



ENEC12012 Stress Analysis

Term 2 - 2021

Profile information current as at 09/05/2024 12:23 am

All details in this unit profile for ENEC12012 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

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 ENEC12005 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 2 - 2021

- 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. **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 Moodle

Feedback

Assignment feedback could be improved.

Recommendation

More structured feedback will be given in the next offering. The workload of the teaching staff was adjusted to ensure the assessment items can be marked and returned within 2 weeks.

Feedback from Moodle and email

Feedback

This unit is generally well structured and has good study materials. The lecturer is also available to help.

Recommendation

This practice will continue in the following offerings as well.

Feedback from Moodle

Feedback

Handwritten notes of the lectures can be uploaded with the recorded videos.

Recommendation

Annotated lecture slides will be uploaded after lectures.

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



Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes			
	1	2	3	4
1 - Online Quiz(zes) - 20%	•		•	

Assessment Tasks	Learning Outcomes			
	1	2	3	4
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 - 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 - 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

10th Edition (SI Units) (2018)

Authors: R.C. Hibbeler

Pearson

London, UK

ISBN: 9781292178202

Binding: Hardcover

Additional Textbook Information

Both paper and eBook versions can be purchased 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)

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
h.baji@cqu.edu.au

Schedule

Week 1 - 12 Jul 2021

Module/Topic	Chapter	Events and Submissions/Topic
Concepts of Stress and Strain Tension/Compression Tests Stress-Strain Behavior of Ductile and Brittle Materials Poisson's ratio	Chapter 1: Stress Chapter 2: Strain Chapter 3: Mechanical Properties of Materials	

Week 2 - 19 Jul 2021

Module/Topic	Chapter	Events and Submissions/Topic
Saint-Venant's Principal Principal of Superposition Elastic Deformation of Axially Loaded Member Statically Indeterminate Axially-Loaded Members	Chapter 4: Axial Load	

Week 3 - 26 Jul 2021

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	

Week 4 - 02 Aug 2021

Module/Topic	Chapter	Events and Submissions/Topic
Shear and Moment Diagrams Bending Deformation of Straight Member The Flexural Formula	Chapter 6: Bending	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 5 - 09 Aug 2021

Module/Topic	Chapter	Events and Submissions/Topic
Unsymmetrical Bending Composite Beams	Chapter 6: Bending	

Vacation Week - 16 Aug 2021

Module/Topic	Chapter	Events and Submissions/Topic
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Week 6 - 23 Aug 2021

Module/Topic	Chapter	Events and Submissions/Topic
Shear in Straight Members The Shear Formula Shear Flow in Built-up Sections	Chapter 7: Transverse Shear	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 7 - 30 Aug 2021

Module/Topic	Chapter	Events and Submissions/Topic
Shear Flow in Thin-Walled Members Shear Centre for Open Thin-Walled Members	Chapter 7: Transverse Shear	

Week 8 - 06 Sep 2021

Module/Topic	Chapter	Events and Submissions/Topic
Thin-Walled Pressure Vessels State of Stress Caused by Combined Loadings	Chapter 8: Combined Loading	Assignment Due: Week 8 Friday (10 Sept 2021) 11:59 pm AEST

Week 9 - 13 Sep 2021

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 General Equations for Plane-Strain Transformation Strain Rosettes	Chapter 9: Stress Transformation Chapter 10: Strain Transformation	Residential School

Week 10 - 20 Sep 2021

Module/Topic	Chapter	Events and Submissions/Topic
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The Elastic Curve
Slope and Displacement by
Integration

Chapter 12: Deflection of Beams and
Shafts

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 11 - 27 Sep 2021

Module/Topic	Chapter	Events and Submissions/Topic
Critical Load Ideal Column with Pin Supports The Secant Formula	Chapter 13: Buckling of Columns	

Week 12 - 04 Oct 2021

Module/Topic	Chapter	Events and Submissions/Topic
Review		Practical Report Due: Week 12 Monday (4 Oct 2021) 11:59 pm AEST

Review/Exam Week - 11 Oct 2021

Module/Topic	Chapter	Events and Submissions/Topic
		Exam Date Will be Announced on Moodle Page

Exam Week - 18 Oct 2021

Module/Topic	Chapter	Events and Submissions/Topic
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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 7%, 7%, and 6% marks, respectively. Each test consists of a number of numerical questions.

Important Notes:

- Each Test is set for 60 minutes. You have 60 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 60 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.

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 1 to 7.

The assignment contains up to 8 questions from topics covered in weeks 1 to 7 of the unit.

Clear detailed solution to all questions in the assignment should be submitted in a single PDF file via Moodle.

Assignment 2 will be available by end of Week 1 through unit Moodle webpage.

Assessment Due Date

Week 8 Friday (10 Sept 2021) 11:59 pm AEST

Return Date to Students

Week 10 Friday (24 Sept 2021)

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

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.

Assessment Due Date

Week 12 Monday (4 Oct 2021) 11:59 pm AEST

Return Date to Students

Exam Week Monday (18 Oct 2021)

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

Learning Outcomes Assessed

- Demonstrate a professional level of communication and teamwork.

Graduate Attributes

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

4 Final Exam

Assessment Type

Online Test

Task Description

This assessment task is an online test. It consists of a number of numerical questions.

Important Notes:

- The assessment is set for 180 minutes. You have 180 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 180 min time may have lapsed and you will be scored zero for that attempt.
- The time frame to complete the test is 24 hours. The start time will be in the exam week and you will be notified about
- the start time on the Moodle page of the unit.
- You can attempt the test up to two (2) times within the given time frame (24 hours).
- The test will be automatically closed after the end of the given time frame.
- The final mark will be the highest of all the two attempts.
- 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.

Assessment Due Date

The exam will be during the exam week period. The exact exam date will be posted on Moodle page of the unit.

Return Date to Students

Online quiz results will be released after completion of the test.

Weighting

50%

Minimum mark or grade

50% (25 of 50)

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

- 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