ENTA13025 *Sustainable Energy for Aviation*
Term 2 - 2023

Profile information current as at 18/04/2024 06:35 pm

General Information

Overview

Aerospace vehicles are powered using a range of energy sources. The design of current aircraft power plants needs to minimise the impact of air travel on the environment while improving passenger safety, comfort and costs. In this unit, you will learn the fundamentals of various types of combustion engines and the parameters that affect their performance. You will also be introduced to the various forms of renewable energy such as solar, wind and hydrogen, and energy storage systems such as batteries and fuel cells, focusing on their applicability in the aviation context. You will build on your knowledge of propulsion systems and learn about strategies to improve the efficiency of jet engines. This unit will also cover future fuels and energy sources, engine emission standards and improving the sustainability of air travel through harnessing waste energy and minimising engine emissions.

Details

Career Level: *Undergraduate*
Unit Level: *Level 3*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites

Prerequisite: Gas Turbine Engines
Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the Assessment Policy and Procedure (Higher Education Coursework).

Offerings For Term 2 - 2023

- Online
- Rockhampton

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Website

This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

Regional Campuses
Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses
Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Written Assessment**
Weighting: 20%
2. **Written Assessment**
Weighting: 20%
3. **Project (applied)**
Weighting: 30%
4. **Online Test**
Weighting: 30%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the CQUniversity Policy site.
You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the CQUniversity Policy site.

Unit Learning Outcomes

On successful completion of this unit, you will be able to:

1. Analyse the performance of various combustion engines and propulsion systems
2. Evaluate the feasibility of using renewable energy sources such as solar, wind and hydrogen and various energy storage systems for air transportation applications
3. Propose emission reduction strategies that suit a given air transport system in various jurisdictions
4. Document professional documentation of the solutions and analysis process using relevant terminology, diagrams and standard symbols.

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level | ◦ Introductory Level | • Intermediate Level | • Graduate Level | ◦ Professional Level | ◦ Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes			
	1	2	3	4
1 - Written Assessment - 20%	•			
2 - Written Assessment - 20%		•	•	•
3 - Project (applied) - 30%			•	•
4 - Online Test - 30%	•	•		

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes			
	1	2	3	4
1 - Communication				•
2 - Problem Solving	•		•	
3 - Critical Thinking	•	•		
4 - Information Literacy	•	•	•	
5 - Team Work				
6 - Information Technology Competence				•
7 - Cross Cultural Competence			•	
8 - Ethical practice			•	•
9 - Social Innovation			•	
10 - Aboriginal and Torres Strait Islander Cultures				

Textbooks and Resources

Textbooks

ENTA13025

Prescribed

Aircraft and Automobile Propulsion: A Textbook
Edition: 1st edn (2013)
Authors: Shekhar, H
Alpha Science International
Oxford , UK
Binding: eBook
ENTA13025

Prescribed

Fundamentals and Applications of Renewable Energy
1st edition (2020)
Authors: Kanoglu, M, Cengel, Y & Cimbala, JM
McGraw Hill
Sydney , NSW , Australia
Binding: eBook

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)

Referencing Style

All submissions for this unit must use the referencing style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Md Nurun Nabi Unit Coordinator
m.nabi@cqu.edu.au

Schedule

Week 1 - 10 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Different cycles for aircraft engines	Chapter 1, Himanshu Shekhar	Tutorial: Questions and problems based on different cycles

Week 2 - 17 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Various propulsions for aircrafts	Chapter 2, Himanshu Shekhar	Tutorial: Questions and problems based on various propulsions

Week 3 - 24 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic

Internal combustion engines and their performances	Chapters 3-4, Himanshu Shekhar	Tutorial: Questions and problems based on Internal combustion engines and their performances

Week 4 - 31 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Carburation, fuel injection and lubrication	Chapters 6 and 7, Himanshu Shekhar	Tutorial: Questions and problems based on carburation, fuel injection and lubrication

Week 5 - 07 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to renewable energy	Chapter 1, Kanoglu et al.	Tutorial: Questions and problems based on renewable energy **Written assessment (Individual)** Due: Week 5 Friday (11 Aug 2023) 12:00 pm AEST

Vacation Week - 14 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
No class and tutorial		

Week 6 - 21 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Fundamentals of solar energy	Chapter 3, Kanoglu et al.	Tutorial: Questions and problems based on fundamentals of solar energy

Week 7 - 28 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Solar energy applications	Chapter 4, Kanoglu et al.	Tutorial: Questions and problems based on Solar energy applications

Week 8 - 04 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Wind energy and its applications	Chapter 5, Kanoglu et al.	Tutorial: Questions and problems based on wind energy and its applications **Written assessment (Individual)** Due: Week 8 Friday (8 Sept 2023) 12:00 pm AEST

Week 9 - 11 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Biomass energy and its applications	Chapter 8, Kanoglu et al.	Tutorial: Questions and problems based on biomass energy and its applications

Week 10 - 18 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Hydrogen and fuel cells. Different energy storage systems.	Chapter 10, Kanoglu et al.	Tutorial: Questions and problems based on Hydrogen, fuel cells and Different energy storage systems.

Week 11 - 25 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Review class		

Week 12 - 02 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
Online test preparation week		**Team Project (Team)** Due: Week 12 Friday (6 Oct 2023) 12:00 pm AEST

Review/Exam Week - 09 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 16 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic

Assessment Tasks

1 Written assessment (Individual)

Assessment Type
Written Assessment

Task Description
This is an individual assessment item worth 20%. Assessment 1 will cover the lectures and tutorials from week 1 to week 4. Students are required to demonstrate their theoretical knowledge, critical thinking, analytical and problem-solving skills. The questions for assessment items will be available in Moodle in Week 2. For each question, there will be marking rubrics in Moodle. This assessment is an important activity to check and enhance students' comprehension. The students should upload their answers to Moodle as a single pdf file within the allocated time period. Further details related to this assessment will be published on the unit Moodle site in Week 2. Students need to study the questions carefully, consult with the provided lecture/tutorial/Moodle materials and conduct research using textbooks, journal articles, and website materials. Students should use appropriate tools for drawings and equations for drawings and equations. There is no specific word count in answering each question. Students are strongly advised to cover the related materials sufficiently before answering the assessment. There will be a submission link in Moodle, where students submit the assessment on or before the deadline. Email submission is not acceptable.

Assessment Due Date
Week 5 Friday (11 Aug 2023) 12:00 pm AEST

Return Date to Students
Week 7 Friday (1 Sept 2023)
A comment file will be uploaded

Weighting
20%

Assessment Criteria
Each question in the assessment will be assessed separately against some criteria (the detailed criteria will be available in Moodle in Week 2). Some of the key criteria are as follows:
· Proper formatting and structuring.
· Have neat, legible, and tidy work and presentation.
· Evidence of understanding, correct workings, answers, and solutions to questions.
· Accuracy and correct results, correct use of terminology (scientific language), and conventions.
· The correct referencing style where necessary.
· On-time submission.

· Prepare answers while respecting the contributions of others by providing appropriate referencing and citations.
· If answering questions requires drawing diagrams and/or writing equations, students should use appropriate tools to have quality diagrams and or equations.
Students are advised to submit the assessment item on or before the deadline to avoid the delay penalty. As per the CQU policy, 5% marks per day will be deducted for any delayed submission without prior approval.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Via submission link available in Moodle

Learning Outcomes Assessed

- Analyse the performance of various combustion engines and propulsion systems

2 Written assessment (Individual)

Assessment Type
Written Assessment

Task Description
This is an individual assessment item worth 20%. Assessment 2 will cover the lectures and tutorials from Week 5 to Week 8. Students are required to demonstrate their theoretical knowledge, critical thinking, analytical and problem-solving skills. The questions for assessment items will be available in Moodle in Week 4. For each question, there will be marking rubrics in Moodle. The students should upload their answers to Moodle as a single pdf file within the allocated time period. Further details related to this assessment will be published on the unit Moodle site in Week 5. Students need to study the questions carefully, consult with the provided lecture/tutorial/Moodle materials and conduct research using textbooks, journal articles, and website materials. Students should use appropriate tools for drawings and equations for drawings and equations. There is no specific word count in answering each question. Students are strongly advised to cover the related materials sufficiently before answering the assessment. There will be a submission link in Moodle, where students submit the assessment on or before the deadline. Email submission is not acceptable.

Assessment Due Date
Week 8 Friday (8 Sept 2023) 12:00 pm AEST

Return Date to Students
Week 10 Friday (22 Sept 2023)
A comment file will be uploaded

Weighting
20%

Assessment Criteria
Each question in the assessment will be assessed separately against some criteria (the detailed criteria will be available in Moodle in Week 4). Some of the key criteria are as follows:
· Proper formatting and structuring.
· Have neat, legible, and tidy work and presentation.
· Evidence of understanding, correct workings, answers, and solutions to questions.
· Accuracy and correct results, correct use of terminology (scientific language), and conventions.
· The correct referencing style where necessary.
· On-time submission.
· Prepare answers while respecting the contributions of others by providing appropriate

referencing and citations.
· If answering questions requires drawing diagrams and/or writing equations, students should use appropriate tools to have quality diagrams and or equations.
Students are advised to submit the assessment item on or before the deadline to avoid the delay penalty. As per the CQU Policy, 5% marks per day will be deducted for any delayed submission without prior approval.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Via submission link available in Moodle

Learning Outcomes Assessed

- Evaluate the feasibility of using renewable energy sources such as solar, wind and hydrogen and various energy storage systems for air transportation applications
- Propose emission reduction strategies that suit a given air transport system in various jurisdictions
- Document professional documentation of the solutions and analysis process using relevant terminology, diagrams and standard symbols.

3 Team Project (Team)

Assessment Type
Project (applied)

Task Description
This is team/group work worth 30%. The minimum mark to pass this assessment is 50%. The students should form a team, each consisting of 3-5 members. The number can be varied depending on the student enrolled in that term. The team should start working on their team project from week 5 and finish in week 12. Further details of the project task description, date and time of the submission will be available in Moodle in week 5.

Assessment Due Date
Week 12 Friday (6 Oct 2023) 12:00 pm AEST

Return Date to Students
Review/Exam Week Friday (13 Oct 2023)
A comment file will be uploaded to Moodle

Weighting
30%

Minimum mark or grade
50%

Assessment Criteria
This is a team submission, and only one submission (project report) should be submitted via Moodle link. Email submission is not acceptable. Besides other criteria, the marking of each team member will be based on each team member's contribution. The team member should contribute equally. A contribution table will be available along with the criteria, where the students should fill in their contributions and sign the form. Any team member’s unsatisfactory contributions will award that member a fail mark in this assessment item. Please be aware that if a team member contributes 0% to the team project, that member will not be taken into account when calculating the marks. Individual team members’ marks may be greater than team marks but will be capped at the maximum marks of this assessment.
Individual team member’s marks can be calculated with the following equation:
Individual team member’s marks = Total marks obtained by the team x (Individual contribution / Equal team contribution).
Say,
·A team (Team A) obtained a 27 out of 30 (30 is the maximum mark for assessment 3).

·Team A has three members.
·Contributions of Member 1, member 2 and Member 3 are 32%, 33% and 35% (total team contribution 100%), respectively.
The marks for each team member as per the previous equation are:
·Marks for member 1 = 27 x 32/33.33 = 25.92
·Marks for member 2 = 27 x 33/33.33 = 26.73
·Marks for member 3 = 27 x 35/33.33 = 28.35
Students are advised to submit the assessment item on or before the deadline to avoid the delay penalty. As per the CQU Policy, 5% marks per day will be deducted for any delayed submission without prior approval.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Submission via Moodle link

Learning Outcomes Assessed

- Propose emission reduction strategies that suit a given air transport system in various jurisdictions
- Document professional documentation of the solutions and analysis process using relevant terminology, diagrams and standard symbols.

4 Online Test

Assessment Type
Online Test

Task Description
Like assessment 3, the minimum mark to pass this assessment is 50%. The online test will be held on the same date and at the same time. You can sit for this test at a location with an uninterrupted Internet connection and where you have access to a scanner. Also, your computer must have a video camera to monitor the test. The guidelines for the online test will be available in Moodle. The online test assessed all four learning outcomes. The test covers topics from weeks 1 to 10 and consists of a mix of short and descriptive answer questions and calculations. This online test will be held during the university exam period. The exact date and time will be available in Weeks 9–10. The test has a duration of 2 hours.
Besides the 2 hours of test duration, the students will have 60 minutes to scan and upload the answers to Moodle submission link. The submission link will become inactive after the allotted time (after three hours from the starting time), and you will be unable to upload/submit your answers via the submission link. Unfortunately, there is no opportunity to submit the answers after the allotted time, and submission via email is not acceptable. Please note this is a closed-book test. Students are not allowed to use textbooks, hand notes, and online resources but can use calculators. Equations will be provided at the end of the questions. You should use A-4 size papers to write answers. To upload/submit your answers, you are required to make all your answers in a single pdf file (the file size must not exceed 100 MB).
If you are unable to find a scanner, you can use your mobile phone to scan and upload the answer scripts.
Please find a list of Camera Scan apps below that is suitable for this.
Adobe Scan (DC) https://adobescan.app.link/d/1n1NntFHTkb
Microsoft Lens https://apps.apple.com/au/app/microsoft-lens-pdf-scanner/id975925059
SwiftScan https://swiftscan.app/en/index.html
CamScanner https://www.camscanner.com/
ClearScan https://clearscanapp.com/

Assessment Due Date

Return Date to Students

Weighting
30%

Minimum mark or grade
50%

Assessment Criteria
No Assessment Criteria

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Pdf file needs to be uploaded to Moodle

Learning Outcomes Assessed

- Analyse the performance of various combustion engines and propulsion systems
- Evaluate the feasibility of using renewable energy sources such as solar, wind and hydrogen and various energy storage systems for air transportation applications

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the **Student Academic Integrity Policy and Procedure**. This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?
A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?
A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?
For academic advice and guidance, the Academic Learning Centre (ALC) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?

Be Honest
If your assessment task is done by someone else, it would be dishonest of you to claim it as your own

Seek Help
If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)

Produce Original Work
Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem