ENEM14011 *Energy Conversion*
Term 1 - 2025

Profile information current as at 08/06/2026 04:00 pm

All details in this unit profile for ENEM14011 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student).The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

General Information

Overview
This unit introduces the key concepts and principles required to analyse problems involving heat transfer and energy conversion. You will analyse and design heat exchangers and analyse the performance of internal combustion engines, gas turbines, and jet engines. You will analyse the combustion processes of fuels, including hydrogen, estimate pollutant emissions, and analyse and design nozzles. You will prepare professional documents that demonstrate critical evaluation of results. You will be required to show your ability to work effectively to solve problems and communicate your work clearly in a professional manner.

Details
Career Level: *Undergraduate*
Unit Level: *Level 4*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites
Prereq: ENEM13014 Thermodynamics or ENEM12003 Thermodynamics
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 - 2025
- Bundaberg
- Cairns
- Gladstone
- Mackay
- Mixed Mode
- 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. Online Quiz(zes)
Weighting: 15%
2. Laboratory/Practical
Weighting: 15%
3. Written Assessment
Weighting: 20%
4. Online Test
Weighting: 50%

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 SUTE

Feedback
More contemporary topics, such as Hydrogen, need to be added to the topics in addition to petrol/diesel engines.

Recommendation
Unit coordinator to discuss with Head of Course about incorporating hydrogen in curriculum. Options of including hydrogen combustion in the unit should be explored.

Feedback from Class discussion

Feedback
Assessment criteria for practical assessment could be improved by introducing marking rubrics.

Recommendation
Ways to introduce marking rubrics for assessments and to provide more effective feedback should be explored.

Feedback from Class discussion

Feedback
The unit delivery was structured and coherent.

Recommendation
This practice should be continued.

Unit Learning Outcomes

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

1. Investigate heat transfer processes in engineering systems
2. Evaluate the performance of heat exchangers and internal combustion engines
3. Examine the combustion processes of fuels and carry out related calculations
4. Determine the performance of gas turbines with respect to jet propulsion
5. Analyse the performance of nozzles and compressors.

The Learning Outcomes for this unit are linked with the Engineers Australia Stage 1 Competency Standards for Professional Engineers in the areas of 1. Knowledge and Skill Base, 2. Engineering Application Ability and 3. Professional and Personal Attributes at the following levels:

Intermediate

2.3 Application of systematic engineering synthesis and design processes. (LO: 1I 2I)

2.4 Application of systematic approaches to the conduct and management of engineering projects. (LO: 1I 2I)

Advanced

1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 1I 2A 3I 4A 5A 6A)

1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 1I 2I 3I 4A 5A 6A)

1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 1I 2A 3I 4A 5A 6A)

1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 1I 2A 3I 4A 5A 6A)

1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 1I 2A 3I 4A 5A 6A)

1.6 Understanding of the scope, principles, norms, accountabilities, and bounds of sustainable engineering practice in the specific discipline. (LO: 1I 2A 3I 4A 5A 6A)

2.1 Application of established engineering methods to complex engineering problem solving. (LO: 1I 2A 3I 4A 5A 6A)

2.2 Fluent application of engineering techniques, tools, and resources. (LO: 1I 2A 3I 4A 5A 6I)

Note: LO refers to the Learning Outcome number(s) which link to the competency and the levels: N – Introductory, I – Intermediate and A - Advanced.

Refer to the Engineering Undergraduate Course Moodle site for further information on the Engineers Australia's Stage 1 Competency Standard for Professional Engineers and course level mapping information https://moodle.cqu.edu.au/course/view.php?id=1511

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
1 - Online Quiz(zes) - 15%	•	•	•		•
2 - Laboratory/Practical - 15%		•			
3 - Written Assessment - 20%	•			•	
4 - Online Test - 50%			•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes				
	1	2	3	4	5
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 - First Nations Knowledges					
11 - Aboriginal and Torres Strait Islander Cultures					

Textbooks and Resources

Textbooks

ENEM14011

Prescribed

APPLIED THERMODYNAMICS FOR ENGINEERING TECHNOLOGISTS 5TH (1993) AUTHORS: EASTOP, T.D. AND MCCONKEY, A.
Edition: 5 (1995)
Authors: EASTOP, T.D. AND MCCONKEY, A.
Pearson
sydney , NSW , Australia
ISBN: ISBN: ISBN-13: 9780582091931

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Access to a scanner.
- Video and audio equipment to join online tutorials
- MATLAB and Simulink Suite Software

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 - 10 Mar 2025

Module/Topic	Chapter	Events and Submissions/Topic
Heat Transfer - Conduction, convection, radiation, Fourier's law of conduction, Newton's law of cooling, composite walls and the electrical analogy, heat flow through a cylinder and sphere.	Chapter 16 - Pages 561-576	Tutorial Problems for week 1: 16.1, 16.5, 16.6, 16.8,

Week 2 - 17 Mar 2025

Module/Topic	Chapter	Events and Submissions/Topic
Heat Transfer - Forced convection, natural convection, heat exchangers, heat exchanger effectiveness, extended surfaces.	Chapter 16 - Pages 599-632	Tutorial Problems for week 2: 16.16, 16.18, 16.20, 16.21, 16.22, 16.30. Week 2 Quiz

Week 3 - 24 Mar 2025

Module/Topic	Chapter	Events and Submissions/Topic

Numerical Methods for Conduction, Finite Difference Method. Heat Transfer- Radiation, black body radiation, grey body, Stefan-Boltzmann law, Lambert's law and the geometric factor, radiant interchange between grey bodies, heat transfer coefficient for radiation.	Chapter 16 - Section 16.6-16-8: Pages 584-599 Chapter 16 -Section 16.14- 16-19: Pages 633-651	Tutorial Problems for week 3:16.37, 16.38, 16.44, 16.46 Week 3 Quiz

Week 4 - 31 Mar 2025

Module/Topic	Chapter	Events and Submissions/Topic
Internal Combustion Engines - Four-stroke cycle, two-stroke cycle, other types of engines, criteria of performance, engine output and efficiency, performance characteristics.	Chapter 13 - Pages 419-442	Tutorial Problems for weeks 4 & 5: 13.1, 13.2, 13.6, 13.8, 13.9, 13.10, 13.11,13.13 Week 4 Quiz Zoom Lab Activity 1

Week 5 - 07 Apr 2025

Module/Topic	Chapter	Events and Submissions/Topic
Internal Combustion Engines - Factors influencing performance, real cycles and the air standard cycle, properties of fuels for IC engines, fuel systems, measurement of air and fuel flow rates, supercharging, engine emissions.	Chapter 13 - Pages 442 - 475	Tutorial Problems for weeks 4 & 5: 13.1, 13.2, 13.6, 13.8, 13.9, 13.10, 13.11,13.13 Week 5 Quiz

Vacation Week - 14 Apr 2025

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 21 Apr 2025

Module/Topic	Chapter	Events and Submissions/Topic
Combustion - Basic chemistry, fuels, combustion equations, stoichiometric air-fuel ratio, Exhaust and flue gas analysis. Hydrogen Fuel	Chapter 7 - Pages 176-192	Tutorial Problems for weeks 6 &7: 7.1, 7.3, 7.5, 7.6, 7.8, 7.9, 7.12 Week 6 Quiz Project Due: Week 6 Wednesday (23 Apr 2025) 11:45 pm AEST

Week 7 - 28 Apr 2025

Module/Topic	Chapter	Events and Submissions/Topic
Combustion - Practical analysis of combustion products, Enthalpy of formation, calorific value of fuels, power plant thermal efficiency, practical determination of calorific values, air and fuel-vapour mixtures	Chapter 7 - Pages 192-230	Tutorial Problems for weeks 6 &7: 7.1, 7.3, 7.5, 7.6, 7.8, 7.9, 7.12 Week 7 Quiz

Week 8 - 05 May 2025

Module/Topic	Chapter	Events and Submissions/Topic
Gas Turbines - Practical gas turbine cycle, modifications to the basic cycle, combustion,	Chapter 9 - Pages 260-283	Tutorial Problems: 9.1, 9.2, 9.3, 9.5 Week 8 Quiz

Week 9 - 12 May 2025

Module/Topic	Chapter	Events and Submissions/Topic
Nozzles and Jet Propulsion - Nozzle shape, critical pressure ratio, maximum mass flow, Nozzles off the design pressure ratio, nozzle efficiency	Chapter 10 - Pages 287-298	Tutorial Problems for weeks 9 &10: 10.1, 10.2, 10.3, 10.4, 10.7, 10.8, 10.9 Week 9 Quiz Practical Assessment Due: Week 9 Wednesday (14 May 2025) 11:45 pm AEST

Week 10 - 19 May 2025

Module/Topic	Chapter	Events and Submissions/Topic
Nozzles and Jet Propulsion - Steam Nozzles, Jet Propulsion	Chapter 10 - Pages 298-325	Tutorial Problems for weeks 9-11: 10.1, 10.2, 10.3, 10.4, 10.7, 10.8, 10.9 Week 10 Quiz

Week 11 - 26 May 2025

Module/Topic	Chapter	Events and Submissions/Topic
Compressors - Positive displacement machines, reciprocating compressors, reciprocating compressors including clearance, multistage compression, steady-flow analysis, rotary machines, vacuum pumps, air motors.	Chapter 12 - Pages 381-415	Tutorial Problems: 12.3, 12.5, 12.9 Week 11 Quiz

Week 12 - 02 Jun 2025

Module/Topic	Chapter	Events and Submissions/Topic
Revision	All chapters previously stated	Revise all tutorial problems and worked examples from the textbook.

Review/Exam Week - 09 Jun 2025

Module/Topic	Chapter	Events and Submissions/Topic
Exam	All chapters previously stated	Exam :Revise all tutorial problems and worked examples from the textbook.

Exam Week - 16 Jun 2025

Module/Topic	Chapter	Events and Submissions/Topic
		End of Term Online Test Due: Exam Week Wednesday (18 June 2025) 10:00 am AEST

Assessment Tasks

1 Online Quizzes

Assessment Type
Online Quiz(zes)

Task Description
These 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 15% weighting of the course. 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 Moodle.

Number of Quizzes
10

Frequency of Quizzes
Weekly

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
15%

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
- Investigate heat transfer processes in engineering systems
- Evaluate the performance of heat exchangers and internal combustion engines
- Examine the combustion processes of fuels and carry out related calculations
- Analyse the performance of nozzles and compressors.

2 Practical Assessment

Assessment Type
Laboratory/Practical

Task Description
Attend all the laboratory sessions, participate in the learning activities, and complete related reports. Details of the laboratory activities will be available in Moodle.

Assessment Due Date
Week 9 Wednesday (14 May 2025) 11:45 pm AEST

Return Date to Students
Week 11 Wednesday (28 May 2025)

Two weeks after the submission

Weighting
15%

Minimum mark or grade
50%

Assessment Criteria
The students will be assessed on attendance, participation, report, test results, presentation skills, discussions and tasks specified in the lab information sheets given in Moodle. A marking rubric will be available in Moodle.

Referencing Style
- Harvard (author-date)

Submission
Online Group

Learning Outcomes Assessed
- Evaluate the performance of heat exchangers and internal combustion engines

3 Project

Assessment Type
Written Assessment

Task Description
This assignment assesses contents from Week 1 to Week 4. The assessment task will be available on the unit Moodle site three weeks before its due date. You will be given an industrial scenario, and you need to develop a numerical model, analyse the results and provide appropriate conclusions and recommendations to demonstrate your knowledge and understanding of the concepts and processes, incorporating any assumptions made, relevant sketches, results in graphs, clear step-by-step solutions and conclusions.

Assessment Due Date
Week 6 Wednesday (23 Apr 2025) 11:45 pm AEST

Return Date to Students
Week 8 Wednesday (7 May 2025)

Two weeks after the submission

Weighting
20%

Minimum mark or grade
50%

Assessment Criteria
The submission will be graded based on

- Clear description of the computation procedure and calculation of the relevant parameters.
- Accuracy of calculations and estimates: This includes statements of any assumptions, if needed, as well as relevant formulae and methods.
- Clear Presentation: This criterion includes the correct use of terminology, conventions, clear communication, logical layout, and referencing of authoritative sources of equations and data.
- Discussions on key points such as the effect of wooden joists and appropriate conclusions

Referencing Style

- Harvard (author-date)

Submission
Online Group

Learning Outcomes Assessed

- Investigate heat transfer processes in engineering systems
- Determine the performance of gas turbines with respect to jet propulsion

4 End of Term Online Test

Assessment Type
Online Test

Task Description
This online assessment will be held during 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 on the unit website.

Assessment Due Date
Exam Week Wednesday (18 June 2025) 10:00 am AEST

It will be held on wednesday exam week at 10 am and the duration will be 3 hours

Return Date to Students

After two weeks the submission

Weighting
50%

Minimum mark or grade
50%

Assessment Criteria
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/judgment on the answer

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Examine the combustion processes of fuels and carry out related calculations
- Determine the performance of gas turbines with respect to jet propulsion
- Analyse the performance of nozzles and compressors.

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