ENEC12012 *Stress Analysis*
Term 3 - 2025

Profile information current as at 16/03/2026 12:17 am

General Information

Overview
In this unit, you will develop skills to analyse the stresses in a structural member subjected to various actions such as axial force, torsion, bending moments, and shear force using the principles of mechanics of materials. You will learn how individual structural members resist and transfer the stresses as well as ways in which they can fail. You will document the process of modeling, testing, and analysis and communicate, work and learn, both individually and in teams in a professional manner. 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 2*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites
Prerequisites: (ENEG11006 Engineering Statics OR ENEC12007 Analysis of Structures) AND (MATH11219 Engineering Mathematics) AND (ENEG11008 Materials for Engineers OR ENEG12005 Materials Science and Engineering)
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 - 2025
- 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. Written Assessment
Weighting: 20%
3. Practical and Written Assessment
Weighting: 10%
4. Online Test
Weighting: 50%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the CQUniversity Policy site.
You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the CQUniversity Policy site.

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from SUTE

Feedback

Students highly appreciated the lecturer's expertise and teaching approach, highlighting his ability to make complex structural concepts engaging and accessible.

Recommendation

Maintaining an engaging and supportive teaching style should be continued. Providing additional industry insights or practical examples to further inspire students' interest in structural engineering should be considered.

Feedback from SUTE

Feedback

Some students felt that an additional drop-in session during the term would be beneficial, especially for questions related to unit content and assessments beyond the weekly tutorial. While they appreciated the current structure, they suggested extra opportunities for interaction.

Recommendation

A couple of optional drop-in sessions throughout the term focused on clarifying unit content and assessments should be introduced. This could be scheduled before key assessment deadlines to provide targeted support.

Unit Learning Outcomes

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

1. Apply the fundamental theories and analytical techniques to solve problems in mechanics of materials
2. Analyse the behaviour of structural members subjected to axial force, torsion, bending moment and shear force
3. Determine principal stresses and discuss failure criteria for a range of engineering materials
4. Demonstrate a professional level of communication and teamwork.

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 1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 2N) 2.2 Fluent application of engineering techniques, tools, and resources. (LO: 3N 4N) 3.4 Professional use and management of information. (LO: 4N) 3.6 Effective team membership and team leadership. (LO: 4N)

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 2I 3I) 1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 1I 2I 3I) 1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 2N 3I) 2.1 Application of established engineering methods to complex engineering problem-solving. (LO: 2I 3I) 2.3 Application of systematic engineering synthesis and design processes. (LO: 2N 3I) 3.2 Effective oral and written communication in professional and lay domains. (LO: 4I) 3.5 Orderly management of self, and professional conduct. (LO: 4I)

Advanced

1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 3A)

Note: LO refers to the Learning Outcome number(s) which link to the competency and the levels: N – Introductory, I – Intermediate and A - Advanced.https://moodle.cqu.edu.au/course/view.php?id=1511

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

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
1 - Online Quiz(zes) - 20%	•		•	
2 - Written Assessment - 20%		•		
3 - Practical and Written Assessment - 10%				•
4 - Online Test - 50%		•	•	

Alignment of Graduate Attributes to Learning Outcomes

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

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes										
	1	2	3	4	5	6	7	8	9	10	11
1 - Online Quiz(zes) - 20%	•	•	•	•		•					
2 - Written Assessment - 20%	•	•	•	•							
3 - Practical and Written Assessment - 10%	•	•		•		•					
4 - Online Test - 50%	•	•	•	•							

Textbooks and Resources

Textbooks

ENEC12012

Prescribed

MECHANICS OF MATERIALS
11th Edition (SI Units) (2023)
Authors: R.C. Hibbeler
Pearson
London , UK
ISBN: 9781292725734
Binding: Hardcover

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

Hassan Baji Unit Coordinator
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Shameen Jinadasa Unit Coordinator
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Schedule

Week 1 - 10 Nov 2025

Module/Topic	Chapter	Events and Submissions/Topic
Concepts of Stress and Strain	Chapter 1: Stress Chapter 2: Strain	

Week 2 - 17 Nov 2025

Module/Topic	Chapter	Events and Submissions/Topic
Tension/Compression Tests Stress-Strain Behavior of Ductile and Brittle Materials Poisson's ratio Saint-Venant's Principal Principal of Superposition Elastic Deformation of Axially Loaded Member Statically Indeterminate Axially-Loaded Members	Chapter 3: Mechanical Properties of Materials Chapter 4: Axial Load	

Week 3 - 24 Nov 2025		
Module/Topic	Chapter	Events and Submissions/Topic
Torsional Deformation of Circular Shaft The Torsion Formula Angle of Twist Statically Indeterminate Torque-Loaded Members Solid Noncircular Shafts Thin-Walled Tubes Having Closed Cross Sections	Chapter 5: Torsion	Progressive Test #1: The test opens at 9:00 AM Monday of this week and closes at 9:00 PM Monday of next week.

Week 4 - 01 Dec 2025		
Module/Topic	Chapter	Events and Submissions/Topic
Shear and Moment Diagrams Bending Deformation of Straight Member The Flexural Formula	Chapter 6: Bending	

Week 5 - 08 Dec 2025		
Module/Topic	Chapter	Events and Submissions/Topic
Bending in Unsymmetrical Sections Bending Composite Sections	Chapter 6: Bending	Progressive Test #2: The test opens at 9:00 AM Monday of this week and closes at 9:00 PM Monday of next week.

Week 6 - 15 Dec 2025		
Module/Topic	Chapter	Events and Submissions/Topic
Shear in Straight Members The Shear Formula Shear Flow in Built-up Sections Shear Flow in Thin-Walled Members Shear Centre for Open Thin-Walled Members	Chapter 7: Transverse Shear	

Vacation Week - 22 Dec 2025		
Module/Topic	Chapter	Events and Submissions/Topic

Vacation Week - 29 Dec 2025		
Module/Topic	Chapter	Events and Submissions/Topic

Week 7 - 05 Jan 2026		
Module/Topic	Chapter	Events and Submissions/Topic
Thin-Walled Pressure Vessels State of Stress Caused by Combined Loadings	Chapter 8: Combined Loading	Progressive Test #3: The test opens at 9:00 AM Monday of this week and closes at 9:00 PM Monday of next week.

Week 8 - 12 Jan 2026		
Module/Topic	Chapter	Events and Submissions/Topic
Plane Stress Transformation General Equations for Plane-Stress Transformation Principal Stresses and Maximum In-Plane Shear Stress Mohr's Circle-Plane Stress	Chapter 9: Stress Transformation	

Week 9 - 19 Jan 2026		
Module/Topic	Chapter	Events and Submissions/Topic
Strain Transformation General Equations for Plane-Strain Transformation Strain Rosettes Failure Criteria	Chapter 10: Strain Transformation and Failure Criteria	

Week 10 - 26 Jan 2026

Module/Topic	Chapter	Events and Submissions/Topic
The Elastic Curve Slope and Displacement by Integration	Chapter 12: Deflection of Beams	

Week 11 - 02 Feb 2026

Module/Topic	Chapter	Events and Submissions/Topic
Critical Load Ideal Column with Different End Supports The Secant Formula	Chapter 13: Buckling of Columns	Assignment Due: Week 11 Monday (2 Feb 2026) 11:59 pm AEST

Week 12 - 09 Feb 2026

Module/Topic	Chapter	Events and Submissions/Topic
Review		

Review/Exam Week - 16 Feb 2026

Module/Topic	Chapter	Events and Submissions/Topic
		Practical Report Due: Exam Week Monday (16 Feb 2026) 11:59 pm AEST

Exam Week - 16 Feb 2026

Module/Topic	Chapter	Events and Submissions/Topic
		End of Term Test Practical Report Due: Exam Week Monday (16 Feb 2026) 11:59 pm AEST

Assessment Tasks

1 Progressive Tests

Assessment Type
Online Quiz(zes)

Task Description
This assessment task consists of three "Progressive Tests". First, second and third tests carry 6%, 7%, and 7% marks, respectively. Each test consists of a number of numerical questions.
Important Notes:

- Each Test is set for 90 minutes. You have 90 minutes from when you start your attempt to submit your answers.
- If you start but leave a test and come back to it later, your 90 min time may have lapsed and you will be scored zero for that attempt.
- You can attempt each test up to three (3) times within the given time frame as specified in the schedule.
- The test will be automatically closed after the end of the given time frame.
- The final mark will be the highest of all the attempts.
- Even though the tests are open for a few days, it is expected that your first attempt would be on the first day.
- The Tests cannot generally be deferred. However, under exceptional circumstances, if you have valid reasons to defer the test(s), please contact the Unit Coordinator with documents of proof before the due date.

AI Assessment Scale - AI Planning: You may use AI for planning, idea development, and research. Your final submission should show how you have developed and refined these ideas.
This assessment is exempted from the 72-hour submission grace period and must be completed by the stated submission date/time.

Number of Quizzes
3

Frequency of Quizzes
Other

Assessment Due Date

Tests opening and closing details are given on the unit schedule.

Return Date to Students

Immediately after the test completion.

Weighting
20%

Assessment Criteria
- Full marks allocated to a question will be awarded for each correct answer.
- No penalty for wrong answers.

Referencing Style
- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed
- Apply the fundamental theories and analytical techniques to solve problems in mechanics of materials
- Determine principal stresses and discuss failure criteria for a range of engineering materials

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

2 Assignment

Assessment Type
Written Assessment

Task Description
The aim of this assignment is to allow the students to demonstrate their understanding of various concepts, theories and processes studied/developed in weeks 7-9.
Clear detailed solution to all questions in the assignment should be submitted in a single PDF file via Moodle.
The assignment will be available by end of Week 6 through unit Moodle webpage.
AI Assessment Scale - AI Planning: You may use AI for planning, idea development, and research. Your final submission should show how you have developed and refined these ideas.

Assessment Due Date
Week 11 Monday (2 Feb 2026) 11:59 pm AEST

Return Date to Students
Monday (16 Feb 2026)

Feedback will be returned within two weeks after assignment due date.

Weighting
20%

Assessment Criteria
Each solution should have the following items:
- Accurate drawing of assumed Sign Conventions, Free-Body and other diagrams as required for the solution. [20%]
- Accuracy in Calculations. [80%]
- All the steps should be explained in full detail.
- A single PDF file with clear and readable working should be submitted.

Referencing Style
- Harvard (author-date)

Submission
Online

Submission Instructions
Submit a single PDF file.

Learning Outcomes Assessed
- Analyse the behaviour of structural members subjected to axial force, torsion, bending moment and shear force

Graduate Attributes
- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

3 Practical Report

Assessment Type
Practical and Written Assessment

Task Description
- Students required to complete the laboratory activities as per instruction given in the Practical Instruction Sheets.
- The Practical Instruction Sheets and report requirements will be given on the Moodle site.
- There are three tests in the lab work: Shear Centre, Buckling and Unsymmetrical bending.
- Students should collect the experimental data during the residential school.
- A report summarizing the experimental data with analysis of the results should be prepared.
- A single PDF file containing three parts (a part for test) should be submitted.

AI Assessment Scale
For Practical Class - No AI: You must not use AI at any point during the assessment. You must demonstrate your core skills and knowledge.
For Report -AI Collaboration: You may use AI to assist with specific tasks such as drafting text, refining and evaluating your work. You must critically evaluate and modify any AI-generated content you use.

Assessment Due Date
Exam Week Monday (16 Feb 2026) 11:59 pm AEST

Return Date to Students
Exam Week Friday (20 Feb 2026)

Feedback will be returned within two weeks after assignment due date.

Weighting
10%

Minimum mark or grade
50% (5 of 10)

Assessment Criteria
(1) Each report will be assessed separately for the criterion accuracy and correct procedure as required in the Instruction.
- Correct application of mathematics and arithmetic
- Results clearly identified and explained
- Correct results/explanation

(2) The report as a whole will be assessed against the following criteria:
Evidence of correct procedures
- All necessary steps in experiment and reporting are followed in the correct order
- Clear presentation of results obtained
- Evidence of checking results (mathematical, graphical, logic-common sense)

Evidence of understanding of the topic
- Explanation of possible error in the experiment
- Interpretation of results

Professional presentation
- Appropriate use of diagrams, clear diagrams
- Correct use of terminology, conventions
- Clear English in the explanation of procedure and interpretation of results

(3) A single PDF should be submitted for the whole report.

Referencing Style
- Harvard (author-date)

Submission
Online

Submission Instructions
Submit a single PDF file.

Learning Outcomes Assessed
- Demonstrate a professional level of communication and teamwork.

Graduate Attributes
- Communication
- Problem Solving
- Information Literacy
- Information Technology Competence

4 End of Term Test

Assessment Type
Online Test

Task Description
This assessment task is an online test that consists of several numerical questions. Students have three hours to complete their solution. An extra half an hour is provided for scanning and uploading and submitting the assessment.
Important Notes:
- The test will be during the exam week.
- The assessment duration is set for 180 minutes with an additional 30 minutes for scanning and uploading.
- The test will be automatically closed after the end of the given time frame.
- The tests cannot generally be deferred. However, under exceptional circumstances, if you have valid reasons to defer the test, you can apply for exam deferral with documents of proof before the due date.

AI Assessment Scale - No AI: You must not use AI at any point during the assessment. You must demonstrate your core skills and knowledge.
This assessment is exempted from the 72-hour submission grace period and must be completed by the stated submission date/time.

Assessment Due Date

The test will be during the exam week. It will be announce later in the term.

Return Date to Students

Weighting
50%

Minimum mark or grade
50% (25 of 50)

Assessment Criteria
Each solution should have the following items:
- Accurate drawing of assumed Sign Conventions, Free-Body and other diagrams as required for the solution. [20%]
- Accuracy in Calculations. [80%]
- All the steps should be explained in full detail.
- A single PDF file with clear and readable working should be submitted.

Referencing Style
- Harvard (author-date)

Submission
Online

Submission Instructions
Submit a single PDF file.

Learning Outcomes Assessed
- Analyse the behaviour of structural members subjected to axial force, torsion, bending moment and shear force
- Determine principal stresses and discuss failure criteria for a range of engineering materials

Graduate Attributes
- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

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