Safety Test and Practice This subject also equips students with basic workshop skills necessary for handling manufacturing project subjects..
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate a practical understanding on the working principle,capability and operation of major aircraft manufacturing processes; and b. Select and use appropriate materials and manufacturing processes for specific parts requirements; and c. Explain the importance of quality, timeliness, regulation conformance,and continuous improvement to aviation engineering.
Subject Synopsis/ Indicative Syllabus	**Workshop Safety -** Use of fire extinguishers; Use of respirators; Use of fall protection andfall arrest equipment. **Use of Hand Tools -** Use of Hand Tools in Bench Fitting; Use of Marking out Tool; Use of Measuring Instruments; Use of Hand Tools in Aircraft Maintenance;Torque loading technique; Bench Fitting; Fabrication of a Part. **Engineering Drawing -** Read and draw orthographic sketches; Read and draw isometric sketches; Read and draw layers, block, attributes; Read and draw sectional view; Read and specify dimensional tolerances; Read and draw treads and fasteners; Draw 3D solid components; Read and draw assemblies; Read and draw electrical circuits and components. **Electronic Safety Test and Practice -** Avionics General Test Equipment; Soldering.

<table>
<tr><td>Learning Methodology</td><td>Workshop-based hands-on activities will be used for students to appreciate the principles and operations of common aircraft manufacturing technologies, and to acquire essential practical skills for them to carry out project tasks.

On-demand demonstrations and tutorials will be provided to support students having difficulties in their hands-on activities.

Technical handouts will be available on-line for students to familiarise with the technical contents.</td></tr>
<tr><td>Assessment Methodsin 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>Workshop Assignments</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Quizzes</td><td>20%</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Training report</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="3"></td></tr>
</table>
Workshop assignments in the form of small manufacturing tasks will be used to assess how well students understand the working principle, capabilities, and operation of the manufacturing processes. Students' skill-level will be evaluated by the artifacts they produced, while their practical knowledge and work attitude be evaluated by individual oral presentation.

Multiple-choice quizzes will be used to assess broadly the students' understanding of declarative knowledge covered by the subject, as well as their material and process selection judgement.

Individual training report will be used to assess holistically how well the students consolidate technical contents, reflect on their engineering decisions, and critically review their learning experience. The students also elaborate on their professional attitude and commitment in their writing.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class Contact</td><td></td></tr>
<tr><td>▪ Hands-on practices</td><td>120 Hrs.</td></tr>
<tr><td>Other Study Effort</td><td>0 Hrs.</td></tr>
<tr><td>Total Study Effort</td><td>120 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>1. Forenz, T. (2018). Aviation Maintenance Technician Certification Series: Materials and hardware. Module 06. US, Aircraft Technical Book Company.
2. Fietz, K. (2019). Aviation Maintenance Technician Certification Series: Maintenance practices. Module 07A. US, Aircraft Technical Book Company.</td></tr>
</table>

Subject Description Form

Subject Code	AAE3103/IC381
Subject Title	Appreciation of Aircraft Manufacturing Processes
Credit Value	3 Training Credits
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The subject provides opportunity for students to gain practical and hands-on training experiences in the following fundamental aircraft engineering and maintenance procedures and practices: • Sheet metal fabrication, • Composites fabrication, • Machining, • Material testing This subject also equips students with basic workshop skills necessary for handling manufacturing project subjects.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate a practical understanding on the working principle, capability and operation of major aircraft manufacturing processes; and b. Select and use appropriate materials and manufacturing processes for specific parts requirements; and c. Show a commitment to quality, timeliness, regulation conformance, and continuous improvement.
Subject Synopsis/ Indicative Syllabus	**Basic Machining -** Milling; Turning. **Sheet-metal Trade Practices -** Drilling and Riveting; Removal and Installation of Hi-Lok; Removal,Inspection and Installation of Anchor Nut. **Composites Trade Practices -** Composite Repair; Wet-layup process; Repair by wet-layup; Repair by Pre-preg with hot bonder. **Material Testing -** Progression of tensile failure (metal); Progression of tensile failure (composites); Progression of compressive failure; Progression of fatigue crack; Progression of shear failure
Learning Methodology	Workshop-based hands-on activities will be used for students to appreciate the principles and operations of common aircraft manufacturing technologies, and to acquire essential practical skills for them to carry out project tasks. Short lectures, demonstrations, and tutorials will be mixed with hands-on activities to deliver technical contents. Technical handouts will be available on-line for students to familiarise with the technical contents before lesson.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/ task	% Weighting	Intended subject learning outcomes to be assessed		
		a	b	c
Workshop assignments	40%	✓	✓	✓
Quizzes	20%	✓	✓	
Training report	40%	✓	✓	✓
Total	100%			

Workshop assignments in the form of small manufacturing tasks will be used to assess how well students understand the working principle, capabilities, and operation of the manufacturing processes. Students' skill-level will be evaluated by the artifacts they produced, while their practical knowledge and work attitude be evaluated by individual oral presentation.

Multiple-choice quizzes will be used to assess broadly the students' understanding of declarative knowledge covered by the subject, as well as their material and process selection judgement.

Individual training report will be used to assess holistically how well the students consolidate technical contents, reflect on their engineering decisions, and critically review their learning experience. The students also elaborate on their professional attitude and commitment in their writing.

Student Study Effort Expected

Class Contact	
▪ Hands-on practices	90 Hrs.
Other Study Effort	0 Hrs.
Total Study Effort	**90 Hrs.**

Reading List and References

1. Forenz, T. (2018). Aviation Maintenance Technician Certification Series: Materials and hardware. Module 06. US, Aircraft Technical Book Company.
2. Fietz, K. (2019). Aviation Maintenance Technician Certification Series: Maintenance practices. Module 07A. US, Aircraft Technical Book Company.

September 2020

Subject Description Form

Subject Code	AAE3104/IC388
Subject Title	Aircraft Manufacturing and Maintenance Practice
Credit Value	3 Training Credits
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The subject provides opportunity for students to learn the principles, gain practical and hands-on training experiences in the following fundamental aircraft engineering and maintenance procedures and practices: • Electrical Wiring Interconnection and Termination, • Welding Trade Practices, • NDT Trade Practices This subject also equips students with basic workshop skills necessary forhandling manufacturing project subjects.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate a practical understanding on the working principle, capability, limitations and operation of fundamental aircraft manufacturing and maintenance processes; and b. Select and use appropriate materials and manufacturing processes for specific parts requirements as applied to aviation engineering; and c. Show a commitment to quality, timeliness, regulation conformance, and continuous improvement as applied to aviation engineering.
Subject Synopsis/ Indicative Syllabus	**Avionics Wire connection and Termination -** Cables and Connectors Identification; ESDS Handling; Removal and Installation of Connector Pin; Cable Printing; Crimping; Continuity, Insulation and Bonding Testing; Fabrication of an Electrical / Electronicproduct. **Welding Trade Practices -** Welding safety; Gas Metal Arc Welding; Gas Tungsten Arc Welding; Welding visual inspection. **NDT Trade Practices -** Non-destructive Testing; Ultrasonic Tests; Eddy-current Tests; UTBond-testing; Penetrant Tests; Radiographic Tests.
Learning Methodology	Workshop-based hands-on activities will be used for students to appreciate the principles and operations of common aircraft manufacturing technologies, and to acquire essential practical skills for them to carry out project tasks. Short lectures, demonstrations, and tutorials will be mixed with hands-on

<table>
<tr><td></td><td>activities to deliver technical contents.

Technical handouts will be available on-line for students to familiarise with the technical contents before lesson.</td></tr>
<tr><td>Assessment Methodsin 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 outcome to be accessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td></tr>
<tr><td>1. Workshop assignments</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Quizzes</td><td>20%</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>3. Training report</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>4. Total</td><td>100%</td><td colspan="3"></td></tr>
</table>
Workshop assignments in the form of small manufacturing tasks will be used to assess how well students understand the working principle, capabilities, and operation of the manufacturing processes. Students' skill- level will be evaluated by the artifacts they produced, while their practical knowledge and work attitude be evaluated by individual oral presentation.

Multiple-choice quizzes will be used to assess broadly the students' understanding of declarative knowledge covered by the subject, as well as their material and process selection judgement.

Individual training report will be used to assess holistically how well the students consolidate technical contents, reflect on their engineering decisions, and critically review their learning experience. The students also elaborate on their professional attitude and commitment in their writing.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td colspan="2">Class Contact</td></tr>
<tr><td>▪ Hands-on practices</td><td>90 Hrs.</td></tr>
<tr><td>Other Study Effort</td><td>0 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>90 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>1. Forenz, T. (2018). Aviation Maintenance Technician Certification Series: Materials and hardware. Module 06. US, Aircraft Technical Book Company.
2. Fietz, K. (2019). Aviation Maintenance Technician Certification Series: Maintenance practices. Module 07A. US, Aircraft Technical Book Company.</td></tr>
</table>

September 2020

Discipline-Specific Requirements (DSR)

- Electives

Subject Description Form

Subject Code	AAE4001
Subject Title	Aviation Project Management
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject will provide students with knowledge in 1. Airline schedule planning and fleet management; and 2. Airline resources allocation and resources management; and 3. Fleet assignment, aircraft routing, and crew planning; and 4. Managing airline fleet and operations in a project management context.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Construct airline network and schedules; and b. Design aircraft routing plans; and c. Conduct crew planning (including crew pairing and rostering); and d. Understand airline operation processes and strategies to manage disruptions; and e. Acquire analytical skills for solving operational issues; and f. Project management skills in airline business context.
Subject Synopsis/ Indicative Syllabus	**Airline Schedule Planning -** Overview of principles of airline schedule planning and the role of optimization models in the airline business context. **Airline Fleet Assignment and Aircraft Routing -** Allocate airline fleets according to uncertain passenger demands in a network. Route aircraft in a network by maximizing aircraft utilization. **Crew Scheduling -** Crew pairing and cost minimization. Crew establishment planning. Crew rostering and constraints. **Airline Scheduling and Operations Project -** Evaluation of aircraft deployment in uncertain market conditions. Managing large fleets and resources. Teamwork in solving planning and operation problems. Schedule disruptions and recovery management.

<table>
<tr><td>Teaching/Learning Methodology</td><td>A mixture of lectures, tutorial exercises, and a team project is used to deliver the various topics in this subject. Some material is covered using a problem-based format where this advances the learning objectives. Other material is covered through directed study to enhance the students' "learning to learn" ability. A team project is specifically designed to promote teamwork and problem solving in a team environment. These skills and taught knowledge are used to integrate the topics and demonstrate to students how the various techniques are interrelated and applied in real-life situations.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td></tr>
<tr><td>1. Mid-term project</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td>✓</td></tr>
<tr><td>2. Final project report</td><td>30%</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>3. Written examination</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>

Continuous assessment (1) & (2): Group projects and tutorial exercises are used to assess students' understanding and application of the knowledge that they have learnt relative to all learning outcomes.

Written examination: questions are designed to assess all learning outcomes except (f), which is assessed in assessment (1) and (2).</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures/project3 hours/week for 9 weeks</td><td>27 Hrs.</td></tr>
<tr><td>▪ Tutorials/project coaching 3 hours/week for 4 weeks</td><td>12 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Preparation for assignments, test, group project, and the written examination</td><td>78 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>117 Hrs.</td></tr>
</table>
</td></tr>
</table>

Reading List and References	1. Wu, C. L., and Maher, S., 2017. Airline scheduling and disruption management, in Air Transport Management: An International Perspective, Ed. L. Budd and S. Ison, pp151-167 Routledge Publishing. 2. Wu, C. L., and Maher S, 2018. Airline Capacity Planning and Management, in Halpern N; Graham A (ed.), The Routledge Companion to Air Transport Management, Taylor & Francis, pp238- 258. 3. Barnhart, C., Cohn, A.M., Johnson, E.L., Klabjan, D., Nemhauser, G.L. and Vance, P.H., 2003. Airline crew scheduling. In Handbook of transportation science (pp. 517-560). Springer, Boston, MA. 4. Ball, M., Barnhart, C., Nemhauser, G. and Odoni, A., 2007. Air transportation: Irregular operations and control. Handbooks in Operations Research and Management Science, 14, pp.1-67. 5. Wu, C. L., 2016. Airline Operations and Delay Management- Insights from Airline Economics, Networks and Strategic Schedule Planning, Ashgate. 6. Bazargan, M., Airline Operations and Scheduling, Ashgate. 7. Journal of Air Transport Management: An International Journal of Research, Policy and Practice. Elsevier. ISSN: 0969-6997. (selected articles).

November 2020

Subject Description Form

Subject Code	AAE4003
Subject Title	Airport Services Engineering
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide students broad understanding of the airport services in all phases of design and engineering to students; and 2. To provide students the essential knowledge in airport facility planning, management and ground services.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Have the basic knowledge of how an airport is operating.; and b. Apply techniques to optimize the airport operations costs and efficiency, including capacity determination, airport facility selection, facility layout, and facility planning; and c. Establish effective ground maneuvering such as airport geometry, terminal layout, aircraft configuration optimization.
Subject Synopsis/ Indicative Syllabus	**Runway Planning, Analysis and Maintenance -** Airfield design and planning (runway, taxiway and apron), aircraft runway length and takeoff weights, pavement strength and condition, Development of Allowable Load Determination and Pavement Classification Number (PCN), airport elevation, temperature, runway slope, obstacles, bird control, Foreign Object Debris, rubber removal, runway inspection. **Airport Facility Planning and Engineering -** Airport layout. Design of terminal facilities, baggage handling facilities, freight facilities, layout planning and optimization, ground support equipment and equipment selection, basic queuing theory and simulation (e.g., simulation of passenger flow for choke point analysis). **Air Traffic Flow and Capacity Management -** Ground Delay Program (GDP): Delay Assignment (DAS) mode, General Aviation Airport Program (GAAP), Unified Delay Program (UDP) mode. Peak-hour analysis (design peak hour and forecast). D*emand* management (Flight schedule coordination, congestion pricing, slot auction, etc.). Air traffic management (airspace structure, navigation systems, air traffic control tower). Collaborative Decision Making. Runway capacity (factors affecting runway capacity, e.g., number of runways, landscape, aircraft mix, wind direction, sequencing of movements, noise considerations). **Ground Maneuvering and Gate Planning -** Ground operations, ground maneuvering, gate operations, and terminal servicing including:

<table>
<tr><td></td><td>

- Airport geometry for operating new and existing airplane models.
- Terminal layouts and gate arrangements.
- Aircraft configuration optimization.

</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Teaching is conducted through class lectures and case studies/laboratory exercises. Both the basic knowledge and theoretical models are going to be introduced. The understanding of how to address problems by using scientific tools is emphasized. Normally, examples of problem-solving techniques are taught in class and related scenarios are provided to students to enhance their application abilities. Laboratory exercises and short reports are used to make up the course work marks.</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. Case studies</td><td>50%</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>2. Assignments</td><td>30%</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>3. Group project report</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="3"></td></tr>
</table>

By the end of each laboratory exercise, a written report is required to be submitted to show the findings. Guest speakers in the aviation industry will be invited to deliver talks and students are required to produce short reports for talks to encourage their involvement. At the end of the semester, an examination is given to students to assess their learning outcomes.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture/Seminar</td><td>24 Hrs.</td></tr>
<tr><td>▪ Laboratory/Case Study/ Visit</td><td>15 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Assignments/Min-Project/Report</td><td>35 Hrs.</td></tr>
<tr><td>▪ Self-study/Preparation</td><td>48 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>122 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>

1. PS Senguttuvan 2007, Principles of Airport Economics, Excel Books. (or latest edition)
2. Airport Cooperative Research Program (ACRP) Reports, The National Academies of Sciences, Engineering, and Medicine. (or latest edition)

</td></tr>
</table>

	3. Anne Graham 2014, Managing Airports 4th Edition: An International Perspective, Routledge. (or latest edition) 4. Alexander T. Wells 2007, Air Transportation: A Management Perspective, Ashgate. (or latest edition) 5. Norman J. Ashford, Saleh Mumayiz, Paul H. Wright 2011, Airport Engineering: Planning, Design and Development of 21st Century Airports, John Wiley & Sons. (or latest edition)

April 2021

Subject Description Form

Subject Code	AAE4007
Subject Title	Aircraft Leasing and Finance
Credit Value	3
Level	4
Pre-requisite/ **Co-requisite/** **Exclusion**	Nil
Objectives	To provide students with an overview of the Aircraft Leasing Industry at undergraduate advanced level.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Describe the salient features of the Aircraft Leasing and Aviation Finance industry; and b. Identify the roles and functions of various airlines and the characteristics of the airline business; and c. Understand and appreciate the aircraft leasing business, economics and the management of risks related to aircraft leasing; and d. Make recommendations on a leasing transaction.
Subject Synopsis/ Indicative Syllabus	**Airline fleets, growth and demand -** Aircraft fleet delivery history, Aircraft order forecasts, Aircraft types and markets segmented and Lessor market share. **Airline markets and segments -** Airline categories, Airline business by market (geography), Airline market trends, Airline costs and Airline revenues. **Aircraft lessors -** Aircraft leasing, background and history, Aircraft lessors by size, shape, portfolio, shareholder, Aircraft leasing – key performance factors and Aircraft leasing – habitual base jurisdictions. **Aircraft Leasing Economics -** Individual aircraft lease financial modelling, Aspects of portfolio aircraft lease financial modelling and Accounting and Auditing mark to market valuation. **Aircraft Leasing Risk Management -** Aircraft general rating, Aircraft specifications and value, Airline risk, not just credit, Aircraft lease transaction risk, Aircraft lease portfolio risk and Aircraft lessor enterprise risk. **Aircraft Lease Risk Investment Submission / Committee -** Assist to prepare an aircraft lease transaction investment submission for discussion, review and approval decision and to conduct the corresponding aircraft lease transaction investment review committee, findings and recommendations.
Teaching/Learning Methodology	1. The teaching and learning methods include lectures/tutorial sessions and assignments. 2. The continuous assessments are aimed at providing students with integrated knowledge of the course of study.

3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered			
	a	b	c	d
1. Lecture	✓	✓	✓	✓
2. Tutorial	✓	✓	✓	✓
3. Assignments	✓	✓		
4. Written Exam	✓	✓	✓	✓

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. Assignments	40%	✓	✓		
2. Written Exam	60%	✓	✓	✓	✓
Total	100 %				

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

Overall Assessment:

0.4 × Continuous Assessment + 0.6 × Written Exam

The continuous assessment consists of two assignments. 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. The written exam is 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	26 Hrs.
	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Self-study	66 Hrs.
	Total student study effort	**105 Hrs.**
Reading List and References	1. Vasigh, B., Fleming, K., & Humphreys, B. (2014). Foundations of airline finance: Methodology and practice. Routledge. 2. Murphy, R., & Desai, N. (Eds.). (2011). Aircraft financing. Euromoney Books. 3. Morrell, P. S. (2013). Airline finance. Ashgate Publishing, Ltd. 4. Vitaly S. Guzhva, Sunder Raghavan, Damon J. D'Agostino (2018). Aircraft Leasing and Financing: Tools for Success in International Aircraft Acquisition and Management. Elsevier Science. 5. Donald H. Bunker. International Aircraft Financing (Volume 1 – General Principles and Volume 2 – Specific Documents).	

December 2020

Subject Description Form

Subject Code	AAE4008
Subject Title	Aviation Finance, Taxation and Insurance
Credit Value	3
Level	4
Pre-requisite/ **Co-requisite/** **Exclusion**	Nil
Objectives	To provide students with an advanced knowledge of aviation finance, taxation and insurance.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Identify the fundamental features of the aircraft asset classes; and b. Appreciate the aircraft trading models and aircraft leasing approaches; and c. Recognise the fundamental features of aviation taxation, legal and insurance considerations; and d. Understand risk management in aviation industry.
Subject Synopsis/ Indicative Syllabus	**Aviation asset class and selection criteria -** • Aircraft asset ▪ Airlines: widebody and narrowbody aircraft ▪ Chartering services: corporate jets and narrowbody aircraft ▪ General aviation: turboprop aircraft and helicopter • Other investment opportunities ▪ Airlines ▪ Airport strategic development ▪ Airport and aircraft equipment **Aircraft trading -** • Aircraft demand • Fleet development (Global and Regional) • Aircraft asset valuation • Market insights **Aircraft leasing -** • Aircraft asset portfolio management • Channel to acquire aircraft assets by aircraft leasing companies ▪ Orderbook ▪ Sale and Leaseback agreement with airlines

	▪ Portfolio purchase • Hedging on foreign exchange, interest rate and fuel (airlines) **Secondary market of an aircraft -** • Aircraft asset residual risk management • Demand on aircraft remarketing, modification, dismantling and recycling • Market insights • Preliminary understanding on technical evaluation of aircraft assets, i.e. aircraft portfolio with operating lease **Aircraft financing mechanism -** • Aircraft financing in China (Free Trade Zones) versus overseas (Cayman and Ireland) • Statistics on aircraft financing and capital market • SPV financing • Engine financing • Capital structure of airlines and aircraft leasing companies **Aviation taxation basics and introduction to insurance requirements -** • Taxation ▪ Airline tax treatment ▪ Aviation financiers taxation ▪ Taxation for aircraft manufacturers and other ancillary industries • Aircraft tax considerations on financing options ▪ Purchase versus lease ▪ Tax considerations for airlines on the use of loan financing ▪ Finance lease versus operating lease ▪ Japanese Operating Lease with Call Option financing ("JOLCO Financing") ▪ Other forms of aircraft finance **Financier Taxation -** • Aircraft operating lease focus ▪ Structuring the deal ▪ Transfer tax considerations • Taxation considerations for other financing options ▪ Finance lease considerations ▪ Hire purchase considerations ▪ Loan financing • Engine / aircraft part specific consideration • Capital market transactions **Aviation Law and Insurance -**

<table>
<tr><td></td><td>

- Aviation Law
  - Examine the legal regime governing carriage by air of passengers, baggage and cargo, and understand the major conventions, e.g. the Chicago Convention, the Rome Convention, the Warsaw Convention and the new Montreal Convention
  - Analyse a factual scenario involving an aviation accident and state the legal liabilities involved
  - Demonstrate an awareness of the impact of aviation law in the years following the terrorist attacks of September 11
  - Preliminary concepts of contracts in aircraft trading, leasing and financing transactions
- Insurance
  - Liability exposure
  - Third party legal liability
  - Insurance considerations for aviation financiers
  - General principles in aviation insurance and common clauses
  - Aviation war risk insurance
  - Insurance considerations for financiers
  - Regulatory requirements for insurance

</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>

1. The teaching and learning methods include lectures/tutorial sessions and assignments.
2. The continuous assessments are aimed at providing students with integrated knowledge of the course of study.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes to be covered</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Tutorial</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>3. Assignments</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>4. Written Exam</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. Assignments	40%	✓	✓	✓	
2. Written Exam	60%	✓	✓	✓	✓
Total	100 %				

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

Overall Assessment:

0.4 × Continuous Assessment + 0.6 × Written Exam

The continuous assessment consists of two assignments. 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. The written exam is 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	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Self-study	66 Hrs.
Total student study effort	**105 Hrs.**

Reading List and References

1. Gillen, D., & Morrison, W. G. (2015). Aviation security: costing, pricing, finance and performance. Journal of Air Transport Management, 48, 1-12.
2. Keaveny, C., & Murray, S. (2013). Aviation finance and leasing. Offshore Investment, 239, 12-14.
3. Mann, E. D. (2009). Aviation finance: An overview. Journal of Structured Finance, 15(1), 109.
4. Coulter, J. M., Redpath, I. J., & Vogel, T. J. (2018). Leasing Agreements in the Airline Industry: A Case Study Examining the Impact of Asu 2016-02. Journal of Business and Educational Leadership, 7(1), 114-123.
5. Anyafo, A. (2018). Buy or Lease Decision in Fixed Assets Acquisition in the Nigerian Civil Aviation Industry. Journal of Administration, 1(1).
6. Wensveen, J. (2018). Air transportation: A management perspective. Routledge.
7. Vitaly S. Guzhva, Sunder Raghavan, Damon J. D'Agostino (2018). Aircraft Leasing and Financing: Tools for Success in International Aircraft Acquisition and Management. Elsevier Science.

	8. Donald H. Bunker. International Aircraft Financing (Volume 1 – General Principles and Volume 2 – Specific Documents).

December 2020

Subject Description Form

Subject Code	AAE4009
Subject Title	Data Science and Data-driven Optimisation in Airline and Airport Operations
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject will provide students with 1. A conceptual and practical foundation in airport and airline operations for knowledge representation and reasoning of artificial intelligence, data mining, soft computing and optimisation methods as problem solving tools; and 2. Research methodology, data interpretation and analytical skills in regard to real-life data and case scenarios of airport and airline operations; and 3. Experience of conducting proper research experiments and engineering reports for results dissemination.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Identify and formulate the data-driven engineering problems in airport and airline operations; and b. Transfer the expert knowledge into knowledge-based system and algorithms via machine learning approaches; and c. Plan, design and develop appropriate algorithms via soft computing methods and analysis the data and the solution quality with alternatives; and d. Review the performance and make judgements based on numerical results and provide off-the-shelf suggestions, profitable solutions and actionable managerial insights.
Subject Synopsis/ Indicative Syllabus	Lectures are used to deliver the fundamental knowledge in relation to various aspects of machine learning, data mining, data analytics, data-driven optimisation and artificial intelligence in airline and airport operations (outcomes a to d). Several laboratories will be made available to equip students with the basic knowledge of data mining, soft computing, optimisation and artificial intelligence in solving aviation engineering problems (outcomes a to c). Given the basic knowledge of data science, a group mini project will be used to help students deepen their knowledge of a specific topic through literature study, methodology study, analysis of data, dissemination of research findings and report writing (outcomes a to d). The subject covers the following topics.

Machine learning, data mining and artificial intelligence - The topics include the following elements:

- Supervise and unsupervised learning approach.
- Descriptive methods, including clustering, association.
- Predictive methods, including classification and regression.
- Supervised learning algorithms: Nearest neighbour algorithm, fuzzy logic, gaussian mixture, neural network, linear regression, logistic regression, decision trees, Naïve Bayes, genetic algorithms
- Unsupervised learning algorithms: associate rules, principal component analysis, gaussian mixture

Data-driven optimisation - The topics include the following elements:

- Basic mathematical formulation and modelling, convex optimisation, data-driven modelling, airline scheduling planning, crew rostering, runway scheduling, gate assignment problem, air logistics transportation problem

Optimisation methods and soft computing - The topics include the following elements:

- Branch and Bound algorithm, heuristics, meta-heuristics, swarm intelligence

Teaching/Learning Methodology

Teaching is conducted through class lectures, case studies, and laboratory exercises. The basic knowledge, research methodology and theoretical models will be introduced. The understanding of how to address and formulate problems by using mathematical programming, artificial intelligence algorithms, and soft computing techniques with modern programming language is emphasised. Research methodology, data analytics skills, algorithm design skills and programme methods are taught in class as well as the related real-life scenarios using data to enhance their research abilities. Laboratory exercises, mini reports, oral disseminations and test are used to make up the course work marks.

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. Laboratory	40%	✓	✓	✓	✓
2. Mini report	20%			✓	✓
3. Oral presentation	10%			✓	✓
4. Test	30%	✓	✓	✓	✓
Total	100 %				

	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: Overall assessment: 1.0 x continuous assessment The continuous assessment (100%) is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus via several laboratory teaching and laboratory report, numerical analysis, reading assignment. In particular, mini projects are used to assess the students' capacities of self-study and problem-solving and effective communication skills in English so as to fulfil the requirements of working in the aviation industry. Test will be conducted to evaluate the students performance in mathematical problem formulation and algorithm design for a given airport and airline engineering problem with a limited examination time.	
Student Study Effort Expected	Class contact:	
	▪ Lecture/seminar	24 Hrs.
	▪ Laboratory	15 Hrs.
	Other student study effort:	
	▪ Literature review / Scientific finding and analysis / final report writing preparation / presentation material preparation	36 Hrs.
	▪ Self-study / preparation	36 Hrs.
	Total student study effort	**111 Hrs.**
Reading List and References	1. Barber, D. (2012). Bayesian reasoning and machine learning. Cambridge University Press. 2. Boyd, S., Boyd, S. P., & Vandenberghe, L. (2004). Convex optimization: Cambridge university press. 3. Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2009). Introduction to algorithms: MIT press. 4. De Neufville, R., & Odoni, A. (2003). Airport systems. planning, design and management. New York: McGraw-Hill. 5. Guido, S., & Müller, A. (2016). Introduction to machine learning with python (Vol. 282). O'Reilly Media. 6. Marsland, S. (2015). Machine learning: an algorithmic perspective. CRC press. 7. Richert, W. (2013). Building machine learning systems with Python. Packt Publishing Ltd. 8. Wallwork, A. (2016). English for writing research papers: Springer.	

	9. Wells, A. T. (2007). Air transportation: A management perspective: Ashgate Publishing, Ltd. 10. Wu, C.-L. (2016). Airline operations and delay management: insights from airline economics, networks and strategic schedule planning: Routledge.

January 2021

Subject Description Form

Subject Code	AAE4105
Subject Title	Engineering Composites
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AAE3002 Aircraft Structures and Materials
Objectives	1. To provide students with knowledge of mechanical behavior of composite materials used in aircraft; and 2. To provide students with understanding of the processing, fabrication and influence of fabrication and environment on properties of aircraft composites; and 3. To gain appreciation of the wide design flexibility that composites can afford.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate a good understanding of types and properties of composites used in aircraft; b. Possess knowledge in processing and fabrication of structural composites; c. Understand mechanical behaviors of aircraft composite materials; d. Analyze composite laminates using classic laminate theory and apply failure criteria to assess composite structures subject to various types of loading.
Subject Synopsis/ Indicative Syllabus	***Introduction to Composites*** - Classification and characteristics of composite materials in aircraft. Mechanical behavior of composite materials. Reinforcements. Matrix materials. Green composites ***Composite Interfaces*** - Fibre-matrix interfaces. Interfacial properties. Stress transfer through composite interfaces. ***Lamina Stress-strain Relationships*** - Lamina and laminate theories. Transformation and prediction of elastic parameters. Load-deformation relationship. ***Analysis of Continuous Fibre-Reinforced Lamina and Laminates*** - Macromechanical behaviour of a lamina. Macromechanical behaviour of a laminate. ***Processing and Fabrication*** - Structural composites and their processing technology. Manufacture of laminated fibre-reinforced composite materials. Influence of fabrication and environment on properties.

Failures, Design, and Applications of Composites - Failure theories. Design optimization. Engineering applications of composites.

Non-Destructive Testing Techniques for Composites – Visual testing, ultrasonic testing, thermography, radiographic testing, electromagnetic testing, acoustic emission, new trends in structural health monitoring strategies.

Laboratory Experiments

Typical experiments:

1. Manufacturing of composites
2. Tensile test of composites
3. Inspection of composites
4. Repair of a composite structure

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to advanced composite materials (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 b).

Teaching/Learning Methodology	Intended subject learning outcomes to be covered			
	a	b	c	d
Lecture	✓	✓	✓	✓
Tutorial	✓	✓	✓	✓
Experiment	✓	✓		

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	✓
2. Assignment	20%	✓	✓	✓	✓
3. Test	10%	✓		✓	✓
4. Laboratory report	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. 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:	
	▪ Self Study	45 Hrs.
	▪ Case study report preparation and presentation	21 Hrs.
	Total student study effort	**105 Hrs.**
Reading List and References	1. Ronald F. Gibson, Principles of Composite Material Mechanics, McGraw-Hill International Editions, latest edition. 2. C.T. Sun, Mechanics of Aircraft Structures, John Wiley & Sons, latest edition. 3. Celine A. Mahieux, Environmental Degradation in Industrial Composites, Elsevier, latest edition. 4. A. Brent Strong, Fundamentals of Composites Manufacturing-Materials, Methods and Applications, Society of Manufacturing Engineers, latest edition.	

December 2019

Subject Description Form

Subject Code	AAE4107
Subject Title	Aircraft Gas Turbine Engine Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AAE3003 Aircraft Propulsion Systems **and** AAE2102/IC2133 Aircraft Manufacturing and Maintenance Fundamentals
Objectives	To provide students with knowledge of aircraft gas turbine engine systems and application in engine monitoring and maintenance
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire good understanding of aircraft turbine engine design and construction. b. Demonstrate good understanding of compressor stall/surge and its prevention. c. Apply their knowledge and skills to explain the limitations of aircraft gas turbine engines under normal and abnormal operational conditions.
Subject Synopsis/ Indicative Syllabus	**Basic Aircraft Turbine Engine Design and Construction** Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop. **Compressor stall/surge** Causes and effects of compressor stall and surge and its prevention. **Bearings and Seal** Constructional features and principles of operation. **Lubricants and Fuel** Properties and specifications; Fuel additives; Safety precautions. **Lubrication Systems** System operation/lay-out and components. **Fuel Systems** Operation of engine control and fuel metering systems including electronic engine control (FADEC); systems lay-out and components.

	Air Systems Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services. **Starting and Ignition Systems** Operation of engine start systems and components; ignition systems and components; maintenance safety requirements **Engine Indication Systems** Exhaust gas temperature / interstage turbine temperature; engine thrust indication: engine pressure ratio, engine turbine discharge pressure or jet pipe pressure systems; oil pressure and temperature; fuel pressure and flow; engine speed; vibration measurement and indication; torque; power. **Power Augmentation Systems** Operation and applications; water injection, water methanol; afterburner systems. **Turbo-prop Engines** Gas coupled/free turbine and gear coupled turbines; reduction gears; integrated engine and propeller controls; overspeed safety devices. **Turbo-shaft engines** Arrangements, drive systems, reduction gearing, couplings, control systems. **Auxiliary power units (APUs)** Purpose, operation, protective systems. **Powerplant Installation** Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains. **Engine Monitoring and Ground Operation** Procedures for starting and ground run-up; interpretation of engine power output and parameters; trend (including oil analysis, vibration and boroscope) monitoring; inspection of engine and components to criteria, tolerances and data specified by engine manufacturer; compressor washing/cleaning; foreign object damage. **Engine Storage and Preservation** Preservation and depreservation for the engine and accessories / systems.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to aircraft gas turbine engines (outcomes a to c).

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

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lecture	✓	✓	✓
2. Tutorial	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Assignments / Quizzes	50%	✓	✓	✓
2. Final 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 continuous assessment including assignments and closed-book quizzes. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lectures	36 Hrs.
▪ Tutorials	3 Hrs.
Other student study effort:	
▪ Assignments	20 Hrs.
▪ Self-study	46 Hrs.
Total student study effort	**105 Hrs.**

Reading List and References	1. EASA Module 15 Gas Turbine Engine, Aircraft Technical Book Co. 4th Edition 2. The Jet Engine, Rolls Royce, Latest Edition 3. Mattingly, J.D., Boyer, K.M., von Ohain, H., Elements of Propulsion: Gas Turbines and Rockets, AIAA, 2016. 4. Aircraft Powerplants, Bent & McKinley, McGraw-Hill, 4th Edition 5. Aircraft Gas Turbine engine Technology, Irwin E Tregar, McGraw-Hill, 2nd Edition 6. Thrust for flight, Thomson, W. (William), Longman, 2nd Edition 7. Aircraft powerplants., Kroes, Michael J.; Thomas W. Wild, McGraw-Hill, Ninth Edition. 8. Aero engine combustor casing : experimental design and fatigue studies, Panigrahi, Shashi Kanta; Niranjan Sarangi, Boca Raton, 2017 9. Axial Turbine Aerodynamics for Aero-Engines: Flow Analysis and Aerodynamics Design, Zou, Zhengping ; Wang, Songtao ; Liu, Huoxing ; Zhang, Weihao, Springer Singapore, 2018

Revised in August 2021

Subject Description Form

Subject Code	AAE4108
Subject Title	Aircraft Inspection and Testing
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requiste:** IC2133 Aircraft Manufacturing and Maintenance Fundamentals
Objectives	To provide students with knowledge of aircraft inspection and application in modern aircraft maintenance.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire good understanding of aircraft inspection and repair techniques; and b. Demonstrate good understanding of inspecting fundamental aircraft components, including mechanics and avionics; and c. Apply their knowledge to handle aircraft material.
Subject Synopsis/ Indicative Syllabus	**Disassembly, Inspection, Repair and Assembly Techniques** - Types of defects and visual inspection techniques; Corrosion removal, assessment and reprotection. general repair methods, structural repair manual; Ageing, fatigue and corrosion control programmes. Non-destructive inspection techniques including: penetrant, radiographic, eddy current, ultrasonic and boroscope methods. Disassembly and re—assembly techniques. Trouble shooting techniques. **Abnormal Events** - Inspections following lightning strikes and HIRF penetration. Inspections following abnormal events such as heavy landings and flight through turbulence. **Electrical Wiring Interconnection System (EWIS)** - Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints; Connector pin removal and insertion; Co-axial cables: testing and installation precautions; Identification of wire types, their inspection criteria and damage tolerance; Wiring protection techniques: cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding; EWIS installations, inspection, repair, maintenance and cleanliness standards. **Riveting** - Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints. **Springs** - Types of springs, materials, characteristics and applications; Inspection and testing of springs. **Bearings** - Purpose of bearings, loads, material, construction; Types of bearings and their application; Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes. **Transmissions** - Gear types and their application; Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns;

Belts and pulleys, chains and sprockets; inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push-pull rod systems.

Control Cables - Types of cables; End fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems; Swaging of end fittings; Inspection and testing of control cables; Bowden cables; Aircraft flexible control systems.

Material handling - Sheet metal: marking out and calculation of bend allowance; sheet metal working, including bending and forming; Inspection of sheet metal work; Composite and non-metallic: Bonding practices; Environmental conditions; Inspection methods.

Welding, Brazing, Soldering and Bonding - Soldering methods; Inspection of soldered joints. Welding and brazing methods; Inspection of welded and brazed joints; Bonding methods and inspection of bonded joints.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to aircraft inspection and testing (outcomes a to c).

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

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lecture	✓	✓	✓
2. Tutorial	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Assignments / Quizzes	50%	✓	✓	✓
2. Final 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 continuous assessment including assignments and closed-book quizzes. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus.

Student Study Effort Expected	Class contact:	
	▪ Lectures	26 Hrs.
	▪ Tutorials	13 Hrs.
	Other student study effort:	
	▪ Assignments	20 Hrs.
	▪ Self-study	46 Hrs.
	Total student study effort	**105 Hrs.**
Reading List and References	1. "EASA Module 6 B1 Materials and Hardware" by Aircraft Technical Book Co. 2. "EASA Module 7A Maintenance Practices" by Aircraft Technical Book Co. 3. "The Jet Engine 5th Edition" by Rolls Royce 4. "Airline Maintenance and Aircraft Manufacturing: Analyses of Select Issues" by Laura T. Pierson 5. "Introduction to Nondestructive Testing – A Training Guide, Second Edition" by Paul E. Mix 6. "Structural Health Monitoring" by Daniel Balageas, Claus-Peter Fritzen, Alfredo Guemes	

January 2021

Subject Description Form

Subject Code	AAE4109
Subject Title	Aircraft Maintenance Practices
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requiste:** IC2133 Aircraft Manufacturing and Maintenance Fundamentals
Objectives	To provide students with knowledge of aircraft maintenance practice and application in modern aircraft maintenance.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire good understanding of safety precautions of aircraft and workshop; and b. Acquire good understanding of aircraft engineering drawing as well as aircraft fits and clearances system; and c. Obtain fundamental knowledge in the area of aircraft screw system and locking devices; and d. Demonstrate good understanding of aircraft maintenance procedures; and e. Apply their knowledge to handle and store aircraft.
Subject Synopsis/ Indicative Syllabus	**Safety Precautions -** Aircraft and Workshop – Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals. Also, instruction in the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge on extinguishing agents. **Workshop Practices -** Care of tools, control of tools, use of workshop materials; dimensions, allowances and tolerances, standards of workmanship; calibration of tools and equipment, calibration standards. **Tools** - Common hand tool types; Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods; Operation, function and use of electrical general test equipment. **Avionic General Test Equipment** - Operation, function and use of avionic general test equipment. **Engineering Drawings, Diagrams and Standards** - Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identifying title block information; microfilm, microfiche and computerised presentations; Specification 100 of the Air Transport Association (ATA) of America;

<table>
<tr><td></td><td>Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams.

Fits and Clearances - Drill sizes for bolt holes, classes of fits; Common system of fits and clearances; Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear; standard methods for checking shafts, bearings and other parts.

Screw threads - Screw nomenclature; thread forms, dimensions and tolerances for standard threads used in aircraft; measuring screw threads.

Locking devices - Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick release fasteners, keys, circlips, cotter pins.

Pipes and Unions - Identification of, and types of rigid and flexible pipes and their connectors used in aircraft. Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes; Bending and belling / flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.

Electrical Cables and Connectors - Cable types, construction and characteristics; High tension and co-axial cables; Crimping; Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes.

Aircraft Weight and Balance - Centre of gravity / balance limits calculation: use of relevant documents; Preparation of aircraft for weighing; Aircraft weighing.

Aircraft Handling and Storage - Aircraft taxiing/towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refueling / defuelling procedures; De-icing/anti-icing procedures; Electrical, hydraulic and pneumatic ground supplies; Effects of environmental conditions on aircraft handling and operation.

Maintenance Procedures - Maintenance planning; Modification procedures; Stores procedures; Certification / release procedures; Interface with aircraft operation; Maintenance inspection / quality control / quality assurance; Additional maintenance procedures; Control of life limited components.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Lectures are used to deliver the fundamental knowledge in relation to aircraft maintenance practices (outcomes a to e).

Tutorials are used to illustrate the applications of fundamental knowledge to practical situations (outcomes a to e).
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="5">Intended subject learning outcomes to be covered</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td>1. Lecture</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Tutorial</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
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</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Assignments / Quizzes	50%	✓	✓	✓	✓	✓
2. Final examination	50%	✓	✓	✓	✓	✓
Total	100 %					

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

Overall Assessment:

0.5 × Final 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 continuous assessment including assignments and closed-book quizzes. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lectures	26 Hrs.
▪ Tutorials	13 Hrs.
Other student study effort:	
▪ Assignments	20 Hrs.
▪ Self-study	46 Hrs.
Total student study effort	**105 Hrs.**

Reading List and References

1. "EASA Module 6 B1 Materials and Hardware" by Aircraft Technical Book Co.
2. "EASA Module 7A Maintenance Practices" by Aircraft Technical Book Co.
3. "The Jet Engine 5th Edition" by Rolls Royce
4. "Airline Maintenance and Aircraft Manufacturing: Analyses of Select Issues" by Laura T. Pierson
5. "Essentials of Airplane Maintenance" by Michael Loong

Subject Description Form

Subject Code	AAE4110
Subject Title	Aircraft Propeller
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AAE2102/IC2133 Aircraft Manufacturing and Maintenance Fundamentals
Objectives	To provide students with knowledge of aircraft propeller and the major design features of modern aircraft propeller.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Obtain fundamental knowledge in the area of blade element theory; and b. Demonstrate good understanding of propeller design and construction; and c. Acquire good understanding of propeller control system and protection system; and d. Apply their knowledge and skills to explain the operation of aircraft propellers under both normal and abnormal situations.
Subject Synopsis/ Indicative Syllabus	**Propeller Fundamentals -** Blade element theory; High/low blade angle, reverse angle, angle of attack, rotational speed; Propeller slip; Aerodynamic, centrifugal, and thrust forces; Torque; Relative airflow on blade angle of attack; Vibration and resonance. **Propeller Construction -** Construction methods and materials used in wooden, composite and metal propellers; Blade station, blade face, blade shank, blade back and hub assembly; Fixed pitch, controllable pitch, constant speeding propeller; propeller/spinner installation. **Propeller Pitch Control -** Speed control and pitch change methods, mechanical and electrical/electronic; Feathering and reverse pitch; Overspeed protection. **Propeller Design Features -** Constant speed operations and logic; Stabilizer offset; Engine axis offset; Power absorption
Teaching/Learning Methodology	Lectures are used to deliver the fundamental knowledge in relation to aircraft propellers (outcomes a to d). Tutorials are used to illustrate the applications of fundamental knowledge to practical situations (outcomes a to d).

	Teaching/Learning Methodology	Intended subject learning outcomes to be covered			
		a	b	c	d
	1. Lecture	✓	✓	✓	✓
	2. Tutorial	✓	✓	✓	✓

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. Assignments / Quizzes	50%	✓	✓	✓	✓
2. Final examination	50%	✓	✓	✓	✓
Total	100 %				

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

Overall Assessment:

0.5 × Final 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 continuous assessment including assignments and closed-book quizzes. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lectures	36 Hrs.
▪ Tutorials	3 Hrs.
Other student study effort:	
▪ Assignments	20 Hrs.
▪ Self-study	46 Hrs.
Total student study effort	**105 Hrs.**

Reading List and References

1. Rodriquez, C.L., EASA Module 17A Propellers, Aircraft Technical Book Co., 2nd Edition.

2. Weick, F.E. Aircraft Propeller Design, McGraw-Hill Book Company, Inc. Latest Edition

	3. Kinney, J.R., Reinventing the Propeller. Aeronautical Specialty and the Triumph of the Modern Aircraft, Cambridge University Press, 2017

Subject Description Form

Subject Code	AAE4111
Subject Title	Compressible Aerodynamics
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AAE3001 Fundamentals of Aerodynamics
Objectives	1. To provide students with knowledge in compressible aerodynamics; and 2. To develop students' capability in aerodynamic analysis of canonical geometries, nozzles, airfoils and wings with the consideration of compressibility.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Obtain fundamental knowledge in the area of aerodynamics primarily in inviscid compressible flow; and b. Gain comprehensive understanding of compressible flows over canonical geometries, nozzle, airfoils and wings; and c. Get familiar with flow physics involved in practical applications including transonic swept wings, shock tubes, super wings, and convergent-divergent nozzles.
Subject Synopsis/ Indicative Syllabus	**Linearized Flow** – Full Velocity Potential Equation; Linearized Subsonic Flow; Compressibility Corrections; Linearized Supersonic Flow. **Transonic Flows** –Velocity Potential Equations for Sub-transonic and Super-transonic Flows; Prandtl-Glauert Rule; Critical Mach number; Drag Divergence; Supercritical Airfoil; Swept Wings; Area Rule. **One-Dimensional** – Normal Shock Relations; One-Dimensional Flow with Heat Addition; One-Dimensional Flow with Friction; **Quasi-One-Dimensional Flows** –Area-Velocity Relation; Convergent/Divergent Nozzles and Diffusers. **Oblique Shock and Expansion Waves** – Oblique Shock Relations; Shock Polar; Pressure-Deflection Diagrams; Shock Interactions; Conical Flow; Prandtl-Meyer Expansion Waves; Supersonic Airfoils. **Unsteady Supersonic Flows** – Shock Tube Equations; Detonation

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test and examination.

2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for compressible aerodynamics.

Technical/scientific examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lectures	✓	✓	✓
2. Tutorials	✓	✓	✓
3. Homework assignments	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Homework assignments	20%	✓	✓	✓
2. Tests	20%	✓	✓	✓
3. Experiments/Projects	20%	✓	✓	✓
4. Examinations	40%	✓	✓	✓
Total	100%			

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

1. The assessment is comprised of 60% continuous assessment (homework assignments, tests and experiment reports/project report) and 40% examination.

2. The continuous assessment consists of homework assignments, tests 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 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:	
	▪ Lectures	33 Hrs.
	▪ Tutorials	6 Hrs.
	Other student study effort:	
	▪ Self-study	33 Hrs.
	▪ Homework Assignments	50 Hrs.
	Total student study effort:	**122 Hrs.**
Reading List and References	1. Anderson J. D., Fundamentals of Aerodynamics. McGraw-Hill, 6th edition, 2016. ISBN 13: 978-1259129919 2. Anderson J. D., Modern Compressible Flow: With Historical Perspective. McGraw-Hill, 3rd edition, 2012. ISBN 13: 978-0072424430 3. Bertin J. J. and Cummings R. M., Aerodynamics for Engineers. Pearson, 6th edition, 2013. ISBN 13: 978-0132832885	

August 2020

Subject Description Form

Subject Code	AAE4201
Subject Title	Flight Control Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AAE3004 Dynamical Systems and Control
Objectives	To provide students with in depth knowledge of manual and powered flight control systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire good understanding of the capabilities of the flight control systems; and b. Acquire good understanding of the limitations of the flight control systems; and c. Acquire good understanding of manual control of the flight control systems; and d. Acquire good understanding of powered control of the flight control systems including Fly-By -Wire.
Subject Synopsis/ Indicative Syllabus	**Tail surfaces and control surfaces - Design and construction -** Describe the following types of construction: • Cantilever, • Non-cantilever (braced). **Structural components -** Describe the function of the following structural components: • Spar and its components (web and girder or cap), • Rib, • Stringer, • Skin, • Torsion box. **Loads, stresses and aeroelastic vibrations ('flutter') -** Describe the vertical and horizontal loads on the ground. Describe the loads in flight for symmetrical and asymmetrical conditions, considering both vertical and horizontal loads and loads due to engine failure. Describe the principle of flutter, flutter damping and resonance for the wing and control surfaces. Explain the significance on stress relief and flutter of the following:

	• Chord-wise and span-wise position of masses (e.g. engines, fuel and balance masses, control balance masses); • Torsional stiffness; • Bending flexibility. Describe the following design configurations: • Conventional (low or mid set) tailplane; • T-tail. **Primary fight controls -** Define a 'primary flight control'. List the following primary flight control surfaces: • Elevator; • Aileron, • Roll spoilers; • Rudder. List the various means of control surface actuation including: • Manual; • Fully powered (irreversible); • Partially powered (reversible). **Manual controls -** Explain the basic principle of a fully manual control system. **Fully powered controls (irreversible) -** Explain the concept of irreversibility in a flight control system. Explain the need for a 'feel system' in a fully powered control system. Explain the operating principle of a stabiliser trim system in a fully powered control system. Explain the operating principle of rudder and aileron trim in a fully powered control system. **Partially powered controls (reversible) -** Explain the basic principle of a partially powered control system. Explain why a 'feel system' is not necessary in a partially powered control system. **System components, design, operation, indications and warnings, degraded modes of operation, jamming -** List and describe the function of the following components of a flight control system: • Actuators; • Control valves; • Cables or electrical wiring; • Control surface position sensors. Explain how redundancy is obtained in primary flight control systems of large transport aeroplanes. Explain the danger of control jamming and the means of

	retaining sufficient control capability. Explain the methods of locking the controls on the ground and describe 'gust or control lock' warnings. Explain the concept of a rudder-deflection limitation (rudder limiter) system and the various means of implementation (rudder ratio changer, variable stops, blow-back). **Secondary fight control - System components, design, operation, degraded modes of operation, indications and warnings -** Define a 'secondary flight control'. List the following secondary flight control surfaces: • Lift-augmentation devices (flaps and slats); • Speed brakes; • Flight and ground spoilers; • Trimming devices such as trim tabs; • Trimmable horizontal stabiliser. Describe secondary flight control actuation methods and sources of actuating power. Explain the function of a mechanical lock when using hydraulic motors driving a screw jack. Describe the requirement for limiting speeds for the various secondary flight control surfaces. For lift-augmentation devices, explain the load-limiting (relief) protection devices and the functioning of an autoretraction system. Explain how a flap/slat asymmetry protection device functions. Describe the function of an autoslat system. Explain the concept of control surface blowback (aerodynamic forces overruling hydraulic forces). **Fly-by-wire control -** Explain that a FBW flight control system is composed of the following: Pilot's input command (control stick/column); • Electrical signalling, including pilot input to computer, computer to flight control surfaces, feedback from aircraft response to computer; • Flight control computers; • Actuators; • Control surfaces. State the advantages and disadvantages of a FBW system in comparison with a conventional flight control system including weight, pilot workload, flight-envelope protection. Explain why a FBW system is always irreversible. State the existence of degraded modes of operation.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorials sessions, homework assignments, tests, case study reports/presentations, and examination.

2. The continuous assessments and examination are aimed at providing students with integrated knowledge required to understanding the impact on environment from the aviation industry and the related mitigation measures.

3. Technical/practical examples and problems are raised and discussed in classes and tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered			
	a	b	c	d
1. Lecture	✓	✓	✓	✓
2. Tutorial	✓	✓	✓	
3. Home assignments		✓	✓	✓
4. Case study report and presentation		✓	✓	✓

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	10%		✓	✓	✓
2. Test	20%	✓	✓	✓	✓
3. Case study	10%		✓	✓	✓
4. Examination	60%	✓	✓	✓	✓
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

The continuous assessment consists of three components: homework assignments, test and case study report & presentation. They are aimed at evaluating the progress of study, assisting them in self-monitoring of fulfilling the respective indented subject learning outcomes.

The examination is used to assess the knowledge acquired by the students for understanding and analysis the problem critically and independently; as well as to determine the degree of achieving the indented subject learning outcomes.

Student Study Effort Expected	Class contact:	
	▪ Lectures	26 Hrs.
	▪ Tutorials	13 Hrs.
	Other student study effort:	
	▪ Self-Study	36 Hrs.
	▪ Homework Assignments	15 Hrs.
	▪ Case Study Report Preparation	15 Hrs.
	Total student study effort	**105 Hrs.**
Reading List and References	1. Brian L. Stevens, Frank L. Lewis,, Eric N. Johnson , Aircraft Control and Simulation: Dynamics, Controls Design, and Autonomous Systems, Wiley-Blackwell Nov 2015.. 2. Clarence W. de Silva, Sensors and Actuators: Engineering System Instrumentation, CRC Press, July 2015. 3. Austin Hughes and Bill Drury, Electric Motors and Drives: Fundamentals, Types and Applications, Newnes, May 2013	

June 2020

Subject Description Form

Subject Code	AAE4202
Subject Title	Electronics & Information Technologies for Unmanned Aerial Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with knowledge of electronics and information technologies for unmanned aerial vehicles (UAV) and unmanned aircraft systems (UAS).
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Possess all required concepts and skills related to the remote control and primary autonomous unmanned aircraft systems; and b. Apply the learnt concepts and skills to operate, maintain and perform diagnosis on existing unmanned aircraft systems; and c. Extend their knowledge to analyze and develop new modules or algorithms in unmanned aircraft systems for desired needs.
Subject Synopsis/ Indicative Syllabus	**System Component, Electronic Device, and Radio Link** Common system components of UAS: airframe, servo, propulsion system (motor, electronic speed controller (ESC), propeller), Li-po battery, radio transmitter and receiver, telemetry, ground control station (GCS), and the autopilot. **Dynamic Modelling of Unmanned Aerial Vehicle** Coordinate systems, kinematic model, dynamic model, propulsion system model, controller allocation model of UAS and model linearization method. **Flight Control Framework** Cascade control structure, position control, attitude control, and control allocation for the low-level control of UAS. **Path and Trajectory Planning** Global path planning for UAS including search-based methods and sample-based methods. Local smooth trajectory generation methods. **Autopilot System Integration and Flight Simulation** Open-source flight controller; Flight simulation platform; Programming and hardware interface; Implementation of control and planning algorithms, Introduction to autonomous aerial robotic system.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/hands on sessions, assignments, test, mini project and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for unmanned aircraft systems.
3. Technical/practical examples and problems are raised and discussed in class/hands on sessions.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lecture	✓	✓	
2. Hands on	✓	✓	
3. Assignment	✓	✓	
4. 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
1. Assignments	15 %	✓	✓	
2. Test	15 %	✓	✓	
3. Mini Project	30 %	✓	✓	✓
4. Examination	40 %	✓	✓	✓
Total	100%			

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

Overall Assessment:

0.4 × End of Subject Examination + 0.6 × Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study. 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. The examination is 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	27 Hrs.
	▪ Hands on	12 Hrs.
	Other student study effort:	
	▪ Self-Study	22 Hrs.
	▪ Mini project	44 Hrs.
	Total student study effort	**105 Hrs.**
Reading List and References	1. Quan, Quan. Introduction to multicopter design and control. Springer, 2017 2. Kenzo Nonami et al, Autonomous flying robots: unmanned aerial vehicles and micro aerial vehicles, Springer, 2010. 3. Donald Norris, Build your own quadcopter: power up your designs with the Parallax Elev-8, New York: McGraw-Hill Education, 2014	

April 2021

Subject Description Form

Subject Code	AAE4203
Subject Title	Guidance and Navigation
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AAE3004 Dynamical Systems and Control **OR** AAE4301 Avionics Systems
Objectives	1. To provide a fundamental understanding and knowledge of conventional and modern design and working principles of navigation and guidance for air vehicles; and 2. To provide the basic mathematical concepts of navigation by inertial and satellite approaches and guidance laws; and 3. To provide an expansive view into the technological trends of future aircraft navigation and guidance systems designs.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand and explain the working principles of navigation and guidance systems for air vehicles; and b. Competently apply the fundamental mathematical concepts of aircraft navigation; and c. Critically evaluate the characteristics, purposes, and design procedures of aircraft navigation and guidance systems; and d. Identify the technological and design trends of future aircraft navigation.
Subject Synopsis/ Indicative Syllabus	**Inertial Navigation System –** reference frames; principles of inertial navigation; gyroscope and accelerometer; attitude estimation and Euler angles **Satellite Navigation System** – principles of satellite navigation; ICAO requirements on accuracy, integrity, continuity and availability; nominal and erroneous errors; integrity monitoring and augmentation systems (ABAS, SBAS, GBAS) for different flight phases, e.g. en-route, non-precision approach and precision approach. **Integrated Navigation System –** Kalman filter and estimation theory; integration of inertial and satellite navigation; redundancy and consistency check. **Guidance in Aviation –**LOS, PN Guidance laws. Modern Guidance Law; Fundamental of Guidance and Control Systems; Principles of LNAV and VNAV, Autopilot and Auto-Landing Systems. **Area Navigation Systems** – Concepts of RNP, RNAV and PBN; area navigation

<table>
<tr><td></td><td>procedures; key components in RNAV; future trend of area navigation

Case Studies - Design and discussion of navigation and guidance systems for various air vehicles. Technological trends in future aircraft navigation and guidance systems.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Lectures are used to deliver the fundamental concepts, theory, mathematical background and technical knowledge related to Radar, Aircraft Guidance and Navigation (outcomes a, b, c and d).

Tutorials are used to provide a deeper understanding of the theoretical material, and to put theoretical material into use via practical examples and demonstrations (outcomes b and c).

Homework assignments, in the form of quiz and problems and case studies, and mini group research project, are used to allow students to reflect on and deepen their knowledge on a selected topic (outcomes a, b, c and d).

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes to be covered</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Tutorial</td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>3. Mini Group Project</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>4. Homework assignments</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</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Homework assignments</td><td>15%</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>2. Test</td><td>15%</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>3. Mini Group Project</td><td>20%</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>4. 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>
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</table>

	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 All homework assignments are designed to assist and enhance the understanding the fundamental theories and concepts taught during the course of the subject, and to be sufficiently practical to allow students to apply the theories and concept in practice. Test and Examination serve to evaluate the student's ability in all of the intended learning outcomes.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Laboratory/Tutorial	6 Hrs.
	Other student study effort:	
	▪ Continue Assessment	35 Hrs.
	▪ Self-study	36 Hrs.
	Total student study effort	**110 Hrs.**
Reading List and References	1. David Wyatt, Aircraft Flight Instruments and Guidance Systems: Principles, Operations and Maintenance, Routledge, latest edition. 2. Lawrence, Modern Inertial Technology – Navigation, Guidance, and Control latest edition, Mechanical Engineering Series, Springer, latest edition. 3. Modern Navigation, Guidance and Control Processing Volume-II, Ching-Fang Lin, Prentice Hall Series in Advanced Navigation, Guidance and Control and Their Applications.	

June 2020

Subject Description Form

Subject Code	AAE4304
Subject Title	Advanced Positioning and Navigation Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with advanced knowledge of positioning and navigation systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Possess all required mathematical concepts and skills related to the area of positioning and navigation; and b. Apply the learnt concepts and skills to maintain and perform diagnosis on existing positioning and navigation systems; and c. Extend their knowledge to analyze and develop new electronic modules and components in positioning and navigation for desired needs.
Subject Synopsis/ Indicative Syllabus	**Introduction and Radio Theory**: EM radiation (radio waves); dipole aerial; polarization; radio frequency spectrum; frequency, amplitude, pulse and phase modulation; SSB in HF communications; pulse modulation; classification of emissions; refraction, reflection, diffraction and attenuation; dipole, parabolic, phase array and slotted antennae; VHF; VHF/UHF; signal propagation; atmospheric/ionospheric ducting; Doppler effect; **NDB and ADF**: ground DF; VDF let-down procedure; NDB frequencies; NDBs locators and beacons; ground installations; BFO; NON A1A and NON A2A; ADF; cardioid polar diagram; RBI/RMI; errors of NDB/ADF; ICAO required fixing accuracy of NDBs; QDM and QDR interception **VOR and VOR Tracking**: VOR frequencies; principle of operation; aircraft navigation reception equipment; aircraft installation; VOR indicator/OBI; ICAO required accuracy of VOR; error of VOR; self-monitoring function; radial cross cuts; **Landing Aids**: DME, interrogation response, required accuracy, transmission classification P0N, beacon saturation. ILS Localiser, Glide-path, ILS displays on the OBI, HSI and EFIS PFD, limits of ILS CATI, II and III, MLS, principle of operation, ICAO required accuracy **Radar**: Radar theory, operating frequencies, pulse radar, radar mile, factors controlling bearing and range resolution, ground based radars, Airborne Weather Radar (AWR), CWR (radio altimeter), Mention Doppler Radar (MTR) **Transponders**: SSR transponders, operation principle, digital data in pulse transmission, Mode A and C, ADS-B

Area Navigation Systems (RNAV), FMS & EFIS: ICAO Annex 11; B-RNAV and P-RNAV; operation of basic RNAV; limitations of B-RNAV; RNP; FMC/FMS operation; internal database content and structure; FMS set-up procedure; EFIS system; recognise and interpret glass cockpit displays; failure warnings; SEI

Global Navigation Satellite Systems -FANS & RNAV Approaches: ICAO required accuracy for GPS; GPS in ADS-B

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.

2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for positioning and navigation.

3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lecture	✓	✓	
2. Tutorial	✓	✓	
3. Homework assignment	✓	✓	
4. Case study report	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Assignments	20 %	✓	✓	
2. Test	20 %	✓	✓	
3. Case study	20 %	✓	✓	✓
4. Examination	40 %	✓	✓	✓
Total	100 %			

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

Overall Assessment:

0.4 × End of Subject Examination + 0.6 × Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study. 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. The examination is 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	26 Hrs.
	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Self-Study	22 Hrs.
	▪ Case Study	44 Hrs.
	Total student study effort	**105 Hrs.**
Reading List and References	1. Oxford ATPL Manual 11 - Radio Navigation – EASA, Oxford Publishing, Latest Edition 2. Davide Dardari et al, Satellite and terrestrial radio positioning techniques: a signal processing perspective, Oxford Academic Press, 2012. 3. Pratap Misra, Global positioning system : signals, measurements, and performance, Ganga-Jamuna Press, 2006 4. Pat Langley-Price et al, Ocean yachtmaster : Adlard Coles' coursebook for ocean navigation student, Adlard Coles Nautical, 2007. 5. Mohinder S. Grewal, Global navigation satellite systems, inertial navigation, and integration, John Wiley & Sons, 2013 6. Aboelmagd Noureldin, Fundamentals of inertial navigation, satellite-based positioning and their integration, Springer, 2013	

December 2019

Subject Description Form

Subject Code	AAE4902
Subject Title	Pilot Ground Theory
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To teach the fundamental knowledge to students who wish to learn the technical and theoretical aspects of flying, and have the desire to pursue their PPL or CPL in the future; and 2. To familiarize student with the use of aeronautical information services, government references and publications for flight planning and navigation purposes; and 3. To teach students aeromedical factor and pilot decision-making to improve pilot's performance; and 4. To develop student's knowledge on the essential knowledge in airworthiness, preparation for flight, and the safe operation of aircraft.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Possess good knowledge in pilot (aeroplane) ground theory including air law, flight rules and procedures; and b. Efficiently utilize aeronautical information services, government references and publications for flight planning and navigation purposes; and c. Recognize the influence and importance of human factor and human performance on flight safety; and d. Possess in-depth understanding of the principle of flight, operation of airplane, pre-flight and airworthiness.
Subject Synopsis/ Indicative Syllabus	**Aviation Law, Flight Rules and Procedure -** Aviation law, Flight Rules and Procedure covering: The Air Navigation Order, The Hong Kong Aeronautical Information Publication, Hong Kong Civil Aviation (Investigation of Accidents) Regulations, AOPA Ground Training Manual. **Navigation -** Meteorology, Aviation Weather Theory and Aviation Weather Services, Air Traffic Control and Airspace, Aeronautical Charts, Navigation Charts and Publications, Communication, Radar Navigation Systems. **Aircraft -** Airplane Instruments and Basics of Onboard Guidance and Navigation Systems from a pilot's perspective. Airplane Performance, Aircraft Weight and Balance. **Aeromedical Factors and Aeronautical Decision Making -** Basic Aviation Physiology and Health Maintenance, Human Limitations, Stress and Stress Management, Ergonomics of the Flight Deck, the Decision-Making Process and

<table>
<tr><td></td><td>Situational Awareness.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Lectures are used to deliver the fundamental theory, technical and operational knowledge, and civil aviation regulations that are studied by student private and commercial pilots in ground theory courses. The knowledge will provide the fundamental knowledge necessary to students who may wish to later pursue their private or commercial pilot’s licenses (outcomes a to d).

Tutorials are used to illustrate and familiarize the application of fundamental knowledge to practical flight situations (outcomes b and c).

Homework assignments, in the form of investigations and evaluations, case studies and flight planning, 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 to d).

Experiments, likely in the form of flight simulation, are used to relate the concepts to practical applications and evaluation of flight performance (outcomes a, b and d).
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes to be covered</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Tutorial</td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>3. Homework assignments</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>4. Experiment</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</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Homework assignments</td><td>15%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Test</td><td>15%</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>3. Experiment</td><td>20%</td><td>✓</td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>4. 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:

0.5 × End of Subject Examination + 0.5 × Continuous Assessment</td></tr>
</table>

	All homework assignments are designed to assist and enhance the understanding the fundamental theories and concepts taught during the course of the subject, and to be sufficiently practical to allow students to apply the theories and concept in practice. The experiment, likely in the form of flight simulation, is designed and aimed to provide students with a taste of flying as a pilot in a safe controlled environment, while at the same time allowed the individual pilot ground theory skills to be evaluated. Test and Examination serve to evaluate the student's ability in all of the intended learning outcomes.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial / Experiment	6 Hrs.
	Other student study effort:	
	▪ Course work	30 Hrs.
	▪ Self-study	36 Hrs.
	Total student study effort	**105 Hrs.**
Reading List and References	1. CAD 54 – Requirements Document: Pilot Licenses and Associated Ratings, Hong Kong Civil Aviation Department. 2. Paul E, Illman, The Pilot's Handbook of Aeronautical Knowledge, latest edition, McGraw-Hill, New York, latest edition. 3. FAA Pilot's Handbook of Aeronautical Knowledge, FAA-H-8083-25A, Flight Standard Service, US DOT FAA, latest edition.	

December 2019

Subject Description Form

Subject Code	AAE4903
Subject Title	Human Factors in Aviation
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with fundamental human factors concepts and develop students' understanding of the applied multi-disciplinary approach mostly concerned on airline transport pilot perspective.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Explain the basic concepts of human factors HF in the aviation industry; and b. Explain the application of ergonomics in flight deck design; and c. Identify and explain the human errors in airport operations, air traffic control, and pilot operation.
Subject Synopsis/ Indicative Syllabus	**Human Factors: Basic Concepts -** Human factors in aviation, Accident statistics, Flight safety concepts, Safety culture. **Basic Aviation Physiology -** Basics of flight physiology, The atmosphere, Respiratory and circulatory system, High-altitude environment Central, peripheral and autonomic nervous systems, Vision, Hearing, Equilibrium, Integration of sensory inputs. **Health Maintenance -** Health and hygiene, Personal hygiene, Body rhythm and sleep, Problem areas for pilots, Intoxication, Incapacitation in flight. **Basic Aviation Psychology** - Human information processing, Attention and vigilance, Perception, Memory, Response selection, Human error and reliability, Reliability of human behavior, Mental models and situation awareness, Theory and model of human error, Error generation, Decision-making, Avoiding and managing errors: Safety awareness, Coordination (multi-crew concepts), Cooperation, Communication, cockpit management: Personality, attitude and behavior, Individual differences in personality and motivation, Identification of hazardous attitudes (error proneness), Human behavior: Arousal, Stress, Fatigue and stress management, Human overload and underload, Advanced cockpit automation: Advantages and disadvantages, Automation complacency, Working concepts.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to various aspects of aviation systems (outcomes a to c).

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

Group mini-projects are used to help students to deepen their knowledge on a specific topic through search of information, analysis of data and report writing (outcomes a to c).

Special seminar(s) delivered by invited industrial professionals may be used to relate the concepts learnt in class to engineering practices. Students are expected to achieve better understanding of human factors through this activity (outcomes a and c).

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lecture	✓	✓	✓
2. Tutorial	✓	✓	✓
3. Mini-project	✓	✓	✓
4. Special seminar	✓		✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Assignments	20%	✓	✓	✓
2. Group mini-project	10%	✓	✓	✓
3. Test	20%	✓	✓	✓
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, group mini-project, and test. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus. In particular, group mini-project is 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 working in the aviation industry.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study effort:	
	▪ Course work	21 Hrs.
	▪ Self-study	45 Hrs.
	Total student study effort	**105 Hrs.**
Reading List and References	1. Salas, Eduardo, Florian Jentsch, and Dan Maurino, eds. Human factors in aviation. Academic Press, 2010. 2. Oxford ATPL Manual 8 - Human Performance & Limitations - EASA, 1st Edition, Oxford Publishing. 3. FAA (2007)**.** Operator's manual: Human factors in airport Operations. 4. Reason J.T. & Hobbs, A.. Managing Maintenance Error: A Practical Guide. Ashgate, latest edition.	

December 2019

Subject Description Form

Subject Code	AAE4904
Subject Title	Meteorology in Aviation
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with general knowledge of a pilot completing a safe flight in given meteorological conditions and the effect of weather conditions within the atmosphere to aircraft operation.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Possess essential knowledge and skills in the area of aircraft meteorology; and b. Identify all the weather information which may affect a given flight; and c. Analyse and evaluate available weather information before flight as well as that collected in flight; and d. Apply a solution to any problems presented by weather conditions.
Subject Synopsis/ Indicative Syllabus	**Wind -** Definition and measurement of wind, Primary cause of wind, General global circulation, Local winds, Mountain waves (standing waves, lee waves), Turbulence, Jet streams. **Thermodynamics –** Humidity, Change of state of aggregation, Adiabatic processes. **Clouds and Fog -** Cloud formation and description, Fog, mist, haze. **Precipitation -** Development of precipitation, Types of precipitation. **Air Masses and Fronts -** Air masses and Fronts. **Pressure Systems -** The principal pressure areas, Anticyclone, Non-frontal depressions, Tropical revolving storms. **Climatology -** Climatic zones, Tropical climatology, Typical weather situations in the mid-latitudes, Local winds and associated weather. **Flight Hazards –** Icing, Turbulence, Wind shear, Thunderstorms, Tornadoes, Inversions, Stratospheric conditions, Hazards in mountainous areas, Visibility-reducing phenomena. **Meteorological Information -** Observation, Weather charts, Information for flight planning, Meteorological services.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.

2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for aircraft meteorology.

3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

4. Special seminar(s) delivered by invited industrial professionals may be used to relate the concepts learnt in class to aviation practices.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered			
	a	b	c	d
1. Lecture	✓	✓	✓	✓
2. Tutorial	✓	✓		
3. Homework assignment	✓	✓	✓	✓

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. Continuous Assessment	50%	✓	✓	✓	✓
2. 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

The continuous assessment consists of two components: homework assignments, and test. 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.

The examination is 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 Hours
▪ Tutorial	6 Hours

	Other student study effort:	
	▪ Self-Study	66 Hours
	Total student study effort	**105 Hrs.**
Reading List and References	1. Oxford ATPL Manual 9 - Meteorology – EASA, Oxford Publishing, Last Edition. 2. Roy Quantick, Climatology for Airline Pilots, John Wiley & Sons, Last Edition. 3. S. Raghavan, Radar Meteorology, Springer Science & Business Media, Last Edition.	

February 2020

Subject Description Form

Subject Code	ISE3004
Subject Title	Systems Modeling and Simulation
Credit Value	3
Level	3
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	This subject provides students with 1. the basic system concept and definitions of system; 2. techniques to model and to simulate various systems; 3. the ability to analyze a system and to make use of the information to improve the performance.
Intended Learning Outcomes	Upon completion of the subject, students will be able to a. understand the system concept and apply functional modeling method to model the activities of a static system; b. understand the behavior of a dynamic system and create an analogous model for a dynamic system; c. simulate the operation of a dynamic system and make improvement according to the simulation results.
Subject Synopsis/ Indicative Syllabus	1. <u>System definitions and classification</u> Introduction to system definitions. System Classification. Components in a System. 2. <u>Basic Static and Dynamic System Modeling Techniques</u> Static System Modeling: IDEF0 (Input, Control, Output, Mechanism). Dynamic System Modeling: Stella (Stock, Flow, Converter). 3. <u>Introduction to Discrete Event Simulation</u> Analytical and Simulation Modeling, Simulation Worldviews, Preparation for Model Building. Generation of Random Number and Vitiate. Introduction to Distribution Functions, Fitting of Probability Distribution Function to Data. 4. <u>Applications of Discrete Event Simulation</u> Simulation Modeling with Probabilistic Functions. Applications of

<table>
<tr><td></td><td>Simulation in Business, Medical, Manufacturing and Transportation systems.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>The emphasis of this subject is on application aspects and considerable efforts are needed on hand-on activities. Teaching is conducted through class lectures, tutorials, laboratory exercises and a mini-project in related to the application of simulation. The lectures are targeted at the understanding system concept, modeling methods, and different simulation techniques. Substantial works on laboratory exercises and tutorials are employed to enforce students' capabilities in building system models and application of simulation software. The mini-project is to give students a chance of conducting a simulation related project in a more comprehensive manner, and test/quiz is used to classify students' achievement in this subject.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td></td><td></td><td></td></tr>
<tr><td>Laboratory/Exercise</td><td>40%</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mini-project/Case Study</td><td>30%</td><td></td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>Test/Quiz</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Each laboratory exercise would be divided into two parts such that the group work would have to be submitted by the end of the laboratory class while the individual component can be hand-in afterward. Test/quiz will be given to access students' learning outcomes, and, a mini-project in related to application of simulation in practical situation.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture/Seminar
2 hours/week for 6 weeks</td><td>12 Hrs.</td></tr>
<tr><td>▪ Tutorial/Hand-on Exercise
2 hours/week for 3 weeks</td><td>6 Hrs.</td></tr>
<tr><td>▪ Laboratory/Case Study/Test
3 hours/week for 5 weeks + 6 hours/week for 1 week</td><td>21 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Project report</td><td>31 Hrs.</td></tr>
</table>
</td></tr>
</table>

	▪ Self Study/Laboratory Report	52 Hrs.
	Total student study effort	122 Hrs.
Reading List and References	1. Zeigler, BP, Praehofer, H, Kim, TG 2000, *Theory of Modeling and Simulation: Integrating Discrete Event and Continuous Complex Dynamic Systems*, Academic Press 2. Altiok, T, Melamed, B 2007, *Simulation Modeling and Analysis with Arena*, Academic Press 3. Evans, JR, Olson, DL 2001, *Introduction to Simulation and Risk Analysis*, Prentice Hall, New Jersey 4. Banks J. et al., 2010, *Discrete-Event System Simulation*, Pearson Education 5. Kelton, WD, Sadowski, R, Zupick, 2014, *Simulation with Arena*, McGraw-Hill	

18.3.2014

Subject Description Form

Subject Code	ISE3013
Subject Title	Data Management in Aviation Industries
Credit Value	3
Level	3
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	The subject will enable students to develop the ability to 1. describe the basic concepts and methods of data management; 2. formulate models for quantitative analysis of managerial problems; 3. derive the data requirements of aviation management project; 4. identify the major applications and limitations of data management for the aviation industries; 5. apply data management techniques and tools for aviation management projects.
Intended Learning Outcomes	Upon completion of the subject, students will be able to a. understand the basic principles of data management by demonstrating a basic level of knowledge regarding the practical use of Decision Support and Business Intelligence Systems for data management; b. convert a managerial decision problem into a model formulation to provide the necessary decision support information for practitioners in the aviation industries; c. formulate a data management plan in the context of aviation management; d. apply data management tools in the context of aviation management, showing a moderate level of skills in using related decision support and modeling applications.
Subject Synopsis/ Indicative Syllabus	1. <u>Introduction to Data Management</u> - Why Data Management is needed in the Aviation Industries - the data life cycle, data sharing requirements, naming conventions, metadata, storage, data ownership, security, privacy, and long-term access, basic concepts in data science and mathematical modeling. 2. <u>Data Visualization: Pattern Analysis</u> - Introduction to data visualization - Patterns and models through On-Line Analytical Processing (OLAP) and MS-Excel tools based on datasets gathered in the aviation

<table>
<tr><td></td><td>industries.

3. <u>Data Mining and Techniques for Operational and Managerial Data in the Aviation Industries</u>
- Beyond pattern analysis, performing complex data analysis
- Clustering;
- Single factor and two factor analysis;
- t- test and ANOVA test
- Moving average technique; Exponential smoothing (forecasting)
- Cases studies drawn from industrial and business applications in the Aviation Industries.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>A mix of lectures, tutorials, and lab sessions is used to deliver the various topics in this subject. Lectures are conducted to introduce students to theoretical concepts and techniques. Some topics are covered in a problem-based format to enhance learning objectives. Lab sessions will be used to illustrate practical application of theories and techniques. Students are given the opportunity to gain hands-on experience on operating Data Management tools during the laboratory sessions.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td></td><td></td></tr>
<tr><td>1. Project</td><td>30%</td><td></td><td></td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>2. Lab exercise</td><td>30%</td><td></td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3. Test I, II</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>
Continuous assessments consist of a project, lab exercises, presentation, and quizzes that are designed to facilitate students to achieve the intended learning outcomes. Lab exercise is designed to encourage students to acquire deep understanding of the relevant knowledge from hands-on practice. Project is designed to enhance students' ability to holistically apply what they have learnt in the context of a real problem through team work. Presentation is designed to facilitate students to show ability to communicate complex concepts clearly. Quiz is designed to test students' understanding and application of theoretical concepts and techniques acquired.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures 3 hours/week x 6 weeks</td><td>18 Hrs.</td></tr>
<tr><td>▪ Lab and test 3 hours/week x 7 weeks</td><td>21 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
</table>
</td></tr>
</table>

	▪ Preparation for the lab reports ▪ Preparation for tests and self-study	21 Hrs. 60 Hrs.
	Total student study effort	120 Hrs.
Reading List and References	1. Han JW, Kamber M, and Pei J 2011, *Data Mining: Concepts and Techniques*, 3rd ed., Morgan Kaufmann Publishers 2. Tan, P, Steinbach M and Kumar V 2006, *Introduction to Data Mining*, Addison Wesley 3. Berson A, and Dubov L 2010, *Master Data Management And Data Governance*, 2nd ed., McGraw-Hill 4. Taylor, B W III 2012, *Introduction to Management Science*, 11th ed., Prentice Hall 5. Winston, W L 2011, *Microsoft® Excel® 2010: Data Analysis and Business Modeling*, 3rd ed., Microsoft Press	

14.12.2017

Subject Description Form

Subject Code	ISE4014
Subject Title	Aircraft Service Engineering and Logistics
Credit Value	3
Level	4
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	This subject will enable students to 1. estimate failure rate of aircrafts; 2. evaluate aircraft reliability; 3. schedule an optimal maintenance plan for aircrafts; 4. maintain fleet readiness; 5. apply principles of quality assurance, quality control, and reliability standards for aircraft services.
Intended Learning Outcomes	Upon completion of the subject, students will be able to a. understand and apply different methodologies in aircraft maintenance, such as condition monitored, on-condition and scheduled maintenance process; b. understand and apply different scheduling methodologies to plan and design fleet aircraft maintenance schedule to maximize aircraft reliability and availability.
Subject Synopsis/ Indicative Syllabus	1. <u>Fundamentals of Maintenance</u> Aircraft Reliability; Types of Maintenance; Failure Rate Patterns; Aircraft Ageing; Technology in Aircraft Maintenance. 2. <u>Development of Maintenance Program</u> Process-Oriented Maintenance; Task-Oriented Maintenance; Maintenance Program Documents; Line Maintenance Operations and Schedule; Aircraft Logbook. 3. <u>Aircraft Maintenance Management</u> Role of Management in Aviation; Aircraft Maintenance Management Structure; Aircraft Maintenance Planning and Scheduling; Management Area of Concerns in an Airline; Cost of aircraft

<table>
<tr><td></td><td>maintenance; Implementing Human Factors in Maintenance.

4. <u>Aviation Industry Certification Requirements</u>

Aircraft Maintenance Engineer; Aircraft certification; Delivery Inspection; Operator certification; Certification of Personnel; Aviation Maintenance certification; JAA joint certifications; National certifications; FAA type certification.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>A mixture of lectures, tutorials, and projects are used to deliver the various topics in this subject. Some materials are covered in a problem-based format, exercise, and assignments to enhance learning effectiveness. Others will be covered through directed study in order to enhance the students' ability of "learning to learn." Some case studies, mainly based on business and industrial experience, are used to integrate these topics and thereby demonstrate to students how the various principles and techniques are inter-related and how they apply in real-life situations.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1. Laboratory work</td><td>10%</td><td>✓</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2. Individual Assignment (×3)</td><td>45%</td><td></td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3. Group Project</td><td>20%</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4. Test</td><td>25%</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>100%</td><td colspan="6"></td></tr>
</table>

The assignments are designed to assess students' understanding about the knowledge of aircraft maintenance and certifications.

The tutorials and exercises are designed to assess students' understanding of analyzing reliability and failure rate patterns.

The projects and case studies are designed to assess students' understanding of the working principles in the development of maintenance program and management.

The test is designed to assess students' understanding of the topics and whether they can present the concepts clearly.</td></tr>
<tr><td>Student Study</td><td>Class contact:</td><td></td></tr>
</table>

Effort Expected	▪ Lectures	21 Hrs.
	▪ Laboratories	18 Hrs.
	Other student study effort:	
	▪ Assignments and exercises	25 Hrs.
	▪ Self-learning and practice for projects	30 Hrs.
	▪ Test preparations	25 Hrs.
	Total student study effort	119 Hrs.
Reading List and References	1. Kinnison, Harry A. 2013, *Aviation Maintenance Management*, McGraw-Hill 2. Friend, C.H. 1992, *Aircraft Maintenance Management*, Longman 3. Florio, Fillppo De 2006, *Airworthiness An Introduction to Aircraft Certification*, A Guide to Understanding JAA, EASA, and FAA Standards 4. Kroe, Micheal J., Watkins, William A., and Delp, Frank 2013, *Aircraft Maintenance and Repair*, Seventh Edition, McGraw-Hill Professional 5. Salas, Eduardo, Jentsch, Florian, and Maurino, Dan 2010, *Human Factors in Aviation*, Academic Press	

10.4.2019