ENEC13017 *Advanced Structural Analysis*
Term 2 - 2020

Profile information current as at 07/05/2024 08:03 am

General Information

Overview
You will learn analysis of indeterminate structures and the implications this has for structural analysis. You will also determine reactions, internal forces, and displacements of structures and analyse truss and beams with moving loads. You will be introduced to the fundamentals of the structural analysis using the matrix method and you will use commercially available software to analyse structures.

Details
Career Level: *Undergraduate*
Unit Level: *Level 3*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites
Prerequisites: ENEG11006 Engineering Statics and ENEC12012 Stress Analysis
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 - 2020

- Bundaberg
- Cairns
- Gladstone
- Mackay
- Online
- 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).

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

Class and Assessment Overview

Recommended Student Time Commitment

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

Class Timetable

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

Metropolitan Campuses
Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Written Assessment**
Weighting: 15%
2. **Written Assessment**
Weighting: 15%
3. **Written Assessment**
Weighting: 15%
4. **Project (applied)**
Weighting: 25%
5. **Take Home Exam**
Weighting: 30%

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 evaluation

Feedback
Great detail and explanation was given in every lecture/tutorial which made the unit content easier to understand.

Recommendation
This practice will continue.

Feedback from Unit evaluation

Feedback
Lecture supplement provided at the start of the unit was great and very useful.

Recommendation
I will revise and provide a lecture supplement for this unit.

Feedback from Unit evaluation

Feedback
The delivery is methodical and straight to the point.

Recommendation
This practice will continue.

Feedback from Unit evaluation

Feedback
Quick response to Q&A.

Recommendation
This practice will continue.

Feedback from Unit evaluation

Feedback
Although SpaceGass software was not taught during lectures, there was an assessment item on using this package.

Recommendation
SpaceGass software is covered in a previous unit (ENEC13015 in T1) and it is expected that students are familiar with this software. Furthermore, I have provided the students with plenty of available resources to get them started with this structural analysis software.

Unit Learning Outcomes

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

1. Conduct structural idealisation, static, and kinematic indeterminacy and the duality of flexibility and stiffness for practical structures
2. Analyse statically indeterminate structures to determine support reactions, internal forces, and nodal displacements
3. Solve structural analysis problems using software packages by applying the finite element method
4. Develop basic programming skills for analysis of indeterminate structures using the matrix method
5. Demonstrate a professional level of communication.

The Learning Outcomes are linked to Engineers Australia Stage 1 Competencies and also discipline capabilities. You can find the mapping for this on the Engineering Undergraduate Course website.

Alignment of Learning Outcomes, Assessment and Graduate Attributes

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

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
1 - Written Assessment - 15%	•				•
2 - Written Assessment - 15%	•	•			•
3 - Written Assessment - 15%		•			•
4 - Project (applied) - 25%			•	•	•
5 - Take Home Exam - 30%	•	•			

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					

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Written Assessment - 15%	•	•	•	•						

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
2 - Written Assessment - 15%	•	•	•	•						
3 - Written Assessment - 15%	•	•	•	•						
4 - Project (applied) - 25%	•	•	•	•						
5 - Take Home Exam - 30%	•	•	•	•						

Textbooks and Resources

Textbooks

ENEC13017

Prescribed

Structural Analysis in SI Units
Edition: 10th edn (2019)
Authors: Hibbeler, R
Pearson
Harlow , Essex , UK
ISBN: 9781292247137
Binding: Paperback

Additional Textbook Information
If you prefer to study with a paper copy, they are available at the CQUni Bookshop here: http://bookshop.cqu.edu.au (search on the Unit code). eBooks are available at the publisher's website.

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Structural analysis software SpaceGass
- Matlab

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 - 13 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Introduction, Review on Analysis of Determinate Trusses and Beams	Chapters 2, 3, 4	

Week 2 - 20 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Influence Lines for Statically Determinate Structures	Chapter 6	

Week 3 - 27 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Beam Deflection: Moment Area Method and Conjugate-Beam Method	Chapter 8	

Week 4 - 03 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Method of Virtual Work for Analysis of Statically Indeterminate Trusses	Chapter 9	

Week 5 - 10 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Method of Virtual Work for Analysis of Statically Indeterminate Beams	Chapter 9	**Assignment 1** Due: Week 5 Friday (14 Aug 2020) 11:59 pm AEST

Vacation Week - 17 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 24 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Analysis of Statically Indeterminate Structures by Force Method	Chapter 10	

Week 7 - 31 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Displacement Method of Analysis: Slope-Deflection Method	Chapter 11	

Week 8 - 07 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Displacement Method of Analysis: Moment Distribution Method	Chapter 12	**Assignment 2** Due: Week 8 Friday (11 Sept 2020) 11:59 pm AEST

Week 9 - 14 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Direct Stiffness Method: Truss Structures	Chapter 14	

Week 10 - 21 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Direct Stiffness Method: Beam Structures	Chapter 15	

Week 11 - 28 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Direct Stiffness Method: Frame Structures	Chapter 16	**Assignment 3** Due: Week 11 Friday (2 Oct 2020) 11:59 pm AEST

Week 12 - 05 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic

Structural Modelling and Computer Analysis	Chapter 17	

Review/Exam Week - 12 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
Revision		**Programming Project** Due: Review/Exam Week Friday (16 Oct 2020) 11:59 pm AEST

Exam Week - 19 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
		Final exam as per the University examination timetable

Term Specific Information

Term 2/2020 final exam in this unit is temporarily changed to a take-home exam due to COVID-19.

Assessment Tasks

1 Assignment 1

Assessment Type
Written Assessment

Task Description
Questions for this assignment are from topics covered in weeks 1 to 3, which include:
1. Basics of analysis methods for determinate trusses and beams
2. Beam deflection based on Integration Method and Moment Area methods
3. Influence life for determinate structures

Assessment Due Date
Week 5 Friday (14 Aug 2020) 11:59 pm AEST

Return Date to Students

Two Week After Due Date

Weighting
15%

Assessment Criteria

In this unit, we require you to provide a detailed explanation of the procedure you use to solve each problem. Your explanations need to be detailed enough to convince the marker that you really know and understand what you are doing. Correct answer and explanation of the correct approach both are important in this course. A substantial part of the marks in your assessment are for evidence of how you thought about the problem. Each question in the assignment will be assessed against the following criteria.

Part 1: Statement of the Problem (20 % of the Marks)
·Clearly state the problem in your own words (1-2 sentences)
·Draw accurate Sign Convention, Free-Body and other diagrams as required for the solution
·State Key Information that are provided.

Part 2: Development of the Problem and Results (80%)
·Show your calculations in detail
·State your answers with magnitude, unit and direction as appropriate
·For marking purpose, this part will be sub-divided by two or more milestones of the calculations with appropriate weights

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Via Moodle as a pdf file

Learning Outcomes Assessed

- Conduct structural idealisation, static, and kinematic indeterminacy and the duality of flexibility and stiffness for practical structures
- Demonstrate a professional level of communication.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

2 Assignment 2

Assessment Type
Written Assessment

Task Description
Questions for this assignment are from topics covered in weeks 4 to 6, which include:
1. Method of Virtual Work for Analysis of Statically Indeterminate Trusses
2. Method of Virtual Work for Analysis of Statically Indeterminate Beams
3. Force Method for Analysis of Indeterminate Structures

Assessment Due Date
Week 8 Friday (11 Sept 2020) 11:59 pm AEST

Return Date to Students

Two Weeks After Due Date

Weighting
15%

Assessment Criteria

In this unit, we require you to provide a detailed explanation of the procedure you use to solve each problem. Your explanations need to be detailed enough to convince the marker that you really know and understand what you are doing. Correct answer and explanation of the correct approach both are important in this course. A substantial part of the marks in your assessment are for evidence of how you thought about the problem. Each question in the assignment will be assessed against the following criteria.

Part 1: Statement of the Problem (20 % of the Marks)
·Clearly state the problem in your own words (1-2 sentences)
·Draw accurate Sign Convention, Free-Body and other diagrams as required for the solution
·State Key Information that are provided.

Part 2: Development of the Problem and Results (80%)
·Show your calculations in detail
·State your answers with magnitude, unit and direction as appropriate
·For marking purpose, this part will be sub-divided by two or more milestones of the calculations with appropriate weights

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Via Moodle as a pdf file

Learning Outcomes Assessed

- Conduct structural idealisation, static, and kinematic indeterminacy and the duality of flexibility and stiffness for practical structures

- Analyse statically indeterminate structures to determine support reactions, internal forces, and nodal displacements
- Demonstrate a professional level of communication.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

3 Assignment 3

Assessment Type
Written Assessment

Task Description
Questions for this assignment are from topics covered in weeks 7 to 6, which include:
1. Displacement Method: Slope-Deflection Method
2. Displacement Method: Moment Distribution Method

Assessment Due Date
Week 11 Friday (2 Oct 2020) 11:59 pm AEST

Return Date to Students

Two Weeks After Due Date

Weighting
15%

Assessment Criteria

In this unit, we require you to provide a detailed explanation of the procedure you use to solve each problem. Your explanations need to be detailed enough to convince the marker that you really know and understand what you are doing. Correct answer and explanation of the correct approach both are important in this course. A substantial part of the marks in your assessment are for evidence of how you thought about the problem. Each question in the assignment will be assessed against the following criteria.

Part 1: Statement of the Problem (20 % of the Marks)
·Clearly state the problem in your own words (1-2 sentences)
·Draw accurate Sign Convention, Free-Body and other diagrams as required for the solution
·State Key Information that are provided.

Part 2: Development of the Problem and Results (80%)
·Show your calculations in detail
·State your answers with magnitude, unit and direction as appropriate
·For marking purpose, this part will be sub-divided by two or more milestones of the calculations with appropriate weights

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Via Moodle as a pdf file

Learning Outcomes Assessed

- Analyse statically indeterminate structures to determine support reactions, internal forces, and nodal displacements
- Demonstrate a professional level of communication.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

4 Programming Project

Assessment Type
Project (applied)

Task Description
This assessment involves writing and running a program in MATLAB software that can analyse a truss, beam or frame structure using the direct stiffness method.
Topics covered in weeks 8 to 11 are used to develop the MATLAB code.

Assessment Due Date
Review/Exam Week Friday (16 Oct 2020) 11:59 pm AEST

Return Date to Students

Two Weeks After Due Date

Weighting
25%

Assessment Criteria
The flowchart should be clearly presented in the final report.
The prepared written code should be provided in the project report.
A sample structure should be run using the prepared code and the results compared with hand calculations.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Via Moodle as a pdf file (report) and m file (MATLAB code)

Learning Outcomes Assessed

- Solve structural analysis problems using software packages by applying the finite element method
- Develop basic programming skills for analysis of indeterminate structures using the matrix method
- Demonstrate a professional level of communication.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

5 Final Exam

Assessment Type
Take Home Exam

Task Description
The final exam covers all the topics from week 1 to 11. It is a take home exam.
Term 2/2020 final exam in this unit is temporarily changed to a take-home exam due to COVID-19.

Assessment Due Date

Final exam as per the University examination timetable

Return Date to Students

Final exam are released as per the University examination timetable

Weighting
30%

Minimum mark or grade
50% (minimum of 15/30)

Assessment Criteria

In this unit, we require you to provide a detailed explanation of the procedure you use to solve each problem. Your explanations need to be detailed enough to convince the marker that you really know and understand what you are doing. Correct answer and explanation of the correct approach both are important in this course. A substantial part of the marks in your assessment are for evidence of how you thought about the problem. Each question in the assignment will be assessed against the following criteria.

Part 1: Statement of the Problem (20 % of the Marks)
·Clearly state the problem in your own words (1-2 sentences)
·Draw accurate Sign Convention, Free-Body and other diagrams as required for the solution
·State Key Information that are provided.

Part 2: Development of the Problem and Results (80%)
·Show your calculations in detail
·State your answers with magnitude, unit and direction as appropriate
·For marking purpose, this part will be sub-divided by two or more milestones of the calculations with appropriate weights

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Via Moodle as a pdf file

Learning Outcomes Assessed

- Conduct structural idealisation, static, and kinematic indeterminacy and the duality of flexibility and stiffness for practical structures
- Analyse statically indeterminate structures to determine support reactions, internal forces, and nodal displacements

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