ENTA13024 *Thermofluid Engineering for Aviation*
Term 1 - 2024

Profile information current as at 19/05/2024 03:26 pm

General Information

Overview

This unit introduces you to the concepts of thermodynamics and fluid mechanics in the context of the aviation and aerospace industries. You will begin with the ideal gas law and the first and second laws of thermodynamics for open and closed systems. You will then investigate the energy conversion and work done in engineering processes, and concepts and processes in thermodynamics to analyse energy and heat transfer in liquid and gas.You will study the physics of phase change processes for pure substances, conduct energy analysis of closed systems, and perform mass and energy analysis of control volumes. A key objective of the unit is improving your problem-solving skills by applying common theorems in fluid mechanics such as Bernoulli and energy equations to solve aerospace vehicle problems. You will study internal and external (drag and lift) fluid flows in the context of aviation systems and their impact on aerodynamics. You will use Computational Fluid Dynamics modelling software to solve complex aerodynamic problems.

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: Aerodynamics and Airframe Systems
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 1 - 2024

- 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: 20%
4. **Online Test**
Weighting: 40%

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. Apply energy equations and thermodynamics laws to solve energy conversion problems
2. Analyse various phase change processes, heat transfer mechanisms, and thermodynamics and heat energy cycles for a variety of heat engines
3. Apply fluid properties and fluid statics theory to calculate hydrostatic pressures and forces
4. Analyse flow regimes using laminar and turbulent flow theories for different systems
5. Analyse the behaviour and fluid dynamics using equations of conservation of mass, motion, and momentum for liquid and gas with the aid of appropriate computational tools
6. Apply relevant terminology, diagrams and standard symbols in the documentation of solutions to analyses of processes

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	5	6
1 - Written Assessment - 20%	•	•				
2 - Written Assessment - 20%			•			•
3 - Project (applied) - 20%				•	•	•
4 - Online Test - 40%	•	•	•	•	•	

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
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

There are no required textbooks.

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

Kalam Azad Unit Coordinator
a.k.azad@cqu.edu.au

Schedule

Week 1 - 04 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Unit overview, introduction to thermofluid and thermodynamics for aviation, properties of fluid.	Lecture notes.	Lecture and Tutorial.

Week 2 - 11 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Fluid energy and energy transfer, mass and energy analysis of control volumes, fluid flow and head loss in a closed system.	Lecture notes.	Lecture and Tutorial.

Week 3 - 18 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Design of fluid machinery for avaiation - characteristics and performance	Lecture notes.	Lecture and Tutorial.

Week 4 - 25 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Aviation fluid machinery applications, the second law of thermodynamics, thermodynamic cycles and power cycles.	Lecture Notes	Lecture and Tutorial.

Week 5 - 01 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic

Introduction to the fundamental heat transfer, heat exchanger.	Lecture Notes	Lecture and Tutorial.

Vacation Week - 08 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Non Teaching Week		**Assessment 1** Due: Vacation Week Friday (12 Apr 2024) 11:59 pm AEST

Week 6 - 15 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to thermal confort, refrigeration cycle, and coefficient of performanc.	Lecture Notes	Lecture and Tutorial.

Week 7 - 22 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Air Conditioning for aviation- cooling & heating systems design, air distribution.	Lecture Notes	Lecture and Tutorial.

Week 8 - 29 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Fluid dynamics and turbulent flow, Bernoulli and energy equations; momentum analysis of flow systems.	Lecture Notes	Lecture and Tutorial.

Week 9 - 06 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Internal and external flows.	Lecture Notes	Lecture and Tutorial.

Week 10 - 13 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Compressibility, Compressible flow, turbomachines in aviation.	Lecture Notes	Lecture and Tutorial. **Assessment 2** Due: Week 10 Friday (17 May 2024) 11:59 am AEST

Week 11 - 20 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to computational fluid dynamics (CFD) for Aviation applications.	Lecture Notes	Lecture and Tutorial.

Week 12 - 27 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Revision	All lecture notes.	Revision and Information will be given related to the online test. **Assessment 3: Mini Project based on Problem-solving approach** Due: Week 12 Friday (31 May 2024) 11:59 pm AEST

Review/Exam Week - 03 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 10 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic

End-of-Term: Online Test	**Assessment 4: Online Test** Due: Exam Week Wednesday (12 June 2024) 11:45 pm AEST

Assessment Tasks

1 Assessment 1

Assessment Type
Written Assessment

Task Description
This assessment 1 covers the weekly topics from Week 1 to Week 5. Students are required to answer analytical and numerical questions. The assignment tasks will be uploaded on the unit website (Moodle).

Assessment Due Date
Vacation Week Friday (12 Apr 2024) 11:59 pm AEST
Online submission through Moodle.

Return Date to Students
Week 7 Friday (26 Apr 2024)
In two weeks from the date of submission

Weighting
20%

Minimum mark or grade
You must get a minimum 40% on this assessemnt item to secure a Pass in this unit

Assessment Criteria
Each question in the assignment will be assessed separately against the following criterion:

20% of the total marks are for accuracy and correct result
· The correct application of maths and arithmetic.
· The correct answer to the questions.
· Correct use of terminology, units, and conventions

40% for correct method and procedure
· The correct selection and application of formulas and maths.
· Clear presentation of mathematical and arithmetical calculations for the results obtained.
· Evidence of checking results (mathematical, graphical, etc.).

30% for evidence of understanding
· Explanation of choices made (why a particular procedure/method is selected).
· Interpretation of results including limitations etc if any.
· Correct and orderly procedures and required steps.

10% for a professional presentation
· Clear identification and statement of each problem.
· A logical layout of the analysis.
· Appropriate use of diagrams.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Online submission through Moodle website

Learning Outcomes Assessed

- Apply energy equations and thermodynamics laws to solve energy conversion problems
- Analyse various phase change processes, heat transfer mechanisms, and thermodynamics and heat energy cycles for a variety of heat engines

2 Assessment 2

Assessment Type
Written Assessment

Task Description
Assignment 2 covers the weekly topics from Week 6 to Week 10. Students are required to answer analytical and numerical questions. The assignment tasks will be uploaded on the unit website (Moodle).

Assessment Due Date
Week 10 Friday (17 May 2024) 11:59 am AEST
Online submission through Moodle

Return Date to Students
Week 12 Friday (31 May 2024)
In two weeks from the date of submission

Weighting
20%

Minimum mark or grade
You must get a minimum 40% on this assessemnt item to secure a Pass in this unit

Assessment Criteria

20% of the total marks are for accuracy and correct result

· The correct application of maths and arithmetic.
· The correct answer to the questions.
· Correct use of terminology, units, and conventions

40% for correct method and procedure

· The correct selection and application of formulas and maths.
· Clear presentation of mathematical and arithmetical calculations for the results obtained.
· Evidence of checking results (mathematical, graphical, etc.).

30% for evidence of understanding

· Explanation of choices made (why a particular procedure/method is selected).
· Interpretation of results including limitations etc if any.
· Correct and orderly procedures and required steps.

10% for a professional presentation

· Clear identification and statement of each problem.
· A logical layout of the analysis.
· Appropriate use of diagrams.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Online submission through Moodle.

Learning Outcomes Assessed

- Apply fluid properties and fluid statics theory to calculate hydrostatic pressures and forces
- Apply relevant terminology, diagrams and standard symbols in the documentation of solutions to analyses of processes

3 Assessment 3: Mini Project based on Problem-solving approach

Assessment Type
Project (applied)

Task Description
Students are required to undertake this project which will allow them to exercise and demonstrate their theoretical thermo-fluid knowledge and skills in a practical application in the area of aviation contexts. In particular, they will be required to investigate the aerodynamic effects on a solid body moving through a fluid. The project task and scope will be uploaded on Moodle as per the schedule.

Assessment Due Date
Week 12 Friday (31 May 2024) 11:59 pm AEST
Online submission through Moodle.

Return Date to Students
Exam Week Friday (14 June 2024)
In two weeks from the date of submission

Weighting
20%

Minimum mark or grade
You must get a minimum of 50% on this assessment item to secure a Pass in this unit

Assessment Criteria
This project will be assessed separately against the following criterion:
· Elaborate discussion of major steps involved in the project (e.g., introduction, Aim and Objective, Problem Statements, methodology and associated Theories) (**30% of total marks**).
· Clarity of expression, including correct grammar, spelling, punctuation, mathematical equations and appropriate referencing of sources (**10% of total marks**).
· Accurate and correct presentation of the key outcomes / results of the project using graphs, tables, and diagrams (**40% of total marks**).
· Discussion and logical presentation of ideas and arguments by means of data analysis and synthesis (**10% of total marks**)

- Conclusion and recommendations (**10% of total marks**).

Referencing Style

- Harvard (author-date)

Submission
Online Group

Submission Instructions
Online submission through Moodle.

Learning Outcomes Assessed

- Analyse flow regimes using laminar and turbulent flow theories for different systems
- Analyse the behaviour and fluid dynamics using equations of conservation of mass, motion, and momentum for liquid and gas with the aid of appropriate computational tools
- Apply relevant terminology, diagrams and standard symbols in the documentation of solutions to analyses of processes

4 Assessment 4: Online Test

Assessment Type
Online Test

Task Description
An online test will be scheduled during the exam week. The online questions will be uploaded in Moodle and will be available to all students at the same time. Students download the Exam paper and start working on the solution. Students are given three hours to complete the solution. An additional time is considered to provide them with downloading, uploading, and perusal of the questions. Students use blank A4 papers to write answers. Students upload their answer booklet as a single pdf file on Moodle.

Assessment Due Date
Exam Week Wednesday (12 June 2024) 11:45 pm AEST
The individual student will sit for the online test under live video monitoring.

Return Date to Students

The assessment marks will be provided along with the certification of Grades.

Weighting
40%

Minimum mark or grade
You must get a minimum 40% on this assessemnt item to secure a Pass in this unit

Assessment Criteria
Students can use Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments). Students can use a calculator - all non-communicable calculators, including scientific, programmable, and graphics calculators are authorized. Each question in the test will be assessed separately against the following criterion:
· **20%** of the total marks are for accuracy and correct results.
· Correct application of maths and arithmetic.
· The correct answer to the questions.
· Correct use of terminology, units, and conventions.
· **50%** for correct method and procedure.
· Correct selection and application of formula and maths.
· Clear presentation of mathematical and arithmetical calculations for the results obtained.
· **30%** for evidence of understanding.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Students upload their answers as a single pdf file on Moodle.

Learning Outcomes Assessed

- Apply energy equations and thermodynamics laws to solve energy conversion problems
- Analyse various phase change processes, heat transfer mechanisms, and thermodynamics and heat energy cycles for a variety of heat engines
- Apply fluid properties and fluid statics theory to calculate hydrostatic pressures and forces
- Analyse flow regimes using laminar and turbulent flow theories for different systems
- Analyse the behaviour and fluid dynamics using equations of conservation of mass, motion, and momentum for liquid and gas with the aid of appropriate computational tools

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