ENEC14014 *Structural and Geotechnical Design*
Term 1 - 2020

Profile information current as at 12/10/2024 06:20 pm

All details in this unit profile for ENEC14014 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 analyse, design and prepare documentation for major civil engineering projects involving a broad range of investigation and design activities. You will establish project requirements and determine design loads and conditions, analyse structures and design components using Australian Standards and/or relevant guidance. You will use commercial computer software to analyse and design the structures with various design actions; conduct site investigations, test and characterise geotechnical materials, design foundations and earth retaining structures, and make assessments of geotechnical stability. In this unit, you are expected to document the process of modelling, testing and analysis, and communicate, work and learn, both individually and in teams, in a professional manner. If you are enrolled in online mode, you will be required to attend a residential school during the term.

Details
Career Level: *Undergraduate*
Unit Level: *Level 4*
Credit Points: *12*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.25*

Pre-requisites or Co-requisites
Prerequisite: (ENEC12012 Stress Analysis or ENEC13010 Solid Mechanics) AND ENEC12008 Geotechnical Engineering AND (ENEC13015 Steel & Timber Design or ENEC13011 Steel Structures) AND (ENEC13016 Concrete Technology & Design or ENEC14013 Concrete Structures)
Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the Assessment Policy and Procedure (Higher Education Coursework).

Offerings For Term 1 - 2020

- 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).

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 12-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 25 hours of study per week, making a total of 300 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. **Portfolio**
Weighting: 50%
2. **Portfolio**
Weighting: 30%
3. **Oral Examination**
Weighting: 20%

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

The unit was structured well and the content covered in a way to ensure easy learning.

Recommendation

This practice will continue in the next offer as well.

Feedback from Moodle

Feedback

Unit content is very useful and able to link with real-life problems.

Recommendation

This is a final year unit. Therefore, the unit content and assessments were set to reflect the real-life problems and the applications of basic theories in the design practice.

Unit Learning Outcomes

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

1. Demonstrate a commitment to ethical practice by promoting principals of sustainable development and awareness of stakeholder requirements
2. Determine and justify loads and load combinations for a structural system
3. Analyse and design concrete and masonry structural components using appropriate Australian Standards
4. Describe and apply site investigation and geotechnical testing techniques to characterise sites and geotechnical materials based on Australian Standards
5. Analyse and design foundations and earth retaining structures and assess stability of slopes
6. Accurately model and analyse structural and geotechnical systems using industry-standard software and Australian Standards.

The Learning Outcomes for this unit are linked with **Engineers Australia's Stage 1 Competency Standard for Engineering Technologist and Professional Engineers.**

Alignment of Learning Outcomes, Assessment and Graduate Attributes

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

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
1 - Portfolio - 50%	•	•	•			•
2 - Portfolio - 30%	•			•	•	•
3 - Oral Examination - 20%		•	•	•	•	

Alignment of Graduate Attributes to Learning Outcomes

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

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Portfolio - 50%	•	•	•	•	•	•	•	•		
2 - Portfolio - 30%	•	•	•	•	•	•	•	•		
3 - Oral Examination - 20%	•	•	•	•		•		•		

Textbooks and Resources

Textbooks

ENEC14014

Prescribed

Soil Mechanics and Foundations
3rd Edition (2010)
Authors: Muni Budhu
John Wiley & Sons
USA
ISBN: 978-0-470-55684-9
Binding: Hardcover
ENEC14014

Supplementary

Foundation Design: Principles and Practices
3rd Edition (2015)
Authors: Coduto, D. P., Kitch, W. A., Yeung, M. R.
Pearson
USA
ISBN: 9780133411898
Binding: Hardcover
ENEC14014

Supplementary

Reinforced and Prestressed Concrete
3rd Edition (2018)
Authors: Yew-Chaye Loo, Sanaul H. Chowdhury
Cambridge University Press
Melbourne , VIC , Australia
ISBN: 9781108405645
Binding: Hardcover

Additional Textbook Information
Copies can be purchased from 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)
- Finite Element Software for Structural Analysis: SPACE GASS

Referencing Style

All submissions for this unit must use the referencing style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Kumaran Suntharavadivel Unit Coordinator
t.suntharavadivel@cqu.edu.au

Schedule

Week 1 - 09 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Unit Introduction and Review of RC Design **Lecture 2:** Bearing Capacity I **Tutorial 1:** Structural Engineering **Tutorial 2:** Geotechnical Engineering	**Structural Design:** Review of Reinforced Concrete Design (AS3600-2018) **Geotechnical Design:** Bearing Capacity of Shallow Foundation	

Week 2 - 16 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Introduction to Masonry Design **Lecture 2:** Bearing Capacity II **Tutorial 1:** Structural Engineering **Tutorial 2:** Geotechnical Engineering	**Structural Design:** Masonry, Material Properties, Design of Control Joints (AS3700-2018) **Geotechnical Design:** Bearing Capacity of Shallow Foundation (continued)	

Week 3 - 23 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Design of Unreinforced Masonry I **Lecture 2:** Bearing Capacity III **Tutorial 1:** Structural Engineering **Tutorial 2:** Geotechnical Engineering	**Structural Design:** Design for in-plane and out-of-plane shear (AS3700-2018) **Geotechnical Design:** Pile Foundation	

Week 4 - 30 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Design of Unreinforced Masonry II **Lecture 2:** Bearing Capacity IV **Tutorial 1:** Structural Engineering **Tutorial 2:** Geotechnical Engineering	**Structural Design:** Design for out-of-plane Bending (AS3700-2018) **Geotechnical Design:** Pile Foundations (continued)	

Week 5 - 06 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Design of Unreinforced Masonry III **Lecture 2:** Retaining Wall I **Tutorial 1:** Structural Engineering **Tutorial 2:** Geotechnical Engineering	**Structural Design:** Design for Compression (AS3700-2018) **Geotechnical Design:** Retaining Wall	

Vacation Week - 13 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Mid-term break		

Week 6 - 20 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Prestressed Concrete Design I **Lecture 2:** Retaining Wall II **Tutorial 1:** Structural Engineering **Tutorial 2:** Geotechnical Engineering	**Structural Design:** Introduction to Prestressed Concrete Design **Geotechnical Design:** Retaining Wall (continued)	

Week 7 - 27 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic

Lecture 1: Prestressed Concrete Design II **Lecture 2:** Slope Stability **Tutorial 1:** Structural Engineering **Tutorial 2:** Geotechnical Engineering	**Structural Design:** Estimation of Prestress Force and Tendon Profile **Geotechnical Design:** Slope Stability	

Week 8 - 04 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Prestressed Concrete Design III **Lecture 2:** Site Investigation **Tutorial 1:** Structural Engineering **Tutorial 2:** Geotechnical Engineering	**Structural Design:** Ultimate Design Checks **Geotechnical Design:** Site Investigation	

Week 9 - 11 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Prestressed Concrete Design IV **Lecture 2:** Soil Testing - Lab **Tutorial 1:** Structural Engineering **Tutorial 2:** Geotechnical Engineering	**Structural Design:** Losses in Prestressed Beam **Geotechnical Design:** Soil Testing - Lab	**Residential School** [13-14 May 2019]

Week 10 - 18 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Tutorials (as required) **Lecture 2:** Tutorials (as required)	Tutorials	

Week 11 - 25 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Tutorials (as required) **Lecture 2:** Tutorials (as required)	Tutorials	

Week 12 - 01 Jun 2020

Module/Topic	Chapter	Events and Submissions/Topic
No lectures in this week		

Review/Exam Week - 08 Jun 2020

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 15 Jun 2020

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

Please read **ENEC14014: General Information** available on the unit Moodle site.
Practical Classes for on-campus students will be scheduled after week 6. Detail of the laboratory timetable will be available in Week 3. Distance students will complete all practicals during residential school.
Any additional information including reading/reference materials will be available on the unit Moodle site as it is available. All students are required to check the information regularly.
Students must be able to defend their understanding and submission workings in a subsequent face to face or online interaction that may be arranged usually after any assignment submission. No marks will be given if for any submission the student cannot satisfactorily explain the procedure and concept followed in solving problems. For submissions with minimum marks, this may constitute a fail grade. During such an interrogation the student must take steps to demonstrate that the submission is their very own work.

Assessment Tasks

1 Structural Design Portfolio

Assessment Type
Portfolio

Task Description
The aim of this assessment is to allow the students to demonstrate their understanding of various concepts, theories and processes developed in Structural Engineering topics covered in the course. This may include but is not limited to structural analysis, calculation of design actions, concrete design and masonry design.
This portfolio contains 3 projects and students are expected to work in a team and/or individually as specified below.
1. Reinforced Concrete (RC) Design – Team Project [20 marks]
2. Prestressed Concrete (PC) Design – Individual Project [15 marks]
3. Masonry Design – Individual Project [15 marks]
Formal assessment is by submission of a portfolio which contains evidence of all the individual and/or teamwork that the student has performed throughout the term. Each project may due on different dates. Students must read each project briefing carefully and follow instructions and time frame as specified to complete the project successfully.
*A **Project Brief*** detailing the requirements for each project, including required pieces of work, will be available on the unit website as below.
1. Reinforced Concrete (RC) Design – Week 1
2. Prestressed Concrete (PC) Design – Week 6
3. Masonry Design – Week 6

Assessment Due Date

Various due dates (see the project briefing)

Return Date to Students

2 weeks from the due date

Weighting
50%

Assessment Criteria
Each main steps in project tasks will be assessed separately for the criterion *accuracy and correct results*.

- Correct application of mathematics and arithmetic
- Reference to correct Standards and/or principles
- Answers clearly identified
- Correct results

In addition, each project as a whole will be assessed against the following criteria:
Evidence of correct procedures

- All necessary steps in the analysis are present in the correct order
- Clear presentation of mathematical and arithmetical working linking given details of the problem to the results obtained
- Evidence of checking results (mathematical, graphical, logic-common sense)

Evidence of the understanding of the topic

- Explanation of choices made in the analysis (why is the procedure required, why this particular procedure)
- Interpretation of results, eg limitations, the direction of vectors

Professional presentation

- The work (job) is clearly identified (problem, data, analysis)
- A clear statement of each problem and its details and requirements
- The logical layout of the analysis
- Appropriate use of diagrams, clear diagrams
- Correct use of terminology, conventions
- Clear English in the explanation of procedure and interpretation of results.

Important: The omission of any of the required items as specified in the **Portfolio Brief** will automatically result in a Fail grade.
Individual Student's Grade in Team Project:
Initially, team submission will be assessed and a grade will be given to each team. Then individual grade will be determined based on their contribution, which will be determined by peer assessment. It may be possible individual grade may be higher than team marks but capped at maximum marks for the assessment.

Example: *Individual contributions of 3 students in* Team A *are given below. This* Team A *received 36 marks (out of 40) for their team project.*
M1 - 30%; M2 - 33%; M3 - 37% (Total 100%)
Based on the contribution, Individual marks are given as follow.
M1 = 36 x (30/33.3) = 32.4 (out of 40)
M2 = 36 x (33/33.3) = 35.6 (out of 40)
M3 = 36 x (37/33.3) = 40.0 (out of 40)

Referencing Style

- Harvard (author-date)

Submission
Online Group

Submission Instructions
Please follow the instructioon given in the project brief

assessmentOutcome

- Demonstrate a commitment to ethical practice by promoting principals of sustainable development and awareness of stakeholder requirements
- Determine and justify loads and load combinations for a structural system
- Analyse and design concrete and masonry structural components using appropriate Australian Standards
- Accurately model and analyse structural and geotechnical systems using industry-standard software and Australian Standards.

assessmentGradAttribute

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Team Work
- Information Technology Competence
- Cross Cultural Competence
- Ethical practice

2 Geotechnical design portfolio

Assessment Type
Portfolio

Task Description
The aim of this assessment is to allow the students to demonstrate their understanding of various concepts, theories and processes developed in Geotechnical Engineering topics covered in the program. This may include but is not limited to consolidation, slope stability, site investigation, earth retaining wall and foundation design.
This portfolio contains 2 projects and laboratory reports. Detail of the projects and laboratory tasks are given below. Students are expected to work in a team and/or individually as specified below.
1. Foundation Design – Individual Project [10 marks]
2. Earth Retaining Wall Design – Individual Project [12 marks]
3. Laboratory Report – Individual Reports [8 marks]
Formal assessment is by submission of a portfolio which contains evidence of all the individual work that the student has performed throughout the term. Students must read and follow the guidance and timeline to complete the project successfully.
A ***Portfolio Brief*** detailing the requirements for Portfolio and laboratory instructions will be available on the unit Website as below.
1. Foundation Design – Week 1
2. Earth Retaining Wall Design – Week 6
3. Laboratory Report – Week 6

Assessment Due Date

Various due dates (see the project briefing)

Return Date to Students

2 weeks from the due date

Weighting
30%

Assessment Criteria
Each main steps in project and laboratory tasks will be assessed separately for the criterion *accuracy and correct results*.

- Correct application of mathematics and arithmetic
- Reference to correct Standards and/or principles
- Answers clearly identified
- Correct results

In addition, each project as a whole will be assessed against the following criteria:
Evidence of correct procedures

- All necessary steps in the analysis are present in the correct order
- Clear presentation of mathematical and arithmetical working linking given details of the problem to the results obtained
- Evidence of checking results (mathematical, graphical, logic-common sense)

Evidence of the understanding of the topic

- Explanation of choices made in the analysis (why is the procedure required, why this particular procedure)
- Interpretation of results, eg limitations, the direction of vectors

Professional presentation

- The work (job) is clearly identified (problem, data, analysis)
- A clear statement of each problem and its details and requirements
- The logical layout of the analysis
- Appropriate use of diagrams, clear diagrams
- Correct use of terminology, conventions
- Clear English in the explanation of procedure and interpretation of results.

Important: The omission of any of the required items as specified in the **Portfolio Brief** will automatically result in a Fail grade.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
One Report for team

assessmentOutcome

- Demonstrate a commitment to ethical practice by promoting principals of sustainable development and awareness of stakeholder requirements
- Describe and apply site investigation and geotechnical testing techniques to characterise sites and geotechnical materials based on Australian Standards
- Analyse and design foundations and earth retaining structures and assess stability of slopes
- Accurately model and analyse structural and geotechnical systems using industry-standard software and Australian Standards.

assessmentGradAttribute

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Team Work
- Information Technology Competence
- Cross Cultural Competence
- Ethical practice

3 Oral Examination (Viva)

Assessment Type
Oral Examination

Task Description
At the end of the term, an oral examination (viva) will be scheduled for each student. Students must be prepared to answer questions raised by the facilitator/lecturer. The questions will be based on project and laboratory work as well as the topics covered in this unit. Due to the nature of the assessment item, each question will be marked either satisfactory or unsatisfactory.
All oral examination will be recorded for assessment review purpose and may be stored up to 3 months (or as required by DDLT) after the release of the grades.

Assessment Due Date

Individual time for each student will be notified in Week 10

Return Date to Students

Feedback will be released only on Grade certification date

Weighting
20%

Minimum mark or grade
50% from the oral examination (student MUST pass each structural and geotechnical oral examinations separately)

Assessment Criteria
Each question in the oral examination will be assessed separately for the criterion *accuracy and correct understanding of the principles*.

- Explanation of choices made in the analysis or design (why is the procedure required, why this particular procedure)
- Interpretation of results, eg limitations, the direction of vectors
- Ability to use the knowledge in similar and/or less-complex scenarios

Each question will be marked either satisfactory or unsatisfactory based on the answer given by the student. The satisfactory answer will be marked as 1 and the unsatisfactory answer will be marked as 0. Then it will be converted to final marks with direct scale.
Example: If a total number of questions = 10 and a student answered 7 questions correctly, then he answered 70% of the questions correctly. Therefore, the student will get 0.7x20 = 14 marks for this assessment item.

Referencing Style

- Harvard (author-date)

Submission
No submission method provided.

Submission Instructions
No submission required

assessmentOutcome

- Determine and justify loads and load combinations for a structural system
- Analyse and design concrete and masonry structural components using appropriate Australian Standards
- Describe and apply site investigation and geotechnical testing techniques to characterise sites and geotechnical materials based on Australian Standards
- Analyse and design foundations and earth retaining structures and assess stability of slopes

assessmentGradAttribute

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

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