ENEM14011 *Energy Conversion*

Term 1 - 2019

Profile information current as at 20/04/2024 01:34 pm

General Information

Overview

This unit introduces you to key concepts and principles required to analyse problems involving heat exchange and energy conversion. You will analyse and design heat exchangers and analyse the performance of compressors, internal combustion engines, gas turbines and jet propulsion. You will analyse combustion processes and estimate pollutant emissions, and analyse and design nozzles to promote safe and efficient combustion. You will prepare professional documents that demonstrate critical evaluation of results. You will be required to show your ability to work productively to solve problems, and document and communicate your work clearly in a professional manner. On-campus students will be required to attend laboratory sessions to promote development of unit learning outcomes. Mixed Mode (online) students will be required to attend a residential school to attend laboratory sessions and an in-class test to promote development of unit learning outcomes.

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 - 2019

- 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. **In-class Test(s)**
Weighting: 15%
2. **Laboratory/Practical**
Weighting: 15%
3. **Online Test**
Weighting: 15%
4. **Examination**
Weighting: 55%

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 coordinator reflection

Feedback

There is misalignment between assignment performance and exam performance. Student performance in the exam is poor even though questions were similar to tutorial questions and textbook examples.

Recommendation

Adjust the assessment weightings and type to encourage higher individual achievement in an authentic manner.

Feedback from Student feedback

Feedback

Students have commented that the use of an individual interview to assess the lab component of the unit is beneficial to their learning.

Recommendation

Continue the use of individual interviews for lab assessments.

Unit Learning Outcomes

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

1. Analyse and explain the principles of heat transfer and conversion between heat energy and mechanical power
2. Analyse and evaluate the performance of heat exchangers and internal combustion engines
3. Analyse and explain combustion calculations and processes
4. Analyse and evaluate the performance of gas turbines with respect to jet propulsion
5. Analyse and evaluate the performance of nozzles with respect to jet propulsion
6. Analyse and evaluate the performance of compressors.

This unit in the Mechanical Engineering course helps students meet the Engineers Australia's stage one competencies.

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level • Introductory Level • Intermediate Level • Graduate Level ◦ Professional Level ◦ Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
1 - In-class Test(s) - 15%	•	•				
2 - Laboratory/Practical - 15%	•	•				
3 - Online Test - 15%			•	•		
4 - Examination - 55%			•	•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
1 - Communication	•	•	•	•	•	•
2 - Problem Solving	•	•	•	•	•	•
3 - Critical Thinking	•	•	•	•	•	•
4 - Information Literacy	•	•	•	•	•	•
5 - Team Work						
6 - Information Technology Competence	•	•	•	•		
7 - Cross Cultural Competence						
8 - Ethical practice						
9 - Social Innovation						
10 - Aboriginal and Torres Strait Islander Cultures						

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - In-class Test(s) - 15%	•	•	•	•						
2 - Laboratory/Practical - 15%	•	•	•	•		•				
3 - Online Test - 15%	•	•	•	•		•				
4 - Examination - 55%	•	•	•	•						

Textbooks and Resources

Textbooks

ENEM14011

Prescribed

Applied Thermodynamics for Engineering Technologists
Edition: 5th (1993)
Authors: Eastop, T.D. and McConkey, A.
Pearson, Prentice Hall
Harlow , Essex , UK
ISBN: 9780582091931
Binding: Paperback
ENEM14011

Prescribed

Thermodynamics and Transport Properties of Fluids (SI Units)
Edition: 5th (1995)
Authors: Rogers, G.F.C. & Mayhew, Y.R.
Blackwell
ISBN: 9780631197034
Binding: Paperback

Additional Textbook Information
Both copies are available to purchase at the CQUni Bookshop here: http://bookshop.cqu.edu.au (search on the Unit code)

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Video and audio equipment to join online tutorials
- Access to a scanner and software that can create pdf documents

Referencing Style

All submissions for this unit must use the referencing styles below:

- Harvard (author-date)
- Turabian

For further information, see the Assessment Tasks.

Teaching Contacts

Justin Hyde Unit Coordinator
j.hyde@cqu.edu.au
Ramadas Narayanan Unit Coordinator
r.narayanan@cqu.edu.au

Schedule

Week 1 - 11 Mar 2019

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 weeks 1 & 2: 16.1, 16.5, 16.6, 16.8, 16.16, 16.18, 16.20, 16.21, 16.22, 16.30, 16.37, 16.38, 16.44, 16.46

Week 2 - 18 Mar 2019

Module/Topic	Chapter	Events and Submissions/Topic
Heat Transfer - Forced convection, natural convection, heat exchangers, heat exchanger effectiveness, extended surfaces, 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 - Pages 599-650	Tutorial Problems for weeks 1 & 2: 16.1, 16.5, 16.6, 16.8, 16.16, 16.18, 16.20, 16.21, 16.22, 16.30, 16.37, 16.38, 16.44, 16.46

Week 3 - 25 Mar 2019

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 3 & 4: 13.1, 13.2, 13.6, 13.8, 13.9, 13.10, 13.11,13.13

Week 4 - 01 Apr 2019

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	Residential school for Mixed Mode students Tutorial Problems for weeks 3 & 4: 13.1, 13.2, 13.6, 13.8, 13.9, 13.10, 13.11,13.13 **In-Class Test** Due: Week 4 Thursday (4 Apr 2019) 9:00 am AEST

Week 5 - 08 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Combustion - Basic chemistry, fuels, combustion equations, stoichiometric air-fuel ratio	Chapter 7 - Pages 176-183	Tutorial Problems for weeks 5-7: 7.1, 7.3, 7.5, 7.6, 7.8, 7.9, 7.12

Vacation Week - 15 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 22 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Combustion - Exhaust and flue gas analysis, practical analysis of combustion products	Chapter 7 - Pages 183-200	Tutorial Problems for weeks 5-7: 7.1, 7.3, 7.5, 7.6, 7.8, 7.9, 7.12

Week 7 - 29 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Combustion - Enthalpy of formation, calorific value of fuels, power plant thermal efficiency, practical determination of calorific values, air and fuel-vapour mixtures	Chapter 7 - Pages 219-230	Tutorial Problems for weeks 5-7: 7.1, 7.3, 7.5, 7.6, 7.8, 7.9, 7.12

Week 8 - 06 May 2019

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 9 - 13 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Nozzles and Jet Propulsion - Nozzle shape, critical pressure ratio, maximum mass flow	Chapter 10 - Pages 287-298	Tutorial Problems for weeks 9-11: 10.1, 10.2, 10.3, 10.4, 10.7, 10.8, 10.9 **Online Test** Due: Week 9 Thursday (16 May 2019) 9:00 am AEST

Week 10 - 20 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Nozzles and Jet Propulsion - Nozzles off the design pressure ratio, nozzle efficiency	Chapter 10 - Pages 298-304	Tutorial Problems for weeks 9-11: 10.1, 10.2, 10.3, 10.4, 10.7, 10.8, 10.9

Week 11 - 27 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Nozzles and Jet Propulsion - Stagnation conditions, jet propulsion, turbojet, turboprop,	Chapter 10 - Pages 309-325	Tutorial Problems for weeks 9-11: 10.1, 10.2, 10.3, 10.4, 10.7, 10.8, 10.9

Week 12 - 03 Jun 2019

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

Review/Exam Week - 10 Jun 2019

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

Exam Week - 17 Jun 2019

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

There is an in-class test for all students in week 4 and an online test in week 9. No extensions are possible for the tests. Students will be notified of the days and times for the test via email and Moodle. It is the student's responsibility to know the days and times of the tests. If you are not available at the prescribed time and day then you should withdraw from the unit before census date or be prepared to receive zero marks for the test(s).

Assessment Tasks

1 In-Class Test

Assessment Type
In-class Test(s)

Task Description
Answer questions in a two-hour test format relating to the topics from weeks 1-3. On-campus students will sit the test in-person during the normal timetabled class. Mixed-mode students will sit the test together with the Rockhampton students during the residential school. All students need to ensure that they are available on the day and at the

allocated time. No extensions are possible. There is no minimum mark for the test and if you do not sit the test then you will get zero marks.

Assessment Due Date
Week 4 Thursday (4 Apr 2019) 9:00 am AEST

Return Date to Students
Vacation Week Thursday (18 Apr 2019)
Global feedback and individual marks will be added to Moodle once marking has been completed

Weighting
15%

Assessment Criteria
You will be scored on the following criteria:

- correct answers to appropriate levels of significant figures
- correct selection and application of theoretical concepts to the specific question situation
- accuracy and quality of presentation of diagrams and schematics used to solve the questions

Referencing Style

- Harvard (author-date)
- Turabian

Submission
Offline

Submission Instructions
Students should hand their answer script to the supervising staff member on their campus at the conclusion of the test.

Learning Outcomes Assessed

- Analyse and explain the principles of heat transfer and conversion between heat energy and mechanical power
- Analyse and evaluate the performance of heat exchangers and internal combustion engines

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

2 Laboratories and Interview

Assessment Type
Laboratory/Practical

Task Description
Each student will be required to complete the following:

1. Data collection for heat exchangers (group work) (Pass/Fail)
2. Data collection for diesel engine (group work) (Pass/Fail)
3. Data collection for petrol engine (group work) (Pass/Fail)
4. Data processing and spreadsheet presentation of results for heat exchangers (individual work) (2%)
5. Data processing and spreadsheet presentation of results for diesel engine (individual work) (2%)
6. Data processing and spreadsheet presentation of results for petrol engine (individual work) (2%)
7. Answer questions on heat exchanger results during interview (individual work) (3%)
8. Answer questions on diesel engine results during interview (individual work) (3%)
9. Answer questions on petrol engine results during interview (individual work) (3%)

The residential school for Mixed Mode students will be held in Rockhampton, 3-5 April 2019.
A schedule for on-campus and Mixed Mode students will be supplied separately in Moodle.
The laboratory activities and interview are compulsory, non-attendance will be marked as zero and will result in a Fail for the entire unit.

Assessment Due Date

To be negotiated with lab technicians and unit coordinator. Each campus is operating independently of each other.

Return Date to Students

Feedback and guidance provided during the lab sessions, after submission of the spreadsheets and on completion of the interview.

Weighting
15%

Minimum mark or grade
50%

Assessment Criteria
The data collection components are Pass/Fail. Students are expected to participate in the lab activity in order to enhance their understanding of the concepts demonstrated by each lab activity. Non attendance and non participation will result in a Fail grade for the labs and the overall unit.
The spreadsheets will be graded on the following criteria:

- Correct presentation of raw data
- Correct processing of raw data
- Correct presentation of results in table format
- Correct presentation of results in graphical format

Students will be interviewed by the Unit Coordinator. In the interview students will be asked a series of questions which test their understanding of each lab activity, the concepts behind each lab activity and an understanding of how the theories apply to everyday machinery which use these concepts. Each student's mark will depend on their ability to answer the questions. Example questions will be available in Moodle. Interviews will be in person or via video conferencing technology (Zoom). The interview may be recorded.

Referencing Style

- Harvard (author-date)
- Turabian

Submission
No submission method provided.

Learning Outcomes Assessed

- Analyse and explain the principles of heat transfer and conversion between heat energy and mechanical power
- Analyse and evaluate the performance of heat exchangers and internal combustion engines

Graduate Attributes

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

3 Online Test

Assessment Type
Online Test

Task Description
Answer questions in a two-hour test format relating to the topics from weeks 4-7. On-campus students will sit the test in-person during the normal timetabled class. Mixed-mode students will sit the test on the same day and time and submit a scanned copy of their answers into Moodle within 15 minutes of the end of the test. All students need to ensure that they are available on the day and at the allocated time. No extensions are possible. There is no minimum mark for the test and if you do not sit the test then you will get zero marks.

Assessment Due Date
Week 9 Thursday (16 May 2019) 9:00 am AEST

Return Date to Students
Week 11 Thursday (30 May 2019)
Global feedback and individual marks will be added to Moodle once marking has been completed

Weighting
15%

Assessment Criteria
You will be scored on the following criteria:

- correct answers to appropriate levels of significant figures
- correct selection and application of theoretical concepts to the specific question situation
- accuracy and quality of presentation of diagrams and schematics used to solve the questions

Referencing Style

- Harvard (author-date)
- Turabian

Submission
Offline Online

Submission Instructions
Mixed mode students to submit via Moodle, on-campus students to submit to supervising staff member at the conclusion of the test.

Learning Outcomes Assessed

- Analyse and explain combustion calculations and processes
- Analyse and evaluate the performance of gas turbines with respect to jet propulsion

Graduate Attributes

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

Examination

Outline
Complete an invigilated examination.

Date
During the examination period at a CQUniversity examination centre.

Weighting
55%

Length
180 minutes

Minimum mark or grade
50

Exam Conditions
Restricted.

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