



ENEG11008 *Materials for Engineers*

Term 3 - 2024

Profile information current as at 05/11/2024 05:04 pm

All details in this unit profile for ENEG11008 have been officially approved by CQU University 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

ENEG11008: Materials for Engineers introduces you to the essential knowledge of materials science and the ways in which engineers understand, select and use materials and processes for engineering applications. In this unit, you will gain knowledge of engineering materials, microstructure and its effect on the material properties. You will learn how to identify and explain the properties of engineering materials and processes and how to classify these materials. You will also learn how to select engineering materials and processes for engineering applications, as well as to conduct material tests and report on their results. Throughout this unit, you will develop teamwork, research and communication skills. 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 1*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

Pre-requisites or Co-requisites

There are no requisites for this unit.

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 3 - 2024

- Mixed Mode

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Website

[This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.](#)

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

[Regional Campuses](#)

Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

[Metropolitan Campuses](#)

Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Online Quiz(zes)**

Weighting: 20%

2. **Practical and Written Assessment**

Weighting: 20%

3. **Written Assessment**

Weighting: 25%

4. **Online Test**

Weighting: 35%

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 unit comments report and self-observation

Feedback

Technical issues associated with ISL arose early weeks of the term.

Recommendation

The unit coordinator should arrange testing sessions with Teaching Technology Support before the term starts. Each local lecturer should be assigned as a co-host to address issues without disrupting the central delivery.

Feedback from SUTE unit comments report and self-observation

Feedback

The delivery of its residential school component was inconsistent across campuses due to staffing and equipment.

Recommendation

Students should be provided with more flexible options. Residential school activities will be arranged based on local specialties.

Feedback from SUTE unit comments report

Feedback

Students commented on calculation questions which were pushed to tutorial classes, instead of discussing them in detail during lectures.

Recommendation

The unit coordinator should provide one sample calculation question while ensuring local lecturers cover multiple examples for a firm understanding.

Unit Learning Outcomes

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

1. Define the atomic and microstructure of engineering materials and their relationship to physical behaviour
2. Classify engineering materials into metals, ceramics, polymers and composites
3. Characterise materials for mechanical properties based on Australian Standards and ASTM methods
4. Explain the role of mechanical, electrical, optical and thermal properties of materials in engineering
5. Apply the frameworks used to select materials for engineering applications.

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:

Introductory

- 1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 1N 3N)
- 1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 2N 4N 5N)
- 1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 1N 2N 3N 5N)
- 1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline. (LO: 1N 2N 3N 4N 5N)
- 2.1 Application of established engineering methods to complex engineering problem solving. (LO: 1N 5N)
- 2.3 Application of systematic engineering synthesis and design processes. (LO: 5N)
- 3.2 Effective oral and written communication in professional and lay domains. (LO: 1N 2N 3N 4N 5N)
- 3.4 Professional use and management of information. (LO: 5N)
- 3.5 Orderly management of self, and professional conduct. (LO: 5N)
- 3.6 Effective team membership and team leadership. (LO: 5N)

Intermediate

- 1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 1I 2N 3I 4N)
- 1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 2N 4I 5N)
- 2.2 Fluent application of engineering techniques, tools and resources. (LO: 3N 4N 5I)
- 3.3 Creative, innovative and pro-active demeanour. (LO: 5I)

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



Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
1 - Online Quiz(zes) - 20%	•	•			
2 - Written Assessment - 25%				•	•
3 - Practical and Written Assessment - 20%	•		•		
4 - Online Test - 35%		•	•	•	•

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

ENEG11008

Prescribed

Callister Materials Science and Engineering: An Introduction

1st ANZ Edition (2019)

Authors: Blicblau, Bruggeman, etc.

John Wiley & Sons

ISBN: 9780730382836

Binding: Paperback

Additional Textbook Information

The online version of the required textbooks is available at CQU's library website.

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

Xiaohan Yang Unit Coordinator

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Schedule

Week 1 - 04 Nov 2024

Module/Topic	Chapter	Events and Submissions/Topic
Week 1 1. Introduction to the Unit 2. Introduction to Materials Science and Engineering	Callister's Chapter 1: 1.2-1.6 & Chapter 6: 6.1-6.2	1. Review lecture slides 2. Review lecture slides and read recommended chapters (1.2 ~ 1.6 & 6.1~6.2) 3. Don't forget to attend the tutorial with a laptop or tablet PC - Attempt each tutorial prior to the ZOOM tutorial session through the link in Moodle. 4. Choose your preferred group for the residential school by 20 Dec 2024.

Week 2 - 11 Nov 2024

Module/Topic	Chapter	Events and Submissions/Topic
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Week 2: Mechanical Properties of Engineering Materials	Chapter 6: 6.3, 6.5-6.7 & 6.10	<ol style="list-style-type: none"> 1. Review lecture slides 2. Read the recommended chapters (Chapter 6: 6.3, 6.5-6.7 & 6.10). 3. Attend weekly Zoom tutorial session. Please attempt this week's online tutorial beforehand.
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Week 3 - 18 Nov 2024

Module/Topic	Chapter	Events and Submissions/Topic
Week 3: Failure of Engineering Materials	Chapters 8: 8.1-8.6	<ol style="list-style-type: none"> 1. Review lecture slides 2. Read the recommended chapters (Chapters 8: 8.1-8.6) 3. Review lab documents and other related materials. 4. Attend weekly Zoom tutorial session. 5. Assessment Online Quiz#1 is open.

Week 4 - 25 Nov 2024

Module/Topic	Chapter	Events and Submissions/Topic
Week 4: Principles of Material Selection, Material Selection Process	Chapter 5 of Materials Selection in Mechanical Design by M. Ashby	<ol style="list-style-type: none"> 1. Review lecture slides 2. Read the recommended chapters (Chapter 5 of Materials Selection in Mechanical Design by M. Ashby) 3. Review the lab documents and the materials selection assignment document. 4. Attend weekly Zoom tutorial session. 5. Submit Assessment Online Quiz#1.

Week 5 - 02 Dec 2024

Module/Topic	Chapter	Events and Submissions/Topic
Week 5: Microstructure of Materials	Chapters 3: 3.1 - 3.5, 3.7 & 3.13 - 3.15	<ol style="list-style-type: none"> 1. Review lecture slides 2. Read recommended chapters (Chapters 3: 3.1 - 3.5, 3.7 & 3.13 - 3.15) 3. Attend weekly Zoom tutorial session. 4. Review Week 4 tutorial (consult your lecturer about your idea / topic for the materials selection process assessment if needed). 5. Selection of Residential School Group in Rockhampton Campus is open this week.

Week 6 - 09 Dec 2024

Module/Topic	Chapter	Events and Submissions/Topic
Week 6: Imperfection and Dislocations of Metals	Chapters 4: 4.1 - 4.5 & 7: 7.1 - 7.6	<ol style="list-style-type: none"> 1. Review lecture slides 2. Read recommended chapters (Chapters 4: 4.1 - 4.5 & 7: 7.1 - 7.6) 3. Complete Part A of the materials selection template. 4. Attend weekly Zoom tutorial session. 5. Assessment Online Quiz#2 is open in Week 7 6. Select your Residential School Group in Rockhampton Campus on 6-7 January 2025 by 20 December 2024.

Week 7 - 16 Dec 2024

Module/Topic	Chapter	Events and Submissions/Topic
Week 7: Strengthening Mechanism of Metals and Diffusion in Solids	Chapter 5: 5.1 - 5.3 & 5.5 and Chapter 7: 7.8 - 7.13	<ol style="list-style-type: none"> 1. Review lecture slides 2. Read recommended chapters (Chapter 5: 5.1 - 5.3 & 5.5 and Chapter 7: 7.8 - 7.13) 3. Attend weekly Zoom tutorial session. 4. Attempt Quiz 2 (due this Sunday) and submit. 5. Select your Residential School Group in Rockhampton Campus on 6-7 January 2025 by 20 December 2024.

Vacation Week - 23 Dec 2024

Module/Topic	Chapter	Events and Submissions/Topic
Merry Christmas!		

Vacation Week - 30 Dec 2024

Module/Topic	Chapter	Events and Submissions/Topic
Happy new year!		

Week 8 and Residential School - 06 Jan 2025

Module/Topic	Chapter	Events and Submissions/Topic
Week 8: Phase Diagram, Phase Transformation and Metal Alloys	Chapter 9: 9.1 - 9.13 & 9.18, Chapter 10: 10.5 & 10.7 & Chapter 11: 11.1 - 11.3	<ol style="list-style-type: none"> 1. Review lecture slides 2. Read recommended chapters (Chapter 9: 9.1 - 9.13 & 9.18, Chapter 10: 10.5 & 10.7 & Chapter 11: 11.1 - 11.3) 3. Attend weekly Zoom tutorial session. 4. Review the lab documents and the materials selection assignment document prior to attending the residential school.

Week 9 - 13 Jan 2025

Module/Topic	Chapter	Events and Submissions/Topic
Week 9: Thermal Properties of Engineering Materials	Chapters 18: 18.2, 18.3, 18.7, 18.8, 18.11, 18.13, 18.15, 18.18	<ol style="list-style-type: none"> 1. Review lecture slides 2. Read recommended chapters (Chapters 18: 18.2, 18.3, 18.7, 18.8, 18.11, 18.13, 18.15, 18.18) 3. Attend weekly Zoom tutorial session. 4. Assessment Attempt Quiz 3 is open till end of next week. 5. Review marks and feedback for your residential school assessment. <p>Residential School and Presentation Due: Week 9 Monday (13 Jan 2025) 12:00 am AEST</p>

Week 10 - 20 Jan 2025

Module/Topic	Chapter	Events and Submissions/Topic

Week 10: Electrical Properties of Engineering Materials

Chapters 19: 19.1 - 19.5

1. Review lecture slides
2. Read recommended chapters (Chapters 19: 19.1 - 19.5)
3. Attend weekly Zoom tutorial session.
4. Assessment Attempt Quiz 3 is due this week.
5. Submit the materials selection process template.

Material Selection Process

Assignment Due: Week 10 Tuesday (21 Jan 2025) 12:00 am AEST

Week 11 - 27 Jan 2025

Module/Topic	Chapter	Events and Submissions/Topic
Week 10: Non-metallic Materials - Ceramics, Polymers and Composites	Chapters 12: 12.1, 12.2, 12.4, 12.5 & 14.1, 14.2, 14.3, 14.6, 14.7, 14.9, & 15.2, 15.12, 15.13 & 16.1, 16.5	<ol style="list-style-type: none">1. Review lecture slides2. Read recommended chapters (Chapters 12: 12.1, 12.2, 12.4, 12.5 & 14.1, 14.2, 14.3, 14.6, 14.7, 14.9, & 15.2, 15.12, 15.13 & 16.1, 16.5)3. Attend weekly Zoom tutorial session.4. Assessment Attempt Quiz 4 is open.

Week 12 - 03 Feb 2025

Module/Topic	Chapter	Events and Submissions/Topic
Revision for the End-of-term Online Test		<ol style="list-style-type: none">1. Read recommended chapters (Chapters 17: 17.2-17.10).2. Attend the tutorial with a laptop or tablet PC.3. Be prepared for the final online test.4. Submit Assessment Attempt Quiz 4.

Exam Week - 10 Feb 2025

Module/Topic	Chapter	Events and Submissions/Topic
Exam week		Attend the online test (Duration 3h) as scheduled (TBA). Only 1 attempt is allowed.

Term Specific Information

Residential School is scheduled on Monday to Tuesday 06/01/2025 to 07/01/2025 (Week 8) at Rockhampton Campus

Assessment Tasks

1 Online Quiz #1-4

Assessment Type

Online Quiz(zes)

Task Description

1. Tri-weekly online quizzes - You will be given a set of questions in Weeks 3, 6, 9 and 11 (Weighting: 20%)
2. You will be able to check your marks immediately after the deadline has passed.
3. The total marks of each online quiz will be scaled to out of 5 marks for the unit total.
4. 50% minimum mark is applied to this section to pass the unit.

Number of Quizzes

4

Frequency of Quizzes

Other

Assessment Due Date

The due date of each quiz is the Wednesday week after. Quiz #1 (Week 4), Quiz #2 (Week 7), Quiz 3 (Week 10). Quiz (Week 12)

Return Date to Students**Weighting**

20%

Minimum mark or grade

50%

Assessment Criteria

Quiz 1 contains the lecture materials in Weeks 1, 2 and 3 (Tutorial#1-3).

Quiz 2 contains the lecture materials in Weeks 3-6 (Tutorial#3-5).

Quiz 3 contains the lecture materials in Weeks 7-9 (Tutorial#6-8).

Quiz 4 contains the lecture materials in Weeks 10~11 (Tutorial#9~11).

Referencing Style

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

Submission

Online

Learning Outcomes Assessed

- Define the atomic and microstructure of engineering materials and their relationship to physical behaviour
- Classify engineering materials into metals, ceramics, polymers and composites

Graduate Attributes

2 Residential School and Presentation

Assessment Type

Practical and Written Assessment

Task Description

Residential school and presentation (20% weighting) - During the residential school

You will form a group of 5, conduct labs, prepare for presentation, and give a presentation as a group during the residential school. It is a two-day residential school to be held on 6-7 January 2025, Week 8. By the end of the residential school, you should complete the following items.

- Conduct a minimum of two labs (group)
- Review of Materials selection tutorial: Part A (individual)
- Determine your topic (product / application) for the materials selection process assignment (individual)
- Analysis of raw data from the laboratory activities (group)
- Presentation of your lab, data, and findings in relation to the real-life applications (group)

Assessment Due Date

Week 9 Monday (13 Jan 2025) 12:00 am AEST

At the end of the residential school

Return Date to Students

Week 9 Monday (13 Jan 2025)

Review marks and feedback for residential school assessment in Week 9.

Weighting

20%

Minimum mark or grade

50%

Assessment Criteria

Group presentation will be assessed against the following marking items:

1. Visual aids – Legibility of text, quality and relevance of figures, visual impact
2. Presentation skills / Preparation / Group dynamics
3. Content, comprehension, and depth of coverage
4. 50% minimum mark is applied to this section to pass the unit.

Referencing Style

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

Submission

Group

Learning Outcomes Assessed

- Define the atomic and microstructure of engineering materials and their relationship to physical behaviour
- Characterise materials for mechanical properties based on Australian Standards and ASTM methods

Graduate Attributes

3 Material Selection Process Assignment

Assessment Type

Written Assessment

Task Description

Material Selection Process Assignment (25%)

With the completion of this assignment, you are expected to achieve the following learning outcomes.

1. Research and apply engineering standards, practices and materials optimization and constraints
2. Work individually to produce quality outputs

Assessment Due Date

Week 10 Tuesday (21 Jan 2025) 12:00 am AEST

Return Date to Students

Week 12 Tuesday (4 Feb 2025)

Weighting

25%

Assessment Criteria

Your task is to analysis an engineering product / application of your interest and suggest alternative material(s) to improve its design for any purpose (e.g. process and / or manufacturing cost, performance, better user and environmental friendliness, improved safety, improved operating conditions, etc.).

Referencing Style

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

Submission

Online

Learning Outcomes Assessed

- Explain the role of mechanical, electrical, optical and thermal properties of materials in engineering
- Apply the frameworks used to select materials for engineering applications.

Graduate Attributes

4 End of Term Online Test

Assessment Type

Online Test

Task Description

End of Term Online Test (35%)

1. The total marks of this online test will be scaled to out of 35 marks for the unit total.
2. Attend the online test (Duration 3h) as scheduled (TBA). Only 1 attempt is allowed.

Assessment Due Date

TBA

Return Date to Students

TBA

Weighting

35%

Minimum mark or grade

50%

Assessment Criteria

50% minimum mark is applied to this section to pass the unit.

Referencing Style

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

Submission

Online

Learning Outcomes Assessed

- Classify engineering materials into metals, ceramics, polymers and composites
- Characterise materials for mechanical properties based on Australian Standards and ASTM methods
- Explain the role of mechanical, electrical, optical and thermal properties of materials in engineering
- Apply the frameworks used to select materials for engineering applications.

Graduate Attributes

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