THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

Department of Aeronautical and Aviation Engineering

Doctor of Philosophy (PhD) /
Master of Philosophy (MPhil)

(Programme code: 48601)

Programme Booklet
2024/25 Cohort

September 2024

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This Programme Booklet is subject to review and changes by the Department from time to time. Students will be informed of the changes as and when appropriate.

This document should be read together with the "Research Postgraduate Student Handbook" available at https://www.polyu.edu.hk/gs/rpghandbook/section1.php

1. GENERAL INFORMATION

1.1 Programme Titles

Master of Philosophy (MPhil)
Doctor of Philosophy (PhD)

1.2 Offering and Administration Host Department

Department of Aeronautical and Aviation Engineering

1.3 Final Awards

Doctor of Philosophy (PhD)
Master of Philosophy (MPhil)

1.4 Period of Study and Mode of Attendance

(a) Normal Period of Study

Mode of Study	**MPhil** (Programme Code)	**PhD** (Programme Code)	
		For students with an MPhil or RPg degree with a dissertation as an award requirement	**For students with a Bachelor's degree with First Class Honours or Master's degree**
Full-time	2 Years (48601-FTM)	3 Years (48601-FD)	4 Years (48601-FTD)
Part-time	4 Years (48601-PTM)	6 Years (48601-PD)	8 Years (48601-PTD)

(b) Maximum Period of Study

Mode of Study	**MPhil** (Programme Code)	**PhD** (Programme Code)	
		For students with an MPhil or RPg degree with a dissertation as an award requirement	**For students with a Bachelor's degree with First Class Honours or Master's degree**
Full-time	3 Years (48601-FTM)	5 Years (48601-FD)	6 Years (48601-FTD)
Part-time	5 Years (48601-PTM)	7 Years (48601-PD)	9 Years (48601-PTD)

1.5 Entrance Requirements

(a) General Entrance Requirements

To register for a full-time/part-time MPhil programme, an applicant shall at least hold a Bachelor's degree with Second Class Honours or above (or equivalent qualification) conferred by a recognised university;

To register for a 3-year full-time / 6-year part-time PhD programme, an applicant shall normally hold a Master of Philosophy (MPhil) or equivalent (a research postgraduate degree with a dissertation as an award requirement) and a Bachelor's degree, conferred by a recognised university; and

To register for a 4-year full-time / 8-year part-time PhD programme, an applicant shall normally hold:-

- A Master's degree and a Bachelor's degree, conferred by a recognised university; OR
- A Bachelor's degree with First Class Honours (or equivalent qualification), conferred by a recognised university.

PolyU may accept other equivalent qualifications. The decision is made on an individual basis.

(b) English Language Requirements

The requirements for those who do not have a degree for which English was the language of instruction at a recognised university are:

- an overall score of at least 6.5 in the International English Language Testing System (IELTS); OR
- a Test of English as a Foreign Language (TOEFL) score of 80 or above for the Internet-based test.

All English language test scores are considered valid for two years after the date of the test.

1.6 Residence Requirements

1.6.1 Residence provides students with an opportunity to become immersed in the intellectual environment of the University. Also included in the residence are periods during which students' research requires off-campus field or non-PolyU laboratory work.

1.6.2 Despite of the mode of study, the residence requirement for an MPhil degree is two regular semesters; and that for a PhD degree is three regular semesters if a relevant research Master's degree is earned prior to entering the programme, but four regular semesters if it is not.

1.6.3 All research postgraduate students must fulfil the residence requirement before thesis submission.

1.6.4 In addition to the residence requirement, FT RPg students are required to be on campus full-time and consequently in such geographical proximity as to be able to participate fully in PolyU activities associated with the RPg programme. .

1.6.5 Where an RPg student needs to conduct his/her research outside Hong Kong, adequate supervision arrangements must be proposed by the Chief Supervisor and approved by the D/SRC for study periods spent outside Hong Kong.

1.6.6 Leave taken by the RPg students during their studies at PolyU will be counted towards their residence requirement of PolyU.

1.7 Leave

1.7.1 With the prior agreement of the Chief Supervisor, a full-time student may take vacation leave of up to four weeks per study year. He/she will be paid his/her Postgraduate Scholarship during the approved period of vacation leave. The period of vacation leave will count towards an RPg student's normal/maximum periods of study.

1.7.2 Students' application for leave of absence shall be approved by the Chief Supervisor. The Departments must keep the leave record of each of their on-going students.

1.7.3 All leave applications (except Unpaid leave) should be submitted with all relevant documents to the Leave Management System for approval and record. RPg students should note that the granting of leave is not automatic. All applications should be made as far in advance as possible. Students will receive an email notification whether or not their applications have been approved after the leave application has been considered by the relevant approval authorities.

1.8 Confirmation of Registration

1.8.1 An RPg student is regarded as provisionally registered for the degree of MPhil or PhD before the Confirmation of Registration is completed.

1.8.2 Students are required to have their registration confirmed, subject to a formal assessment, according to the normal deadlines as stipulated below:

Study mode	Normal period of study	Deadline for Confirmation of Registration
Full-time PhD	4 years	At the end of the first 6 semesters
Full-time PhD	3 years	At the end of the first 5 semesters
Full-time MPhil	2 years	At the end of the first 3 semesters
Part-time PhD	8 years	At the end of the first 12 semesters
Part-time PhD	6 years	At the end of the first 9 semesters
Part-time MPhil	4 years	At the end of the first 6 semesters

1.8.3 Application for extension of confirmation of registration would only be considered on medical grounds. Medical proof must be attached to the application for the approval of the DRC Chair.

1.8.4 Students failing to have their registration confirmed by the deadline will be de-registered from the Research Postgraduate programme immediately.

1.8.5 Confirmation of Registration consists of:

- submission of a written report;
- a presentation to the Confirmation Panel and other attendees (as appropriate) *; and
- an oral defence of the research proposal.

**The DRC can determine whether the presentation is open to the staff and students of the Department or not.*

2. RATIONALE, AIMS AND INTENDED LEARNING OUTCOMES OF THE PROGRAMME

2.1 University Overarching Aims of Research Degree Programmes

The research degree programmes are designed in such a way to enable the student to:

- acquire competence in research methods and scholarship; and
- display sustained independent effort and independent original thought.

The PhD programmes also target to produce academics, researchers or industrial R & D professionals.

2.2 Learning Outcomes for MPhil Programme of the Institution and Department of Aeronautical and Aviation Engineering

Institutional Learning Outcomes for MPhil programme	Intended Learning Outcomes of MPhil programme in Department of Aeronautical and Aviation Engineering
Research and Scholarship Excellence MPhil graduates of PolyU should demonstrate advanced competence in research methods, possess in-depth knowledge and skills in their area of study and attain the ability to apply their knowledge and act as leaders in analyzing and solving identified issues and problems in their area of study. They should also be able to disseminate/communicate effectively their research findings in publications, conferences and classrooms.	**Research and Scholarship Excellence** MPhil graduates of AAE should (1) demonstrate the ability to enhance and apply advanced knowledge to solve complex engineering problems; (2) develop the ability to disseminate the research outputs in a professional manner; and (3) prepare for advanced study (such as PhD) or for industry position.
Originality MPhil graduates of PolyU will be versatile problem solvers with good mastery of critical and creative thinking methodologies. They can generate practical and innovative solutions to problems in their area of study.	**Originality** MPhil graduates of AAE will be versatile problem solvers with good mastery of critical and creative thinking methodologies. They can generate practical and innovative solutions to problems in their area of AAE disciplines.
Lifelong Learning Capability MPhil graduates of PolyU will have an enhanced capability for continual professional development through inquiry and reflection on knowledge in their area of study.	**Lifelong Learning Capability** MPhil graduates of AAE will have an enhanced capability for continual professional development through inquiry and reflection on knowledge in the area of AAE disciplines.

2.3 Leaning Outcomes for PhD Programme of the Institution and Department of Aeronautical and Aviation Engineering

Institutional Learning Outcomes for PhD programme	Intended Learning Outcomes of PhD programme in Department of Aeronautical and Aviation Engineering
Research and Scholarship Excellence PhD graduates of PolyU should demonstrate state-of-the-art expertise and knowledge in their area of study, possessed superior competence in research methodologies and contribute as leaders in creating new knowledge through analysis, diagnosis and synthesis. They should also be able to disseminate/communicate their research ideas and findings effectively and efficiently in publications, conferences and classrooms.	**Research and Scholarship Excellence** PhD graduates of AAE should (1) exhibit the skills and knowledge to develop original ideas of significance in engineering science to analyze, understand and design intricate engineering problems; (2) develop the ability to disseminate and promote research outputs in a professional manner; and (3) prepare for academic or senior position in industry.
Originality PhD graduates of PolyU will be able to think out of the box. They will be innovative problem solvers with excellent mastery of critical and creative thinking methodologies. They will create original solutions to issues and problems pertaining to their area of expertise and the society in general.	**Originality** PhD graduates of AAE will be able to think out of the box. They will be innovative problem solvers with excellent mastery of critical and creative thinking methodologies. They will create original solutions to issues and problems pertaining in the area of AAE disciplines and the society in general.
Lifelong Learning Capability PhD graduates of PolyU will demonstrate the ability to engage in an enduring quest for knowledge and an enhanced capability for continual academic/professional development through self-directed research in their area of study.	**Lifelong Learning Capability** PhD graduates of AAE will demonstrate the ability to engage in an enduring quest for knowledge and an enhanced capability for continual academic/professional development through self-directed research in the area of AAE disciplines.

3. PROGRAMME STRUCTURE

3.1 University Coursework Requirements

Programme	Credit Requirements	Details	National Education Requirement#
MPhil Full-time and Part-time	9 credits + English Enhancement Subjects*	1 credit from Academic Integrity and Ethics/Ethics Subject + (0/3/5 credits) English Enhancement Subjects* + 2 credits from attending seminars + 6 credits from other subjects (no more than 3 credits from Guided-study subjects)	Non-credit bearing; complete an e-module on "Understanding China and the Hong Kong Special Administrative Region, P.R.C." and pass the assessment
PhD 3-year full-time/ 6-year part-time	15 credits + English Enhancement Subjects*	1 credit from Academic Integrity and Ethics/Ethics Subject + (0/3/5 credits) English Enhancement Subjects* + 3 credits from attending seminars + 2 credits from Practicum + 9 credits from other subjects (no more than 6 credits from Guided-study subjects)	
PhD 4-year full-time/ 8-year part-time	22 credits + English Enhancement Subjects*	1 credit from Academic Integrity and Ethics/Ethics Subject + (0/3/5 credits) English Enhancement Subjects* + 4 credits from attending seminars + 2 credits from Practicum + 15 credits from other subjects (no more than 9 credits from Guided-study subjects)	

Remark: The Ethics subject (HTI6081) was replaced by Academic Integrity and Ethics (AIE) subjects starting from the 2024/25 academic year.

* All research students admitted from the 2021/22 cohort are required to take the Research Language Skills Assessment (RLSA). Students' performance on the test will determine if they need to complete the University's English Enhancement Subjects and which subject(s) they should take. Here are the details:

(i) Students who receive Band 1 (both writing and speaking)
Be exempted from all English enhancement subjects.

(ii) Students who receive Band 2 or above (both writing and speaking)
Taking ENGL6016 "*Advanced Academic English for Research Students: Publishing and Presenting*" (3 credits)

(iii) Students who receive Band 3 or below
Taking ELC6011 "*Presentation Skills for Research Students*" (2 credits) and ELC6012 "*Thesis Writing for Research Students*" (3 credits)

Note: Band 1 is the highest grade and Band 5 is the lowest.

RPg students from the 2022/23 cohort onwards are required to complete the National Education Requirement before thesis submission as a graduation requirement.

3.2 Programme Structure: Coursework credit and thesis requirements

3.2.1 Coursework credits of MPhil

Mode and level	Subject (number of credits)	Compulsory/ Elective	Credit
MPhil 2-year Full-time/ 4-year Part-time	ENGL6016 Advanced Academic English for Research Students: Publishing and Presenting (3) ELC6011 Presentation Skills for Research Students (2) ELC6012 Thesis Writing for Research Students (3)	Compulsory	0/3/5*
	Academic Integrity and Ethics (AIE)/Ethics Subject (1)	Compulsory	1#
	AAE6001 Research Seminar I (1) AAE6002 Research Seminar II (1)	Compulsory	2
	AAE6201 Advanced Computational Fluid Dynamics Materials (3); or AAE6202 Mathematics and Computational Methods for Aviation Engineering Applications Materials (3); or AAE6203 Mathematics for Aircraft Structure, Guidance, Navigation, and Control (3)	Compulsory	3
	AAE6101 Advanced Aerospace Structures and Materials (3); or AAE6102 Satellite Communication and Navigation (3); or AAE6103 Advanced Control Theory for Aircraft (3); or AAE6104 Advanced High Speed Propulsion (3); or AAE6105 Advanced Aerodynamics (3); or AAE6106 Networked Transportation and Air Traffic Systems (3)	Compulsory	3
			Total: 9 Credits

* All research students admitted from the 2021/22 cohort are required to take the Research Language Skills Assessment (RLSA). Students' performance on the test will determine if they need to complete the University's English Enhancement Subjects and which subject(s) they should take.

All RPg students admitted in and after the 2024/25 cohort are required to pass a compulsory one-credit subject on AIE within their first year of study. Students may choose one AIE subject from the subject pool that best suits their research studies. The subject pool is subject to review and change.

3.2.2 Coursework credits of 3-year full-time/6-year part-time PhD

Mode and level	Subject (number of credits)	Compulsory/ Elective	Credit
PhD 3-year Full-time/ 6-year Part-time	ENGL6016 Advanced Academic English for Research Students: Publishing and Presenting (3) ELC6011 Presentation Skills for Research Students (2) ELC6012 Thesis Writing for Research Students (3)	Compulsory	0/3/5*
	Academic Integrity and Ethics (AIE)/Ethics Subject (1)	Compulsory	1#
	AAE6001 Research Seminar I (1) AAE6002 Research Seminar II (1) AAE6003 Research Seminar III (1)	Compulsory	3
	AAE6005 Practicum I (1) AAE6006 Practicum II (1)	Compulsory	2
	AAE6201 Advanced Computational Fluid Dynamics Materials (3); or AAE6202 Mathematics and Computational Methods for Aviation Engineering Applications Materials (3); or AAE6203 Mathematics for Aircraft Structure, Guidance, Navigation, and Control (3)	Compulsory	3
	AAE6101 Advanced Aerospace Structures and Materials (3); or AAE6102 Satellite Communication and Navigation (3); or AAE6103 Advanced Control Theory for Aircraft (3); or AAE6104 Advanced High Speed Propulsion (3); or AAE6105 Advanced Aerodynamics (3); or AAE6106 Networked Transportation and Air Traffic Systems (3)	Compulsory	3
	Free elective subjects offered to research degree students within or outside PolyU at level 6 or above, subject to the approval of the chief supervisor.	Elective	3
Total: 15 Credits			

* All research students admitted from the 2021/22 cohort are required to take the Research Language Skills Assessment (RLSA). Students' performance on the test will determine if they need to complete the University's English Enhancement Subjects and which subject(s) they should take.

All RPg students admitted in and after the 2024/25 cohort are required to pass a compulsory one-credit subject on AIE within their first year of study. Students may choose one AIE subject from the subject pool that best suits their research studies. The subject pool is subject to review and change.

3.2.3 Coursework credits of 4-year full-time/8-year part-time PhD

Mode and level	Subject (number of credits)	Compulsory/ Elective	Credit
PhD 4-year Full-time/ 8-year Part-time	ENGL6016 Advanced Academic English for Research Students: Publishing and Presenting (3) ELC6011 Presentation Skills for Research Students (2) ELC6012 Thesis Writing for Research Students (3)	Compulsory	0/3/5*
	Academic Integrity and Ethics (AIE)/Ethics Subject (1)	Compulsory	1#
	AAE6001 Research Seminar I (1) AAE6002 Research Seminar II (1) AAE6003 Research Seminar III (1) AAE6004 Research Seminar IV (1)	Compulsory	4
	AAE6005 Practicum I (1) AAE6006 Practicum II (1)	Compulsory	2
	AAE6201 Advanced Computational Fluid Dynamics Materials (3); or AAE6202 Mathematics and Computational Methods for Aviation Engineering Applications Materials (3); or AAE6203 Mathematics for Aircraft Structure, Guidance, Navigation, and Control (3)	Compulsory	3
	AAE6101 Advanced Aerospace Structures and Materials (3); or AAE6102 Satellite Communication and Navigation (3); or AAE6103 Advanced Control Theory for Aircraft (3); or AAE6104 Advanced High Speed Propulsion (3); or AAE6105 Advanced Aerodynamics (3); or AAE6106 Networked Transportation and Air Traffic Systems (3)	Compulsory	3
	Free elective subjects offered to research degree students within or outside PolyU at level 6 or above, subject to the approval of the chief supervisor.	Elective	9
			Total: 22 Credits

* All research students admitted from the 2021/22 cohort are required to take the Research Language Skills Assessment (RLSA). Students' performance on the test will determine if they need to complete the University's English Enhancement Subjects and which subject(s) they should take.

All RPg students admitted in and after the 2024/25 cohort are required to pass a compulsory one-credit subject on AIE within their first year of study. Students may choose one AIE subject from the subject pool that best suits their research studies. The subject pool is subject to review and change.

3.3 Grading

All of the subjects taken will be assigned a grade and a numeral grade point is assigned to each subject grade, as follows:

Grade	Grade Point	Description
A+	4.3	Excellent
A	4.0	
A-	3.7	
B+	3.3	Good
B	3.0	
B-	2.7	
C+	2.3	Satisfactory
C	2.0	
C-	1.7	
D+	1.3	Pass
D	1.0	
F	0	Failure

3.4 Thesis Requirements

3.4.1 On completion of an approved programme of study and research, students must submit a thesis and defend it in an oral examination.

3.4.2 MPhil and PhD theses shall consist of the student's own account of his/her investigations and be an integrated and coherent piece of work.

3.4.3 Students are required to complete the coursework credit requirements before submission of their thesis for examination. All MPhil and PhD students need to complete their coursework with a qualifying GPA of 2.7 or above before submission of their thesis for examination.

3.5 Relationship between the Programme Outcomes and Subjects

3.5.1 The curriculum map below illustrates the relationship between the programme learning outcomes and the subjects of MPhil:

Programme Outcomes of MPhil	**Thesis**	**Academic Integrity and Ethics (AIE)/Ethics Subject**	**AAE6001 – AAE6002** Research Seminar I - IV	**AAE6201** Advanced Computational Fluid Dynamics	**AAE6202** Mathematics and Computational Methods for Aviation Engineering Applications	**AAE6203** Mathematics for Aircraft Structure, Guidance, Navigation, and Control	**AAE6101** Advanced Aerospace Structures and Materials	**AAE6102** Satellite Communication and Navigation	**AAE6103** Advanced Control Theory for Aircraft	**AAE6104** Advanced High Speed Propulsion	**AAE6105** Advanced Aerodynamics	**AAE6106** Networked Transportation and Air Traffic Systems
To demonstrate the ability to enhance and apply advanced knowledge to solve complex engineering problems.	√		√	√	√	√	√	√	√	√	√	√
To develop the ability to disseminate the research outputs in a professional manner.	√		√	√	√	√	√	√	√	√	√	√
To prepare for advanced study (such as PhD) or for industry position.	√	√	√	√	√	√	√	√	√	√	√	√
To be versatile problem solvers with good mastery of critical and creative thinking methodologies. They can generate practical and innovative solutions to problems in their area of AAE disciplines.	√	√	√	√	√	√	√	√	√	√	√	√
To have an enhanced capability for continual professional development through inquiry and reflection on knowledge in the area of AAE disciplines.	√	√	√	√	√	√	√	√	√	√	√	√

3.5.2 The curriculum map below illustrates the relationship between the programme learning outcomes and the subjects of PhD:

Programme Outcomes of PhD			**AAE6001 – AAE6004**	**AAE6005 – AAE6006**	**AAE6201**	**AAE6202**	**AAE6203**	**AAE6101**	**AAE6102**	**AAE6103**	**AAE6104**	**AAE6105**	**AAE6106**	
	Thesis	**Academic Integrity and Ethics (AIE)/Ethics Subject**	**Research Seminar I - IV**	**Practicum I - II**	**Advanced Computational Fluid Dynamics**	**Mathematics and Computational Methods for Aviation Engineering Applications**	**Mathematics for Aircraft Structure, Guidance, Navigation, and Control**	**Advanced Aerospace Structures and Materials**	**Satellite Communication and Navigation**	**Advanced Control Theory for Aircraft**	**Advanced High Speed Propulsion**	**Advanced Aerodynamics**	**Networked Transportation and Air Traffic Systems**	**Free elective subjects**
To exhibit the skills and knowledge to develop original ideas of significance in engineering science to analyze, understand and design intricate engineering problems.	√		√	√	√	√	√	√	√	√	√	√	√	√
To develop the ability to disseminate and promote research outputs in a professional manner.	√		√	√	√	√	√	√	√	√	√	√	√	√
To prepare for academic or senior position in industry.	√	√	√	√	√	√	√	√	√	√	√	√	√	√
To be able to think out of the box and be innovative problem solvers with excellent mastery of critical and creative thinking methodologies and create original solutions to issues and problems pertaining in the area of AAE disciplines and the society in general.	√	√	√	√	√	√	√	√	√	√	√	√	√	√
To be able to demonstrate the ability to engage in an enduring quest for knowledge and an enhanced capability for continual academic/professional development through self-directed research in the area of AAE disciplines.	√	√	√	√	√	√	√	√	√	√	√	√	√	√

4. REGULATIONS AND ADMINISTRATIVE PROCEDURES

The academic regulations governing the operation and assessment of all research degree programmes can be found in the "Research Postgraduate Student Handbook" available at https://www.polyu.edu.hk/gs/rpghandbook/section1/. Some regulations are extracted and presented in the following sections.

4.1 GPA Requirement

4.1.1 All MPhil and PhD students need to complete their coursework with a qualifying GPA of 2.7 or above before submission of their thesis for examination.

4.1.2 The qualifying GPA is the result of the accumulated value of the subject grade point multiplied by the subject credit value divided by the total credit value for those subjects. It is computed as follows:

$$\text{Qualifying GPA} = \frac{\sum \text{Subject Grade Point x Subject Credit Value}}{\sum \text{Subject Credit Value}}$$

Where

a) credits earned from all compulsory subjects, except those assessed with a "Pass" or "Fail" grade (such as Practicum and Seminars), will be included in the calculation of Qualifying GPA;

b) The best grade point will be chosen for the calculation of the Qualifying GPA for credits earned for elective subjects;

c) the following subjects will be excluded from the calculation of Qualifying GPA:
   - (i) exempted subjects
   - (ii) ungraded subjects
   - (iii) incomplete subjects
   - (iv) subjects for which credit transfer has been approved, but without any grade assigned
   - (v) subjects from which a student has been allowed to withdraw (i.e. those with the grade "W")

4.1.3 Students may take more subjects than required in order to improve their GPA or in order to strengthen their knowledge.

4.1.4 Subjects taken after submission of the thesis will not contribute to the qualifying GPA.

4.1.5 Students may only retake a subject which they have failed (i.e. Grade F or U), and the number of retakes is restricted to a maximum of two. (i.e. a maximum of three attempts for each subject is allowed).

4.1.6 The second retake of a failed subject requires the approval of the Faculty/School Board Chairman.

4.1.7 Students who have failed a compulsory subject after two retakes may be deregistered.

4.1.8 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.

4.1.9 A student may be exempted from taking a compulsory subject if s/he has successfully completed a similar subject previously in another programme or if s/he already has the associated knowledge/skills via work experience, etc. Subject exemption is decided by the DRC but students can also apply for it. In order to satisfy the credit requirement, it is necessary for the student to take another subject, to be approved by the Chief Supervisor, in place of the exempted subject. Such subject will be considered as an elective subject.

4.1.10 The grades obtained by research students on all subjects will be considered and endorsed by the Subject Assessment Review Panel (SARP) of the department offering the subject.

4.1.11 Unless specified otherwise, University's General Assessment Regulations (GAR) for credit-based programmes should also apply to the RPg programme.

4.2 Credit Transfer

4.2.1 *Credits which have already been used to contribute to a previous award should not be transferred to contribute to the MPhil/PhD award with the following exceptions:*

(a) All returning students will be allowed to transfer the grade obtained in the subject "HTI6081 Ethics: Research, Professional & Personal Perspectives" to the new RPg programme regardless of its level, provided that the grade was attained within five years of re-admission;

(b) All 3-year full-time/6-year part-time PhD students will be allowed to transfer one credit from his/her previous attendance in seminars.

4.2.2 *Transfer of credits of subjects at postgraduate level earned from recognised previous studies*

Applications for the transfer of credits from recognised previous studies will be endorsed by the DRC with justifications and approved by the HoD. Only credits gained from subjects at postgraduate level that have not been used to contribute to an award will be acceptable for transfer. The validity period for such credit transfer for research degree programmes is defined to be eight years from the year of attainment at the time of admission. The maximum number of credits transferrable for different categories of students is:

No more than 50% of the credit requirement of the programme disregarding whether the credits were earned within or outside PolyU.

4.2.3 *Transfer of credits taken at postgraduate level outside PolyU after admission*

Taking subjects outside PolyU during the student's research postgraduate studies in PolyU with prior approval is regarded as an acceptable way to gain credits. The student should submit an application (Form GSB/48), via his/her Chief Supervisor, to the Department to initiate the transfer. The application will be endorsed by the DRC Chair and approved by the HoD.

The transfer of grades will be in accordance with the grading table below and the grade gained will be included in the calculation of the qualifying GPA:-

Grade Obtained Outside PolyU after Admission	Grade Transferred to PolyU	Grade Point	Interpretation
A+	A+	4.3	Excellent
A	A	4.0	
A-	A-	3.7	
B+	B+	3.3	Good
B	B	3.0	
B-	B-	2.7	
C+	C+	2.3	Satisfactory
C	C	2.0	
C-	C-	1.7	
D+	D+	1.3	Pass
D	D	1.0	
F	F	0.0	Failure

4.2.4 *Minimum number of credits with a letter grade*

An MPhil student must complete a least three credits with a letter grade and a PhD student at least six to allow for a meaningful calculation of the qualifying GPA.

4.3 Subject Registration

4.3.1 Research students will register for subjects at the same time as other students. Whether a research student can add a subject will depend on the availability of vacancies in the subject and the approval of the Chief Supervisor. Similarly, a student can drop a subject if it is approved by the Chief Supervisor. The student will perform the subject registration/deletion via the eStudent platform.

4.3.2 Dropping of subjects after the add/drop period is not allowed. If a student has a genuine need to drop a subject after the add/drop period, it will be handled as withdrawal of subject. The student should submit an application for withdrawal of subject to the Chief Supervisor and Subject Lecturer for approval. The withdrawn subject will be reported in the Assessment Result Notification and Transcript of Studies although it will not be counted in the calculation of QGPA.

4.3.3 Application for withdrawal of subject will not be entertained after the commencement of examination period.

4.4 Guided-study Subjects

Guided-study subjects are those in which normally no lecturing is done and in which the student is required by the subject supervisor to read specified monographs and journal publications; the student and subject supervisor frequently meet to discuss the progress made by the student in the subject. The weighting assigned for coursework should be less than the weighting assigned for the examination. Coursework normally consists of assignments and presentations. Examination is compulsory and normally includes both written and oral. At the end of the semester, the student is examined by the subject supervisor and another staff member who is knowledgeable about the topic. A grade will be given in the same way as for regular taught subjects in Form GSB/27. All Guided-study subjects will be at level 6 and their code number will be between 6800 and 6999.

4.5 Progress Report

All RPg students will be assessed by their academic departments annually. Each RPg student is required to submit a progress report via the Annual Research Monitoring System (Research Student) (ARMS) and will be allowed to proceed with his/her studies subject to satisfactory performance as judged by DRC.

The reporting requirements will be announced at the appropriate time each academic year.

If an RPg student fails to submit his/her progress report by the stipulated deadline, the DRC shall convene a meeting to consider whether he/she should be de-registered as a result of unsatisfactory progress.

The DRC shall, on receipt of the report, evaluate and assess the progress of the RPg student. If an RPg student's progress is unsatisfactory, the DRC is required to give details of the proposed remedial action and consider carefully whether the student should be provided with stipend and/or cash awards for the following 12 months. The case, together with the DRC's recommendations, shall be submitted to the GSB Chair for decision. An RPg student may be deregistered if his/her progress is rated unsatisfactory for two consecutive times.

4.6 Deregistration

4.6.1 A student may be deregistered in the following circumstances:

a) if his/her progress is considered unsatisfactory; or
b) if the maximum period of study is exceeded; or
c) if his/her thesis is deemed unsatisfactory.

4.6.2 A recommendation for deregistration as a result of unsatisfactory progress may be proposed by the Chief Supervisor and approved by the DRC. The DRC Chairman cannot take action by himself/herself on this issue.

4.6.3 A recommendation for deregistration made by the Board of Examiners (BoE) shall be approved or rejected by the GSB.

5. SUBJECT SYLLABI

The syllabi of subjects are presented in the subsequent pages.

AAE6001-4	Research Seminar I, II, III and IV
AAE6005-6	Practicum I and II
AAE6101	Advanced Aerospace Structures and Materials
AAE6102	Satellite Communication and Navigation
AAE6103	Advanced Control Theory for Aircraft
AAE6104	Advanced Propulsion Technology
AAE6105	Advanced Aerodynamics
AAE6106	Networked Transportation and Air Traffic Systems
AAE6201	Advanced Mathematics of Physics and Modern Engineering
AAE6202	Mathematics and Computational Methods for Aviation Engineering Applications
AAE6203	Mathematics for Aircraft Structure, Guidance, Navigation, and Control

Subject Description Form

Subject Code	AAE6001 AAE6002 AAE6003 AAE6004
Subject Title	Research Seminar I Research Seminar II Research Seminar III Research Seminar IV
Credit Value	One credit per subject
Level	6
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	To let the students to meet with leaders and senior researchers of different research fields and broaden their exposure to and knowledge of latest research and technology.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. develop substantial fundamentals and state-of-art technologies in aeronautical and aviation engineering discipline. b. broaden their exposure to other disciplines so as to help developing in- depth understanding and specialize one or more research methodologies and techniques in aeronautical and aviation engineering discipline. c. develop the ability to pose scientific problems in aeronautical and aviation engineering. d. develop the ability to disseminate and promote research outputs in a professional manner.
Subject Synopsis/ Indicative Syllabus	To be arranged in line with the departmental seminars.

Teaching/Learning Methodology	Full-time students are required to attend at least 10 research seminars per year, in addition to workshops/conferences, and to submit a report, to the Chief Supervisor, of no less than 1,500 words (excluding references) on one of the attended seminars every year. Part-time students are required to attend at least 10 research seminars per two years, in addition to workshops/conferences, and to submit a report, to the Chief Supervisor, of no less than 1,500 words (excluding references) on one of the attended seminars once every two years. The research seminars may or may not be organized by the host department and are expected to last not less than an hour each. Students should discuss the relevance and suitability of the seminars with their Chief Supervisors before attending the seminars. The scope of a seminar attended by students should have significant research value to their study, enabling them to keep abreast of the latest discovery and enhancing their knowledge in the field(s). Chief Supervisors are required to assess the report (with a pass or failure grade). Students who failed to submit a report to the satisfaction of their Chief Supervisor are required to make a re-submission until a pass grade is obtained. The Chief Supervisor has to pass the record of the seminars attended by their students and the report with a pass grade to the office concerned for custody at the end of each academic year/semester. The total credits need to be earned by students are listed as follows: 2-year full-time/4-year part-time MPhil: 2 credits 3-year full-time/6-year part-time PhD: 3 credits 4-year full-time/8-year part-time PhD: 4 credits Full-time students are expected to complete one credit in a year while Part-time students are expected to complete one credit in two years.
Assessment Methods in Alignment with Intended Learning Outcomes	At the end of the semester, students are required to submit a report of no less than 1,500 words on one of the attended seminars. Chief Supervisors are required to assess the report and an overall assessment grade of Pass of Fail will be given.
Reading List and Reference	N/A

Oct 2022

Subject Description Form

Subject Code	AAE6005 AAE6006
Subject Title	Practicum I Practicum II
Credit Value	One credit per subject
Level	6
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	This subject is compulsory for PhD students. Aims to provide teaching experience and training opportunity to research students in order to widen their exposure for the development of their academic career.
Intended Learning Outcomes	a. To develop substantial fundamentals and state-of-art technologies in aeronautical and aviation engineering discipline. b. To broaden their exposure to other disciplines so as to help developing in-depth understanding and specialize one or more research methodologies and techniques in aeronautical and aviation engineering discipline. c. To develop the ability to pose scientific problems in aeronautical and aviation engineering. d. To develop the ability to disseminate and promote research outputs in a professional manner.
Subject Synopsis/ Indicative Syllabus	The nature of the training shall be related to teaching and professional services, and be relevant to the formal programme of study.

Teaching/Learning Methodology	As part of the programme requirement, all PhD students, irrespective of funding source and mode of study, **must** complete two training credits before graduation. To earn one credit, students will be required to engage in teaching supporting activities/professional service assigned by the HoD/DoS or his/her delegate for 6 hours/week in any 13-week semester. Students are allowed to complete these two credits any time before they graduate. They can choose to complete these two credits in two different semesters or within the same semester, subject to the approval of the Chief Supervisor. Stipend recipients are NOT allowed to fulfill part of their departmental training requirement through the completion of these compulsory training credits. For students, who are required to undertake teaching supporting activities, are required to complete the training programmes organised by the Educational Development Centre (EDC), English Language Centre/Chinese Language Centre (as required) before the commencement of any teaching supporting activities.	
Assessment Methods in Alignment with Intended Learning Outcomes	At the end of the training session, an assessment report on the performance of the relevant student(s), with details of activities undertaken and an overall assessment grade of Pass or Fail.	
Student Study Effort Expected	The duties normally include: - assistance with running of tutorials/seminars/workshops, and/or supervision of laboratory or practical work; - assistance with supervising Final Year Project of undergraduates; - assistance with grading of assignments, excluding tests and examination papers; - assistance with preparation of material and resources for supporting teaching and learning; - assistance with invigilation of University degree examinations; and - assistance with other teaching and administrative duties, as deemed appropriate by the department.	6 hours per week in any 13-week semester.
Reading List and References	To be advised by the supervisor.	

Aug 2022

Subject Description Form

Subject Code	AAE6101
Subject Title	Advanced Aerospace Structures and Materials
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	1. To provide students with tools that are needed to carry out stress and failure analysis of aerospace structural components. 2. To provide students with an overview of the advanced materials that are used for aerospace vehicles. 3. To provide students with an overview of the non-destructive testing techniques that are used to ensure the safe operation of aerospace vehicles.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. perform stress analysis for typical aerospace structural components using both analytical methods and computational tools; b. determine the optimal materials for different aerospace structural components; c. choose the non-destructive testing methods that best suit certain aerospace structural components; d. recognize the frontier of research in aerospace structures and materials.
Subject Synopsis/ Indicative Syllabus	**Thin-wall structures** – wings; fuselages; empennages; thin-wall approximation. **Metallic materials** – material chemistry; forming; light-weight alloys; superalloys. **Composite materials** – rule of mixtures; laminated plate theory; fabrication; functional composite materials. **Analysis of aerospace structural components** – bending; shear; torsion; combined loading; stress; angle of twist; deflection; fatigue; fracture. **Non-destructive testing** – ultrasonic testing; piezoelectric transducer; guided wave testing; phased array scanning; structural health monitoring. **Finite element analysis** – 1D elements; 2D elements; 3D elements; high-order elements; static analysis; dynamic analysis.

Teaching/Learning Methodology	Lectures and tutorials are used to deliver the fundamental knowledge and research elements in relation to aircraft structures and materials.

Teaching/Learning Methodology	Intended subject learning outcomes			
	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 (Please tick as appropriate)			
		a	b	c	d
1. In-class tests and/or take-home assignments	40%	√	√	√	√
2. Final 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

An examination is adopted to assess students on the overall understanding and the ability to apply the concepts. It is supplemented by Assignments and Quizzes. The Assignments and Quizzes can provide timely feedback to both lecturers and students on various topics of the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Self-Study	40 Hrs.
▪ Completion of assignments	40 Hrs.
Total student study effort	119 Hrs.

Reading List and References	1. Eringen, A. C., & Suhubi, E. S. (2013). *Linear theory*. Academic press. 2. Fu, Y. B., & Odgen, R. W. (2002). *Nonlinear Elasticity: Theory and Applications*. Cambridge UK: Cambridge University Pressing. 3 Megson, T.H.G. *Aircraft structures for engineering students*. Elsevier. Latest edition. 4. Gibson, R. F., *Principles of Composite Material Mechanics*. McGraw-Hill, latest edition. 5. Chandrupatla, T. R., & Belegunda, A. D. (2011). *Introduction to Finite Elements in Engineering* (4th ed.). Pearson.

Jun 2024

Subject Description Form

Subject Code	AAE6102
Subject Title	Satellite Communication and Navigation
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	To provide students with fundamental scientific aspects of satellite communication and navigation, including signal processing, position, velocity and timing estimation, and future development of satellite navigation.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) Understand the scientific theoretical aspects in satellite navigation and communication. b) Conduct the positioning estimation using raw data provided by a receiver of global positioning system GPS. c) Conduct analysis of the signal processing used in the receiver for satellite navigation and communication. d) Apply the satellite navigation solutions to different situations of engineering context and professional practice.
Subject Synopsis/ Indicative Syllabus	**Introduction of Guidance, Navigation, and Control –** the role of GNC in autonomous systems, the relationship between navigation, and guidance and control, positioning to navigation. **Introduction of GNSS –** system architecture, global coordinate systems, time reference and GPS time system, radio frequency spectrum of GNSS signal, future plan of GNSS. **Receiver signal processing –** Digtal signal processing, GPS signal acquisition, GPS Signal tracking, delay lock loop and phase lock loop, decode GPS navigation data. **Position, velocity and timing estimation** – pseudo range, linear estimation for GPS position, weighted least square, dilution of precision, velocity estimation, carrier smoothing. **GNSS measurement and error source** – control segment error, signal propagation modeling errors, measurement error, user range error URE. **Improved GNSS navigation** – differential GNSS, real-time kinematics RTK, GPS/INS integration, Kalman filter, multipath mitigation. **GNSS navigation in civil aviation use** – accuracy and integrity, receiver autonomous integrity monitoring RAIM, satellite based augmentation system

	SBAS, ground based augmentation system GBAS. **Challenges and threats of GNSS receiver** – Radio frequency interference spoofing, none-light-of-sight (NLOS) reception
Teaching/Learning Methodology	1. The teaching and learning methods include lecture/tutorial/laboratory sessions, homework assignments and mini research project. 2. Technical/scientific examples and problems are raised and discussed in class/tutorial sessions. 3. The mini research project which includes literature review, research methodology, and experimental/numerical data analysis is used to provide students a guided study with the basic research elements.

Teaching/Learning Methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lecture	√	√	√	√
2. Tutorial	√	√	√	
3. Homework assignment	√	√	√	√
4. Laboratory	√	√		√
5. Mini research project	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	10%	√	√	√	
3. Mini research project report	20%	√	√	√	√
4. Laboratory report	10%	√	√		√
5. Examination	40%	√	√	√	√
Total	100 %				

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

Overall Assessment:

0.40 x End of Subject Examination + 0.6 x Continuous Assessment

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

	communication. The continuous assessment consists of four components: homework assignments, test, mini research project report and laboratory 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. In particular, the mini research project can provide students a guided study with the basic research elements. 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.
	▪ Tutorials and Laboratory Works	6 Hrs.
	Other student study effort:	
	▪ Literature Review and Self-learning	30 Hrs.
	▪ Assignments	20 Hrs.
	▪ Mini-project and Laboratory Reports	22 Hrs.
	Total student study effort	111 Hrs.
Reading List and References	1. Misra, P. and P. Enge, *Global Positioning System: Signals, Measurements, and Performance*. Lincoln, MA 01773 Ganga-Jamuna Press, Latest Edition. 2. Kaplan, E. and C. Hegarty, *Understanding GPS: principles and applications*. Artech House Publishers, Latest Edition. 3. Groves, P.D., *Principles of GNSS, Inertial, and Multi-Sensor Integrated Navigation Systems (GNSS Technology and Applications)*, Artech House Publishers, Latest Edition.	

Jun 2020

Subject Description Form

Subject Code	AAE6103
Subject Title	Advanced Control Theory for Aircraft
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	To provide students with theories of advanced flight control including linear and nonlinear analysis and control methodologies, backstepping, feedback linearization, sliding mode control, adaptive control.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) possess the essential knowledge and skills in advanced flight control theories. b) design flight controllers which can deal with real-life model uncertainties or disturbances. c) analyze the closed-loop stability of the designed flight controller. d) apply the advanced control theories to control the aircraft.
Subject Synopsis/ Indicative Syllabus	**Introduction of Flight control –** nonlinearities, model uncertainties, wind disturbances. **Linear control and analysis –** state-space representation, state-space solutions, stability, controllability, observability, state feedback design, output feedback design. **Nonlinear control and analysis –** Lyapunov's indirect and direct methods, invariant set theorem, Barbalat's lemma. **Backstepping** – stabilization by backstepping. **Input-output linearization** – asymptotic tracking by input-output linearization, normal form and zero dynamics. **Sliding control** – sliding surface, disturbance rejection, robustness. **Adaptive control** – adaptive control for aircrafts, adaptive control for Euler-Lagrange systems.

Teaching/Learning Methodology

1. The teaching and learning methods include lecture/tutorial sessions, homework assignments and mini project.

2. Scientific examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lecture/Tutorial	√	√	√	√
2. Homework assignment	√	√	√	√
3. Mini project	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

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

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

Overall Assessment:

0.5 x End of Subject Examination + 0.5 x Continuous Assessment

The continuous assessment consists of two components: homework assignments and an in-class test. Homework assignments 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 learned. The in-class test serves to evaluate the students' capability of analyze the performance of complex aircraft systems using linear control technique, Lyapunov and Lyapunov-like methodologies.

The final examination is used to assess the knowledge acquired by the students for understanding, analyzing, and solving the control problems of aircraft systems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected	Class contact:	
	▪ Lecture	39 Hrs.
	Other student study effort:	
	▪ Literature Review and Self-learning	30 Hrs.
	▪ Assignments	30 Hrs.
	▪ Software design (take home exercises)	12 Hrs.
	Total student study effort	111 Hrs.
Reading List and References	1. H. K. Khalil, *Nonlinear Systems*. 2002, Third Edition 2. J.J. Slotine and W. Li, *Applied Nonlinear Control*, Prentice Hall Englewood Cliffs, 1991. 3. C.-T. Chen, *Linear Systems Theory and Analysis (3rd Edition)*, Oxford University Press, 1999. 4. E. Shtessel, Y., Edwards, C., Fridman, L., Levant, A., *Sliding Mode Control and Oservation*. 2014: Springer, Latest Edition 5. Mclean, D. *Automatic Flight Control Systems*, Prentice Hall International, Latest Edition.	

Feb 2024

Subject Description Form

Subject Code	AAE6104
Subject Title	Advanced High Speed Propulsion
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Fundamental knowledge in gas turbine technology and thermodynamics as well as compressible flow.
Objectives	To provide students with in-depth knowledge in advanced high speed propulsion.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand and analyze the requirements for high speed propulsion and the system differences with the low speed gas turbines. b. Understand and analyze the operations and the corresponding cycle analysis for various high speed propulsion engines. c. Apply the advanced knowledge in high speed propulsion through a research project.
Subject Synopsis/ Indicative Syllabus	1. High speed flight missions, classification of systems, mission analysis, types of high speed propulsion systems. 2. Combustion – constant area and constant pressure combustors, supersonic combustion, equilibrium chemistry, adiabatic flame temperature. 3. Nozzles – Quasi-one-dimensional isentropic flow, nozzle operation, conditions for maximum thrust, nozzle performance. 4. Inlets/Compression Systems – inlet types, inlet starting, analysis of different shock inlets and isentropic spike inlets. 5. Ramjets/Scramjets: Cycle analysis, 1-D internal flow analysis, performance calculation. 6. Turbine-Based Systems for High Speed Flight: Cycle analysis, water/fluid injection, afterburning, turboramjets, performance calculations. 7. Oblique Detonation Engines: Principles of operation, performance analysis. 8. Experimental methods for hypersonic propulsion testing: Impulse facilities, similitudes and experimental techniques for measurements.

Teaching/Learning Methodology	1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, and design project. 2. Technical/scientific examples and problems are raised and discussed in class/tutorial sessions. 3. Advanced knowledge in rocket propulsion will be applied through a research project.

Teaching/Learning Methodology	**Intended subject learning outcomes**		
	a	b	c
1. Lecture	√	√	√
2. Tutorial	√	√	√
3. Homework assignments/tests	√	√	
4. Research 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. Homework assignment	20%	√	√	
2. Test	20%	√	√	
3. Research project	35%	√	√	√
4. Examination	25%	√	√	√
Total	100 %			

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

Overall Assessment:

0.25 x End of Subject Examination + 0.75 x Continuous Assessment

The continuous assessment consists of three components: homework assignments, tests and a design project. Homework assignments and tests 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 research project requires extensive research in the most updated high speed propulsion technology and the applications of these advanced technology to possible implementation.

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.
	▪ Tutorials	6 Hrs.
	Other student study effort:	
	▪ Literature Review and Self-learning	26 Hrs.
	▪ Assignments	50 Hrs.
	Total student study effort:	115 Hrs.
Reading List and References	1. Curran, E. T. and Murthy, S.N.B., Scramjet Propulsion, latest edition 2. Murthy, S.N.B, Developments in High-Speed Propulsion, latest edition 3. Heiser, W.H. and Pratt, D. T., Hypersonic Airbreathing Propulsion, latest edition. 4. Segal, C., The Scramjet Engine, Cambridge University Press, latest edition 5. Sforza, P.M., Theory of Aerospace Propulsion, latest edition.	

Oct 2021

Subject Description Form

Subject Code	AAE6105
Subject Title	Advanced Aerodynamics
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	1. To provide students with knowledge in compressible aerodynamics. 2. To develop students' capability in aerodynamic analysis of canonical geometries, 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. b. Gain comprehensive understanding of compressible flows over canonical geometries, airfoils and wings. c. Get familiar with flow physics involved in practical applications including boundary-layer flow, flow separation and shock-wave/boundary-layer interactions. d. Be exposed to state-of-the-art research advances.
Subject Synopsis/ Indicative Syllabus	**One-Dimensional and Quasi-One-Dimensional Flows** – Normal Shock Relations; One-Dimensional Flow with Heat Addition; One-Dimensional Flow with Friction; Area-Velocity Relation; Nozzles and Diffusers. **Oblique Shock and Expansion Waves** – Oblique Shock Relations; Shock Polar; Pressure-Deflection Diagrams; Shock Interactions; Conical Flow; Prandtl-Meyer Expansion Waves. **Linearized Flow** – Velocity Potential Equation; Linearized Subsonic Flow; Compressibility Corrections; Linearized Supersonic Flow. **Transonic and Hypersonic Flows** – Full Velocity Potential Equation; Newtonian Theory; Mach Number Independence; Hypersonic Small-Disturbance Equations; Statistical Thermodynamics; Kinetic Theory; High-Temperature Gas Dynamics. **Boundary-Layer Flow** – Boundary-Layer Equations; Self-Similar Solutions; Von Kármán Momentum Integral; Boundary-Layer Transition; Linear Stability Theory; Turbulent Boundary Layer; Turbulence Modeling; Hypersonic Viscous Interactions; Shock-Wave/Boundary-Layer Interactions.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments and case study report and presentation.
2. Technical/scientific examples and problems are raised and discussed in class/tutorial sessions.
3. Case study report and presentation will be applied to provide students a guided study with the basic research elements, including literature review, research methodology, experimental/numerical data analysis and presentation skill.

Teaching/Learning Methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lecture	√	√	√	√
2. Tutorial	√	√	√	
3. Homework assignment	√	√	√	
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 assignment	20%	√	√	√	
2. Test	20%	√	√	√	√
3. Case study report and presentation	20%	√	√	√	√
4. Examination	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 and 40% examination.
2. The continuous assessment consists of homework assignment, tests and case study report and presentation. They are aimed at evaluating the progress of students' study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, enhancing the integration of the knowledge learnt and training students' research skills.
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	25 Hrs.
	▪ Case study report and presentation	25 Hrs.
	Total student study effort:	122 Hrs.
Reading List and References	1. Anderson J. D., Fundamentals of Aerodynamics. McGraw-Hill, latest edition. 2. Anderson J. D., Modern Compressible Flow: With Historical Perspective. McGraw-Hill, latest edition. 3. Bertin J. J. and Cummings R. M., Aerodynamics for Engineers. Pearson, latest edition.	

Jun 2020

Subject Description Form

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Subject Code	AAE6106
Subject Title	Networked Transportation and Air Traffic Systems
Credit Value	Three credit per subject
Level	6
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	This subject will provide students with 1. Classical and modern development in graph theory and networked transportation with applications to urban and air transportation; 2. The knowledge to solve the networked transportation problem; and 3. The ability to analyse the efficiency and effectiveness of transportation network and produce sensible and actionable insight and strategies.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Design mathematical models for transportation networks; and b. Able to solve and analyse solutions for transportation networks; and c. Determine and evaluate the global/local optimal solutions for urban and air transportation problems.
Subject Synopsis/ Indicative Syllabus	**Transportation Networks** – Network structures; Centripetal and centrifugal networks; Point-to-point and hub-and-spoke networks; Detour level in a hub-and-spoke network; Regular network; Small-world network; Scale-free network; Time-space network; Network expansion; Directed graph; Undirected graph. **Distance measures** – Euclidean; Cosine; Manhattan, Minkowski; Chebyshev; Haversine distances; Eccentricity; Radius; Centre. **Networked Transportation and traffic flow** – Assignment problem; Transhipment problem; Shortest path problem; Maximum Flow problem; Minimum cost flow problem; Transportation network efficiency and resilience; Level of network coverages; Connectivity; Multi-modal transportation network. **Networked transportation application** – Airline network design and hub location problems; Airport ground transportation problems. **Convexity, linear programming and convex optimisation problem** – Affine and convex sets; hyperplanes; convex functions and its properties; basic properties of linear programme; fundamental theorem of linear programming.

Teaching/Learning Methodology

Teaching is conducted through lectures and assignment. The basic knowledge, research methodology and theoretical models will be introduced. The understanding of how to address and formulate networked transportation problems by using mathematical modelling and optimization tools is emphasised. Methodology and data analytics skills are taught in class as well as related real-life scenarios.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lecture	√	√	√

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. Assignment	20%	√	√	√
2. Mid-term examination	30%	√	√	√
3. Final examination	50%	√	√	√
Total	100 %			

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

Overall Assessment:

$$0.5 \times \text{Continuous Assessment} + 0.5 \times \text{Final Examination}$$

The continuous assessment (50%) is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus via assignment and mid-term examination. The final examination (50%) will also be considered to assess the students' learning outcome.

Student Study Effort Expected

Class contact:	
▪ Lecture	39 Hrs.
Other student study effort:	
▪ Self-learning/preparation	36 Hrs.
▪ Assignment	36 Hrs.
Total student study effort	111 Hrs.

Reading List and References	1. Bell, M. G., & Iida, Y. (1997). *Transportation network analysis*. Wiley Publications. 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. (2022). *Introduction to algorithms*: MIT press. 4. Wells, A. T. (2015). *Air transportation: A management perspective*: Ashgate Publishing, Ltd.

Jul 2022

Note: Implementation in Semester 2, 2022/23

Subject Description Form

Subject Code	AAE6201
Subject Title	Advanced Computational Fluid Dynamics
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	1. To provide students with advanced knowledge of computational fluid dynamics (CFD). 2. To develop students' capability to numerically analyse canonical flow problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. obtain in-depth knowledge of CFD particularly in the compressible flow regime. b. get familiar with modern CFD techniques. c. perform numerical analysis of canonical flow problems.
Subject Synopsis/ Indicative Syllabus	**Partial differential equations** – Mathematical classification; Well-posed problem; Model equations; Euler equations; Navier–Stokes equations **Finite differences –** Error; Consistency; Stability; Upwind schemes; Flux splitting schemes; Flux-difference splitting schemes; Advection upstream splitting method (AUSM); Weighted essentially non-oscillatory (WENO) schemes; Compact schemes; Total variation diminishing (TVD) and slope limiters **Time-marching techniques** – Runge–Kutta methods; Lower-upper symmetric Gauss–Seidel (LU-SGS) method; Point relaxation method; Line relaxation method; Generalized minimal residual method **Other CFD techniques –** Finite-volume method; Grid generation; Boundary conditions; Parallel computing **Case studies** – Application of the numerical techniques to canonical aerodynamic problems

Teaching/Learning Methodology	1. The teaching and learning methods include lectures/tutorials, projects, and homework assignments. 2. The lectures/tutorials aim at providing students with integrated knowledge of CFD. 3. Technical/scientific problems and examples will be raised in projects and homework assignments to develop students' skills of numerical analysis.

Teaching/Learning Methodology	Intended subject learning outcomes		
	a	b	c
1. Lectures/tutorials	√	√	√
2. Projects	√	√	√
3. Homework assignments	√	√	√

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. Projects	30%	√	√	√
2. Tests	20%	√	√	√
3. Examination	50%	√	√	√
Total	100%			

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

1. The assessment is comprised of 50% continuous assessment (projects and tests) and 50% examination.
2. The continuous assessment consists of projects and tests. They are used to evaluate the progress of students' study, assist them in self-monitoring of fulfilling the respective subject learning outcomes, and enhance the integration of the knowledge learnt.
3. The examination is used to assess the knowledge acquired by the students for understanding and analysing 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.
	▪ Projects/homework assignments	50 Hrs.
	Total student study effort	122 Hrs.
Reading List and References	1. Anderson D. A., Tannehill, J. C., Pletcher R. H., Munipalli R., and Shankar V. (2020). *Computational Fluid Mechanics and Heat Transfer*. CRC Press, 4th edition. 2. Anderson J. D. (1995). *Computational Fluid Dynamics: The Basics with Applications.* McGraw-Hill, 1st edition. 3. Ferziger J. H., Perić M., and Street R. L. (2020). *Computational Methods for Fluid Dynamics*. Springer, 4th edition.	

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Note: Implementation in Semester 1, 2023/24

Subject Description Form

Subject Code	AAE6202
Subject Title	Mathematics and Computational Methods for Aviation Engineering Applications
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide students with understanding and knowledge about the advanced mathematics in aviation engineering. 2. To develop students' capability to conduct numerical analysis and design optimisation methods in solving mathematical modelling in the context of aviation and air transportation. 3. To provide students with in-depth and the state-of-the-art modelling methods in aviation domain.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. obtain in-depth knowledge and the state-of-the-art numerical methods and modelling approaches; b. competently apply the fundamental mathematic concepts in formulating the aviation or air transport research problems and able to conduct analysis and solve the problems with relevant research methodologies; c. critically evaluate the characteristics and properties of the models with the given engineering problems; and d. identify the key challenges in the research domains and able to conduct critical review of the research methodologies.
Subject Synopsis/ Indicative Syllabus	**Differential equations -** ordinary differential equations; partial differential equations; numerical methods **Dynamical systems –** fixed point; stability; discrete-event systems; finite-dimensional dynamical systems; infinite-dimensional dynamical system **Convexity and convex functions** – affine and convex sets; hyperplanes; convex functions and its properties; conjugate function, quasiconvex functions, log-concave and log-convex functions; convexity with respect to generalised inequalities **Convex optimisation problem** – convex optimisation; linear optimisation; quadratic optimisation problems; geometric programming; vector optimisation **Duality** – The Lagrange dual function; the Lagrange dual problem; geometric interpretation; saddle-point interpretation; optimality condition; perturbation and sensitivity analysis.

	Statistical estimation – Parametric distribution estimation; non-parametric distribution estimation **Uncertainty modelling** - Stochastic Linear Programming, stochastic integer programmes, and approximation and sampling methods (e.g., Monte Carlo methods and sample average approximation; Robust optimisation, min-max/max-min optimisation, decomposition methods for two-stage robust optimisation problems. **Algorithms for unconstrained minimisation** – unconstrained minimisation problems; descent methods; gradient descent method; steepest descent method. **Interior-point methods** – Inequality constrained minimisation problems; logarithmic barrier function and central path; Primal-dual interior-point methods.
Teaching/Learning Methodology	1. The teaching and learning methods include lectures/tutorials, projects and homework assignments. 2. The lectures/tutorials aim at providing students with integrated knowledge of mathematics in air transportation, air mobility, safety and reliability modelling in aviation. 3. Homework assignments and quiz are used to allow students to reflect on and deepen their knowledge of a selected topic.

Teaching/Learning Methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lectures/tutorials	√	√	√	√
2. Homework assignments	√	√	√	√

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. Projects (case study)	30%	√	√	√	√
2. Tests/assignments	20%	√	√	√	√
3. Examination	50%	√	√	√	√
Total	100%				

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

1. The assessment is comprised of 50% continuous assessment (projects and tests) and 50% examination.

2. The continuous assessment consists of projects and tests. They are used to

	evaluate the progress of students' study, assist them in self-monitoring of fulfilling the respective subject learning outcomes, and enhance the integration of the knowledge learned. 3. The examination is used to assess the knowledge acquired by the students for understanding and analysing 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	39 Hrs.
	Other student study effort:	
	▪ Self-study	33 Hrs.
	▪ Projects/homework assignments	50 Hrs.
	Total student study effort	122 Hrs.
Reading List and References	1. Ashford, N. J., Stanton, H. M., Moore, C. A., Pierre Coutu, A. A. E., & Beasley, J. R. (2013). *Airport operations*. McGraw-Hill Education. 2. Birge, J. R., & Louveaux, F. (2011). *Introduction to stochastic programming*. Springer Science & Business Media. 3. Boyd, S., Boyd, S. P., & Vandenberghe, L. (2004). *Convex optimisation.* Cambridge university press. 4. Griffiths, D. V., & Smith, I. M. (2020). *Numerical methods for engineers*. CRC press. 5. Kong, Q., Siauw, T., & Bayen, A. (2020). *Python Programming and Numerical Methods: A Guide for Engineers and Scientists*. Academic Press. 6. Michael, L. P. (2018). *Scheduling: theory, algorithms, and systems*. Springer.	

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Note: Implementation in Semester 1, 2023/24

Subject Description Form

Subject Code	AAE6203
Subject Title	Mathematics for Aircraft Structure, Guidance, Navigation, and Control
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide students with understanding and knowledge about the key mathematics in aircraft structure, guidance, and control. 2. To develop students' capability to numerically analyze research problems from a mathematical view, for example using the matrix to represent the problem. 3. To provide students with in-depth mathematical examples of aircraft structure, guidance, and control.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. obtain in-depth knowledge of basic matrix concepts, notations, vectors, matrix space, and key properties of the matrix, solving the optimization problem using the matrices. b. competently apply fundamental mathematic concepts to aircraft structure, guidance, and control problems. c. critically evaluate the characteristics of the given engineering problem using the properties of the matrix. d. identify the key challenges of the research in aircraft structure, guidance, and control from the mathematical view.
Subject Synopsis/ Indicative Syllabus	1. **Basic topology**: Finite, countable, and uncountable sets; metric spaces; compact sets; perfect sets; connected sets. 2. **Matrix analysis**: Eigenvalues, eigenvectors, and similarity; definition of norms and inner products; properties of norms; matrix norms; singular value decomposition; Schur decomposition; the Jordan canonical form theorem. 3. **Optimization**: Convexity; affine and convex sets; convex function; LP weak and strong duality; optimality conditions. 4. **Dynamic System and Stability**: Application to linear systems theory and stability. 5. **Case Studies**: Optimal control, linear quadratic regulator, an air traffic control problem.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorials and homework assignments.

2. The lectures/tutorials aim at providing students with integrated knowledge of mathematics in aircraft structure, guidance, and control. In-class case studies will be raised to develop student's skills in applying mathematical concepts to real engineering problems.

3. Homework assignments are used to allow students to reflect on and deepen their knowledge of a selected topic.

Teaching/Learning Methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lectures/tutorials	√	√	√	√
2. Homework assignments	√	√	√	√

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	30%	√	√	√	√
2. Midterm exam	20%	√	√	√	√
3. Final exam	50%	√	√	√	√
Total	100%				

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

1. The assessment is comprised of 50% continuous assessment and 50% final exam.

2. The continuous assessment consists of assignments and midterm exam. They are used to evaluate the progress of students' study, assist them in self-monitoring of fulfilling the respective subject learning outcomes, and enhance the integration of the knowledge learned.

3. The final 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:	
▪ Lectures	33 Hrs.
▪ Tutorials	6 Hrs.
Other student study effort:	

	▪ Self-study	33 Hrs.
	▪ Projects/homework assignments	50 Hrs.
	Total student study effort	122 Hrs.
Reading List and References	1. W. Rudin, *Principles of mathematical analysis*, 3d ed. New York: McGraw-Hill, 1976. 2. R. A. Horn and C. R. Johnson, *Matrix analysis*, 2nd ed. Cambridge; Cambridge University Press, 2013. 3. S. P. Boyd and L. Vandenberghe, *Convex optimization*. Cambridge; Cambridge University Press, 2004.	

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