



# **ENEM13014 *Thermodynamics***

## **Term 2 - 2020**

Profile information current as at 01/05/2024 05:50 pm

All details in this unit profile for ENEM13014 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

Students investigate the flow of energy (heat) and work done in engineering processes, apply and explain key concepts and processes in thermodynamics and explain the procedures used to analyse the flow of energy and heat in liquids and gasses. Students use energy equations and the laws of thermodynamics to analyse and solve problems. They analyse the heat energy cycle for heat engines and heat pumps. They communicate effectively regarding technical aspects of thermodynamics, prepare technical and laboratory reports, clearly document technical procedures problem solutions, and evaluate uncertainties and the results of their work. Students develop a capacity to work, learn, and communicate ethically and professionally, as individuals and in teams, to investigate, solve problems and present solutions. Distance education (FLEX) students are required to have access to a computer to make frequent use of the Internet and are required to participate in Residential School activities.

### 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

Prerequisites: MATH11218 Applied Mathematics AND (ENEG11009 Fundamentals of Energy & Electricity OR PHYS11185 Engineering Physics B)

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

- 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).

### Residential Schools

This unit has a Compulsory Residential School for distance mode students and the details are:

Click here to see your [Residential School Timetable](#).

### 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. **Take Home Exam**

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**

The lecturer was extremely helpful and provided plenty of time to students.

**Recommendation**

Good to hear these good comments. I will try to keep it going in the same manner in the future. I expected a lower failure rate than occurred. This could be due to affected students not spending adequate time carefully following the lecture/lecture video. I will be really happy if students (likely affected students) contact me if they have any confusion in any parts of the contents and its delivery. I am happy to take their call on my mobile and even after hours.

#### Feedback from Unit Evaluation

**Feedback**

The unit content was sufficient and the lecturer was very clear and easy to understand. Feedback on labs and assignments was clear.

**Recommendation**

Thank you for acknowledging this. This will be maintained in the coming years. In addition, the logical flow of unit contents and their necessity in studying thermodynamics will be clearly explained in the unit delivery.

#### Feedback from Unit Evaluation

**Feedback**

Answers to textbook questions need to be available somewhere so that students can see if they are correctly solving the problems.

**Recommendation**

The answers will be given as per the request. In addition, some more problems will be solved in the review class in week 12. I will ask students to practice some of the recommended problems from the textbook.

#### Feedback from Unit Evaluation

**Feedback**

The tutorials need to use the whole two hours so that students can practice questions in the tutorial and ask questions when they get stuck.

**Recommendation**

Generally, time spent depends on how students can absorb the information. More time will be taken in the coming years to make sure students understand the tutorial solutions. I will go through each step clearly and slowly so that students can grasp the solution process. I must spend more time observing how students can progress in solving the problems on their own.



Graduate Attributes	Learning Outcomes								
	1	2	3	4	5	6	7	8	
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 - Take Home Exam - 40%	•	•	•					•		

## Textbooks and Resources

### Textbooks

ENEM13014

#### Prescribed

##### **Fundamentals of Engineering Thermodynamics**

8th edition (2014)

Authors: Moran, MJ., Shapiro, HN, Boettner, DD and Bailey, MB

John Wiley & Sons Ltd

New York , NY , USA

ISBN: 978-1-118-41293-0

Binding: Hardcover

ENEM13014

#### Prescribed

##### **Thermodynamic and Transport Properties: SI Units**

Edition: 5th or latest if any (1994)

Authors: Rogers, GFC and Mayhew, YR

Wiley Blackwell

Southern Gate , Chicester , UK

ISBN: 978-0-631-19703-4

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

**Mohammad Rasul** Unit Coordinator

[m.rasul@cqu.edu.au](mailto:m.rasul@cqu.edu.au)

## Schedule

### **Week 1 - 13 Jul 2020**

Module/Topic	Chapter	Events and Submissions/Topic
Fundamentals - Energy resources, thermodynamic concept, work, heat, 1st law of thermodynamics.	1 and 2 (excluding section 2.7)	Introduction, overview, and lecture and tutorial on chapter 2 (problems 1.27, 1.30, 2.2, 2.6, 2.7, 2.8 and 2.16).

### **Week 2 - 20 Jul 2020**

Module/Topic	Chapter	Events and Submissions/Topic
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Energy equations, non-flow and steady flow; properties of gases.	2 and 3 (excluding section 3.7)	Lecture on chapter 2 and 3, and tutorial on chapter 2 (problems 2.19, 2.26, 2.29, 2.59, 2.60 and 2.64).
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### Week 3 - 27 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Properties of vapours; non-flow process for gases.	3	Lecture on chapter 3 and tutorial on chapter 2 (problems 2.67, 2.72, 2.74, 2.80, 2.85 and 2.86). Assignment 1 question paper will be uploaded in the unit Moodle site by Friday of this week.

### Week 4 - 03 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Non-flow process for vapours; steady flow processes for gases and vapours.	5	Lecture on chapter 5 and tutorial on chapter 3 (problems 3.10, 3.13, 3.14, 3.23, 3.24 and 3.71).

### Week 5 - 10 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Second law of thermodynamics; Carnot cycle for gases and vapours, entropy.	5 and 6 (excluding sections 6.8 to 6.10)	Lecture on chapter 5 and 6, and tutorial on chapter 5 (problems 5.17, 5.43, 5.45, 5.65 and 5.68).

### Vacation Week - 17 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
		This is a week for residential school for distance students, yet to confirm. The specific schedule will be available in the unit moodle site about a month ago.

### Week 6 - 24 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Rankine cycle for steam power plant. Written Assessment 1 on chapters 2,3,5 and 6 is due this week.	8 (excluding section 8.6)	Lecture on chapter 8 and tutorial on chapter 5 and 6 (problems 5.76, 5.81, 6.3, 6.7 and 6.10).  <b>Written Assessment (Assignment 1) Due: Week 6 Friday (28 Aug 2020) 11:55 pm AEST</b>

### Week 7 - 31 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Air standard Otto cycle; constant volume process.	8 and 9 (excluding sections 9.12 to 9.14)	Lecture on chapter 8 and 9, and tutorial on chapter 8 (problems 8.7, 8.20, 8.27, 8.29 and 8.30). Assignment 2 question paper will be uploaded in the unit Moodle site by Friday of this week.

### Week 8 - 07 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Air standard diesel and dual combustion cycles	9	Lecture on chapter 9 and tutorial on chapter 8 (problems 8.35, 8.37, 8.40, 8.46 and 8.49).

### Week 9 - 14 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic



Sterling and Ericson cycles.	9	Lecture and tutorial on chapter 9 (problems 9.1, 9.11, 9.20, 9.28 and 9.34).
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### Week 10 - 21 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Brayton cycle for gas turbines. Written Assessment 2 on chapters 8 and 9 is due this week.	9	Lecture and tutorial on chapter 9 (problems 9.50, 9.53, 9.54, 9.61 and 9.68).  <b>Written Assessment (Assignment 2) Due:</b> Week 10 Friday (25 Sept 2020) 11:55 pm AEST

### Week 11 - 28 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Reversed cycles - refrigeration.	10 (excluding section 10.7)	Lecture and tutorial on chapter 10 (problems 10.1, 10.10, 10.15, 10.29 and 10.34).

### Week 12 - 05 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
Revision	10	Review class

### Review/Exam Week - 12 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic

### Exam Week - 19 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
		<b>Written Assessment (Take Home Exam 40%) Due:</b> Exam Week Monday (19 Oct 2020) 11:45 pm AEST

## Assessment Tasks

### 1 Written Assessment (Assignment 1)

#### Assessment Type

Written Assessment

#### Task Description

This assessment task relates to the unit learning outcomes numbers 1- 3 and will cover study materials from chapters 2, 3, 5 and 6 of your textbook. The assignment questions will be available in unit Moodle site about three weeks prior to due date.

#### Assessment Due Date

Week 6 Friday (28 Aug 2020) 11:55 pm AEST

Late submission will not be accepted unless otherwise extension is requested in advance for valid reason(s) and approved by Lecturer.

#### Return Date to Students

Week 8 Friday (11 Sept 2020)

Feedback will be provided.

#### Weighting

20%

#### Minimum mark or grade

50%

#### Assessment Criteria

This assignment will be marked to a marking scheme as indicated in Assignment 1 question paper. Marks will be given for correct demonstration of appropriate understanding and processes used for solution, use of correct units, and neat and legible diagrams (both schematic and p-v or T-s diagrams, as appropriate). Late submission will draw a penalty at

the rate of 5% per working day after the due date.

### Referencing Style

- [Harvard \(author-date\)](#)

### Submission

Online

### Submission Instructions

Submission must be compiled as a single pdf file with file name as your last name\_student ID\_Assignment 1 and submitted through the unit moodle site. The first page of the assignment must show the following information: Name, Student Number, Year, Term, Unit Code and Assessment title.

### Learning Outcomes Assessed

- Describe and explain key concepts and processes of thermodynamics
- Analyse the flow and non-flow process using tables of properties for fluids, formulae, and calculations and present working to explain the analysis
- Explain energy equations including the first law of thermodynamics and analyse and solve problems using these equations

### Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking

## 2 Written Assessment (Assignment 2)

### Assessment Type

Written Assessment

### Task Description

This assessment task relates to the unit learning outcomes numbers 4-6 and will cover study materials from chapters 8 and 9 of your textbook. The assignment questions will be available in unit Moodle site about three weeks prior to due date.

### Assessment Due Date

Week 10 Friday (25 Sept 2020) 11:55 pm AEST

Late submission will not be accepted unless otherwise extension is requested in advance for valid reason(s) and approved by Lecturer.

### Return Date to Students

Week 12 Friday (9 Oct 2020)

Feedback will be provided

### Weighting

20%

### Minimum mark or grade

50%

### Assessment Criteria

This assignment will be marked to a marking scheme as indicated in Assignment 2 question paper. Marks will be given for correct demonstration of appropriate understanding and processes used for solution, use of correct units, and neat and legible diagrams (both schematic and p-v or T-s diagrams, as appropriate). Late submission will draw a penalty at the rate of 5% per working day after the due date.

### Referencing Style

- [Harvard \(author-date\)](#)

### Submission

Online

### Submission Instructions

Submission must be compiled as a single pdf file with file name as your last name\_student ID\_Assignment 2 and submitted through the unit moodle site. The first page of the assignment must show the following information: Name, Student Number, Year, Term, Unit Code and Assessment title.

### Learning Outcomes Assessed

- Explain the effects of entropy in engineering processes and the limitations that the second law of thermodynamics places on such processes
- Explain and analyse the heat energy cycle for a variety of heat engine and refrigeration cycles
- Communicate effectively using the terminology, symbols, and diagrams of thermodynamics and professionally document calculations and problem solutions

#### **Graduate Attributes**

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Team Work
- Information Technology Competence

### **3 Written Assessment (3 Laboratory Exercises)**

#### **Assessment Type**

Practical Assessment

#### **Task Description**

This assessment task relates to learning outcomes numbers 5-8 of the unit. Each student will be required to complete the following three laboratory exercises:

1. Performance analysis of solar energy collector (5 marks)
2. Performance analysis of Refrigeration cycle (7.5 marks)
3. Performance analysis of Rankine steam cycle (7.5 marks)

Laboratory Report should have the following features and be arranged in the order given:

1. Title Page: Title, Author, University, School, Unit, Lecturer's name, Summary.
2. Summary: Summary should include a brief description of the introduction to the topic, objectives and scopes of experiment performed, and its methodology, results and discussion, and conclusions.
3. Table of Contents with page numbers.
4. Introduction.
5. Objectives.
6. Equipment details and diagram (simple and neat).
7. Experimental procedure.
8. Results: Graph or tables of results. Give graphs a figure number, and tables a table number.
9. Discussion: Where possible, compare results with theory and similar results found in the literature.
10. Conclusion.
11. Appendix I: Sample calculations and table of results if all results which cannot be presented graphically in the main text.
12. Appendix II: Raw data (typed)

Because of the COVID-19 social distancing policy, instructions and demonstration on all laboratory exercises will be provided through zoom session. Lectures on each laboratory about what can be/should have been achieved from face to face laboratory exercises will be provided first, then a recording of the demonstration of the experiments will be played. There will be opportunity of questions and answer like what we do in lectures during this zoom session. Attendance to online zoom sessions for Laboratory exercises are compulsory for both on-campus and distance students. Students will be required to submit report in a team by due date. There will be 3 to 4 students in a team. The data will be provided for writing lab report. Laboratory reports of students who did not attend the online lecture and presentation sessions will not be accepted for marking and will be awarded zero marks. All the information, schedule for lab sessions and due date for each lab report will be posted on the unit Moodle site.

#### **Assessment Due Date**

Submission dates will be supplied separately.

#### **Return Date to Students**

Two weeks after the submission of report.

#### **Weighting**

20%

#### **Minimum mark or grade**

50%

## Assessment Criteria

Assessment will be done based on the professionalism in reporting and presentation, relevant and comprehensive content, clarity in results and discussion, sample calculation and referencing of source material as detailed below:

Professional presentation and formatting of the report. The report should address all key elements/steps undertaken to complete the laboratory sessions and report writing (i.e. sections on summary, introduction, theory, objectives, equipment and procedures, results and discussion, conclusions, and references) (10%).

Properly written background and introduction with citations of literature/references using Harvard referencing style, related theory, equipment and actual procedures used (not direct copy from the lab sheet) (20%).

Clarity and logical explanation of results and discussion including properly presented equations, graphs, tables, diagrams and/or drawings, etc. You should compare your results with similar experiments done elsewhere in the literature and/or your textbook (60%).

A clearly presented sample calculation and correctly referencing of source materials (10%).

It is expected that every member of a team will contribute to the write-up of the laboratory report. Late submission will draw a penalty at the rate of 5% every day after the due date and will be reflected in the final assessment.

## Referencing Style

- [Harvard \(author-date\)](#)

## Submission

Online

## Submission Instructions

Submission must be compiled as a single pdf file with file name as your last name\_student ID\_Laboratory report and submitted through the Unit Website. The first page of the assignment must show the following information: Name, Student Number, Year, Term, Unit Code and Assessment title.

## Learning Outcomes Assessed

- Explain and analyse the heat energy cycle for a variety of heat engine and refrigeration cycles
- Communicate effectively using the terminology, symbols, and diagrams of thermodynamics and professionally document calculations and problem solutions
- Prepare technical and laboratory reports with a thorough evaluation of experimental uncertainties and results obtained
- Work, learn and communicate in an ethical, professional manner both individually and in teams, using information literacy skills to investigate problems and present solutions.

## Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

## 4 Written Assessment (Take Home Exam 40%)

### Assessment Type

Take Home Exam

### Task Description

This is an individual assessment accessible via the unit Moodle site and comprises of a set of questions on the topics covered from Week 1 to 12. Students are required to answer analytical and numerical questions to demonstrate their theoretical knowledge and analytical and problem-solving skills. This test is an important activity to check and enhance an individual student's comprehension of the topics. This test is an integrated part of the study to test the critical aspects of each topic. This take-home exam weights 40% of the final mark. This exam will be available for a limited time during Exam week, and students need to attend this examination during that time. (For example, this examination questions will be released on exam week either Monday or Tuesday or Wednesday or Thursday or Friday at 9 AM. Exam answers should be submitted to Moodle within the specified examination time period. In addition, students should submit their scanned detailed solution and workings within the allowed time period to Moodle.

Further specific details (including days and times) related to this assessment will be published on the unit Moodle site. Take-home examination has a set start time and answer/workings submission link will be closed after the end time. Students are strongly advised to sufficiently cover the

material related to the test before the test. If you encounter any difficulty with network access during tests, contact the unit coordinator at your earliest convenience.

**Assessment Due Date**

Exam Week Monday (19 Oct 2020) 11:45 pm AEST

Details are provided in task description.

**Return Date to Students****Weighting**

40%

**Minimum mark or grade**

50%

**Assessment Criteria**

The detailed assessment criteria will be provided with the take home exam questions.

**Referencing Style**

- [Harvard \(author-date\)](#)

**Submission**

Online

**Learning Outcomes Assessed**

- Describe and explain key concepts and processes of thermodynamics
- Analyse the flow and non-flow process using tables of properties for fluids, formulae, and calculations and present working to explain the analysis
- Explain energy equations including the first law of thermodynamics and analyse and solve problems using these equations
- Explain the effects of entropy in engineering processes and the limitations that the second law of thermodynamics places on such processes
- Explain and analyse the heat energy cycle for a variety of heat engine and refrigeration cycles
- Communicate effectively using the terminology, symbols, and diagrams of thermodynamics and professionally document calculations and problem 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