ENEX13006 *Thermofluids Theory and Applications*
Term 2 - 2020

Profile information current as at 14/12/2025 12:33 pm

General Information

Overview

This unit will introduce you to the fundamentals of thermodynamics and fluid mechanics. You will start with gas laws and laws of thermodynamics for open and closed systems. You will further work on the physics of phase change processes using T-v and P-v diagrams for pure substances. This will allow you to move on to energy analysis of closed systems, and mass and energy analysis of control volumes. In this unit, you will learn how to classify fluids and determine different forces on submerged objects. You will later work on two most commonly used equations in fluid mechanics: Bernoulli and energy equations in the context of pressure, velocity, and energy conservation. You will finish this section by discussing internal and external (drag and lift) fluid flows. This unit will allow you to work on problems related to heat transfer such as steady and transient heat conduction, and forced and natural heat convection. You will be introduced to the working principles of hydraulic and pneumatic devices, their configuration, and their characteristics. This will enable you to analyse pneumatic circuits and select components in the context of mechatronics systems. Students enrolled in distance mode are required to attend a compulsory Residential school, must have access to a computer, and make frequent use of the internet.

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

MATH11219 Applied Calculus AND ENEG11009 Fundamentals of Energy and Electricity AND [ENEG11006 Engineering Statics OR ENEM12007 Statics & Dynamics]
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 - 2020

- Mackay
- Mixed Mode

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. **Practical Assessment**
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.

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from Unit Evaluation

Feedback
Lab practicals including the virtual lab directly helped in creating clear understanding of the concepts taught.

Recommendation
This practice will be continued.

Feedback from Unit Evaluation, Discussion in class

Feedback
Weekly quizzes are very useful and enabled students to make regular study times and remain up-to-date.

Recommendation
This practice will be continued.

Feedback from Unit Evaluation

Feedback
Lab documents can be improved.

Recommendation
All lab sheets will be checked and ways to improve these documents will be explored.

Unit Learning Outcomes

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

1. Describe fundamental and key concepts of thermodynamics and fluid mechanics
2. Apply energy equations and laws of thermodynamics to solve conservation problems
3. Analyse various phase change processes, heat transfer mechanisms, and thermal cycles
4. Solve problems related to flow rates, pressures, and forces for fluid systems
5. Design mechatronics systems using pneumatic elements
6. Communicate professionally using relevant technical terminology, symbols, and diagrams and effectively document calculations and solutions
7. Work autonomously and as a team to analyse problems and present solutions.

Stage 1 Competency Standard for Professional Engineers.

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	7
1 - Written Assessment - 20%	•	•					
2 - Written Assessment - 20%	•		•		•		

Assessment Tasks	Learning Outcomes						
	1	2	3	4	5	6	7
3 - Practical Assessment - 20%				•	•	•	•
4 - Online Test - 40%		•	•	•		•	

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes						
	1	2	3	4	5	6	7
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							

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Written Assessment - 20%	•	•	•			•		•		
2 - Written Assessment - 20%	•	•	•			•		•		
3 - Practical Assessment - 20%	•	•	•		•	•	•	•		
4 - Online Test - 40%	•	•	•					•		

Textbooks and Resources

Textbooks

ENEX13006

Prescribed

Fundamentals of Thermal-Fluid Sciences (in SI Units) 5th (2016)
Edition: 5th (2016)
Authors: Cengel, YA, Turner, RH & Cimbala, JM,
McGraw Hill Education Maidenhead, Berkshire, UK
Berkshire, , UK
ISBN: 9780078027680
Binding: Paperback

Additional Textbook Information
If you prefer to study with a paper copy, they are available at the CQUni Bookshop here: http://bookshop.cqu.edu.au (search on the Unit code). eBooks are available at the publisher's website.

View textbooks at the CQUniversity Bookshop

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

Ramadas Narayanan Unit Coordinator
r.narayanan@cqu.edu.au

Schedule

Week 1 - 13 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Unit Information, Introduction, Basics of Thermodynamics	Chapter 1 & 2 of Textbook of the unit.	Lecture and Tutorial.

Week 2 - 20 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Energy, Properties of pure substances	Chapter 3 & 4	Lecture, Tutorial and Weekly Quiz.

Week 3 - 27 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Closed systems, Control Volumes	Chapters 5 & 6	Lecture, Tutorial and Weekly Quiz.

Week 4 - 03 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Second Law of Thermodynamics	Chapters 7 & 8	Lecture, Tutorial and Weekly Quiz.

Week 5 - 10 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Power cycles	Chapter 9	Lecture, Tutorial, Weekly Quiz and Lab Experiment

Vacation Week - 17 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Vacation		

Week 6 - 24 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Refrigeration cycles	Chapter 9	Lecture, Tutorial Weekly Quiz and Lab experiment.

Week 7 - 31 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Properties of fluids, Fluid statics	Chapter 10 & 11	Lecture, Tutorial and Weekly Quiz. Lab Experiments

Week 8 - 07 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Bernoulli's equations, Momentum analysis of flow	Chapters 12 & 13	Lecture, Tutorial and Weekly Quiz.

Week 9 - 14 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Internal flow	Chapter 14, 15 Sections.1-.2.	Lecture, Tutorial and Weekly Quiz. **Laboratory reports** Due: Week 9 Monday (14 Sept 2020) 2:00 pm AEST

Week 10 - 21 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Heat Transfer	Chapter 16 &17	Lecture, Tutorial and Weekly Quiz.

Week 11 - 28 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Pneumatics	Lecture notes	Lecture, Tutorial and Weekly Quiz. **Assignment** Due: Week 11 Monday (28 Sept 2020) 2:00 pm AEST

Week 12 - 05 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
Revision	All chapters	

Review/Exam Week - 12 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
Exam/Review		

Exam Week - 19 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
Exam		

Term Specific Information

The lab practicals in this term will be run online due to COVID 19 restrictions.

Assessment Tasks

1 Weekly Online Quizzes

Assessment Type
Written Assessment

Task Description
The weekly quizzes assess contents from each week. There will be 10 quizzes starting from week 2 extending up to week 11 and all quizzes together will have 20% weighting of the unit. The assessment task can be accessed from the unit Moodle site on a weekly basis. Each quiz will be open for a week and students need to attempt within the open period. Weekly due dates will be given in the Moodle.

Assessment Due Date

Weekly due dates will be given in the Moodle

Return Date to Students

Students will be getting feedback immediately after the submission of the quizzes.

Weighting
20%

Minimum mark or grade
50%

Assessment Criteria
The correct answer will get full marks and the incorrect answer will be given zero marks.

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Describe fundamental and key concepts of thermodynamics and fluid mechanics
- Apply energy equations and laws of thermodynamics to solve conservation problems

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Technology Competence
- Ethical practice

2 Assignment

Assessment Type
Written Assessment

Task Description
This assignment assesses contents from Week 1 to Week 9. The assessment task will be available in the unit Moodle site. You must provide detailed solutions to the problems given in the assignment in order to demonstrate your knowledge and understanding of the concepts and processes incorporating any assumptions made, relevant sketches, clear step by step solution and conclusion/judgement on the answer

Assessment Due Date
Week 11 Monday (28 Sept 2020) 2:00 pm AEST

Return Date to Students

Two weeks after submission

Weighting
20%

Assessment Criteria
Your submission will be graded based on the report, the method of solution, appropriate explanation and completeness of the solution. A complete solution should include any assumptions made, relevant sketches, clear step by step solution and conclusion/judgement on the answer. More information will be there in the Moodle.

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Describe fundamental and key concepts of thermodynamics and fluid mechanics
- Analyse various phase change processes, heat transfer mechanisms, and thermal cycles
- Design mechatronics systems using pneumatic elements

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Technology Competence
- Ethical practice

3 Laboratory reports

Assessment Type
Practical Assessment

Task Description
Attend all the laboratory sessions and participate in the learning activities and complete related reports. Details of the laboratory activities will be available in Moodle.
Distance students will have a compulsory residential school.

Assessment Due Date
Week 9 Monday (14 Sept 2020) 2:00 pm AEST

Within two weeks of each laboratory session.

Return Date to Students

Two weeks after submission

Weighting
20%

Minimum mark or grade
50%

Assessment Criteria
Students will be assessed on attendance, participation, report, test results, presentation skills, discussions and tasks specified in the lab information sheets given in the Moodle.

Referencing Style

- Harvard (author-date)

Submission
Online Group

Learning Outcomes Assessed

- Solve problems related to flow rates, pressures, and forces for fluid systems
- Design mechatronics systems using pneumatic elements
- Communicate professionally using relevant technical terminology, symbols, and diagrams and effectively document calculations and solutions
- Work autonomously and as a team to analyse problems and present solutions.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Team Work
- Information Technology Competence
- Cross Cultural Competence
- Ethical practice

4 Online Exam

Assessment Type
Online Test

Task Description
This online assessment will be held during the exam week. All students need to complete this assessment at the same time. Students will receive the assessment via Moodle at the same time and have to provide the answers via Moodle. Details will be provided in the unit website.

Assessment Due Date

Date and time will be given in the unit website.

Return Date to Students

After two weeks the submission date.

Weighting
40%

Minimum mark or grade
50%

Assessment Criteria
This exam assesses contents from Week 1 to Week 12. You must provide detailed solutions to the problems given in the assessment in order to demonstrate your knowledge and understanding of the concepts and processes incorporating any assumptions made, relevant sketches, clear step by step solution and conclusion/judgement on the answer.

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Apply energy equations and laws of thermodynamics to solve conservation problems
- Analyse various phase change processes, heat transfer mechanisms, and thermal cycles
- Solve problems related to flow rates, pressures, and forces for fluid systems
- Communicate professionally using relevant technical terminology, symbols, and diagrams and effectively document calculations and solutions

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Ethical practice

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