ENEM13014 *Thermodynamics*
Term 2 - 2023

Profile information current as at 30/04/2024 01:05 am

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
The unit will introduce the laws of thermodynamics, energy, work, and heat transfer in liquids and gasses. You will learn how to analyse and solve problems on heat engines, refrigeration, heat pumps as well as Rankine and Brayton cycles. You will develop the capacity to work, learn, and communicate ethically and professionally, as individuals and in teams, to investigate, solve problems, prepare technical and laboratory reports, and evaluate uncertainties and the results of your work. In this unit, you must complete compulsory practical activities. Refer to the Engineering Undergraduate Course Moodle site for proposed dates.

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.
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

- 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: 15%
2. **Written Assessment**
Weighting: 15%
3. **Practical Assessment**
Weighting: 20%
4. **Examination**
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 Student evaluation

Feedback

Tutorial/example questions should be done from start to finish instead of explaining the concept only.

Recommendation

More time will be taken to go through the start to finish of tutorial/example questions and clear explanations will be provided in the coming years.

Feedback from Student evaluation.

Feedback

There were some issues with understanding the goal of some questions, though it is non-critical.

Recommendation

Some more background information will be provided to make the students understand the goal of the questions.

Feedback from Student evaluation

Feedback

Unit Coordinator's understanding and delivery of the content made this unit enjoyable and engaging.

Recommendation

A similar or improved standard will be maintained in the coming years.

Feedback from Student evaluation.

Feedback

The exam was difficult and needed more time/ resources.

Recommendation

The exam was open book. These comments will be taken into consideration in the coming years during setting up the question paper.

Unit Learning Outcomes

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

1. Analyse the flow and non-flow processes using tables of properties of fluids, P-v-T, P-v, and T-v diagrams
2. Explain the first and second law of thermodynamics and their limitations
3. Analyse the heat energy cycles for a variety of heat engine, refrigeration, and heat pump cycles
4. Analyse Rankine and Brayton cycles including their T-s diagrams and practical applications
5. Prepare technical and laboratory reports with a thorough evaluation of experimental uncertainties and results obtained in an ethical and professional manner both individually and in teams.

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

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

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

2.3 Application of systematic engineering synthesis and design processes. (LO: 1N 2N 3N 4N 5I)

2.4 Application of systematic approaches to the conduct and management of engineering projects. (LO: 1N 2N 3N 4I 5I)

3.3 Creative, innovative, and pro-active demeanour. (LO: 1N 2I 3I 4I 5I)

3.4 Professional use and management of information. (LO: 1N 2I 3I 4I 5I)

Advanced

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

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

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

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

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

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

3.1 Ethical conduct and professional accountability. (LO: 5A)

3.2 Effective oral and written communication in professional and lay domains. (LO: 5A)

3.5 Orderly management of self, and professional conduct. (LO: 1N 2N 3I 4N 5A)

3.6 Effective team membership and team leadership. (LO: 5A)

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 - Written Assessment - 15%	•	•			
2 - Written Assessment - 15%			•	•	
3 - Practical Assessment - 20%					•
4 - Examination - 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 - Aboriginal and Torres Strait Islander Cultures					

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 , New York , USA
ISBN: 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: ISBN 978-0-631-19703-4
Binding: Paperback

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
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Schedule

Week 1 - 10 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Fundamentals - Energy resources, thermodynamic concept,work,heat, 1st law of thermodynamics.	Chapters 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 - 17 Jul 2023

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

Week 3 - 24 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Properties of vapours; non-flow process for gases.	Chapter 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 - 31 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Non-flow process for vapours; steady flow processes for gases and vapours.	Chapter 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 - 07 Aug 2023

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

Vacation Week - 14 Aug 2023

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 - 21 Aug 2023

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.	Chapter 8 (excluding section 8.6)	Lecture on chapter 8 and tutorial on chapters 5 and 6 (problems 5.76, 5.81, 6.3, 6.7 and 6.10). **Written Assessment (Assignment 1)** Due: Week 6 Friday (25 Aug 2023) 11:59 pm AEST

Week 7 - 28 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Air standard Otto cycle; constant volume process.	Chapters 8 and 9 (excluding sections 9.12 to 9.14)	Lecture on chapters 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 - 04 Sep 2023

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

Week 9 - 11 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Sterling and Ericson cycles.	Chapter 9	Lecture and tutorial on chapter 9 (problems 9.1, 9.11, 9.20, 9.28 and 9.34).

Week 10 - 18 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic

Brayton cycle for gas turbines. Written Assessment 2 on chapters 8 and 9 is due this week.	Chapter 9	Lecture and tutorial on chapter 9 (problems 9.50, 9.53, 9.54, 9.61 and 9.68).
Week 11 - 25 Sep 2023		
Module/Topic	**Chapter**	**Events and Submissions/Topic**
Reversed cycles - refrigeration.	Chapter 10 (excluding section 10.7)	Lecture and tutorial on chapter 10 (problems 10.1, 10.10, 10.15, 10.29 and 10.34). **Written Assessment (Assignment 2)** Due: Week 11 Friday (29 Sept 2023) 11:59 pm AEST
Week 12 - 02 Oct 2023		
Module/Topic	**Chapter**	**Events and Submissions/Topic**
Revision	Chapter 10 and guideline for exam preparation	Review class
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 (Assignment 1)

Assessment Type
Written Assessment

Task Description
This assessment task relates to the unit learning outcomes numbers 1and 2 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 3 weeks prior to due date.

Assessment Due Date
Week 6 Friday (25 Aug 2023) 11:59 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 (8 Sept 2023)
Feedback will be provided.

Weighting
15%

Minimum mark or grade
50%

Assessment Criteria
This assignment will be marked to a marking scheme as indicated in Assignment 1 questions. 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

- Analyse the flow and non-flow processes using tables of properties of fluids, P-v-T, P-v, and T-v diagrams
- Explain the first and second law of thermodynamics and their limitations

2 Written Assessment (Assignment 2)

Assessment Type
Written Assessment

Task Description
This assessment task relates to the unit learning outcomes numbers 3 and 4 and will cover study materials from chapters 8 and 9 of your textbook. The assignment questions will be available in unit Moodle site about 3 weeks prior to due date

Assessment Due Date
Week 11 Friday (29 Sept 2023) 11:59 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
Review/Exam Week Friday (13 Oct 2023)
Feedback will be provided.

Weighting
15%

Minimum mark or grade
50%

Assessment Criteria
This assignment will be marked to a marking scheme as indicated in Assignment 2 questions. 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

- Analyse the heat energy cycles for a variety of heat engine, refrigeration, and heat pump cycles
- Analyse Rankine and Brayton cycles including their T-s diagrams and practical applications

3 Practical Assessment (3 Laboratory exercises)

Assessment Type
Practical Assessment

Task Description
This assessment task relates to learning outcomes number 5 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 schedule for both internal and distance students will be supplied separately. 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)

The laboratory report should be submitted in a team of 3-5 students.
At laboratory session, arrive early, be organised and ready to do the laboratory experiment.

Ensure to bring laboratory instruction sheet, notebook, ruler, pen, pencil and calculator.

Compulsory personal protection equipment (PPE) listed in your laboratory instruction sheet must be used.

Assessment Due Date

First report is due after 2 weeks from the date of your experiment, 2nd report due after one week from the first report due date and and 3rd report is due after one week from the 2nd report due date.

Return Date to Students

The feedback on first report will be provided after 2 weeks from the date of your first report submission, feedback on 2nd report will be provided after one week from the first report feedback date and the feedback on 3rd report will be provided after one week from the 2nd report feedback date.

Weighting
20%

Minimum mark or grade
50%

Assessment Criteria
The laboratory exercises are compulsory and will be up to 2 hours in duration. Submitted report without attending laboratory session (practical) will be marked as zero. Assessment will be done based on the professionalism in reporting and presentation, relevant and comprehensive content (as mentioned under laboratory above), 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 i.e 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 group will contribute to the conduct, preparation and 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 Group

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

- Prepare technical and laboratory reports with a thorough evaluation of experimental uncertainties and results obtained in an ethical and professional manner both individually and in teams.

Examination

Outline
Complete an invigilated examination.

Date
During the examination period at a CQUniversity examination centre.

Weighting
50%

Length
180 minutes

Minimum mark or grade
50%

Exam Conditions
Open Book.

Materials
Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).
Calculator - all non-communicable calculators, including scientific, programmable and graphics calculators are authorised

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