



ENEC14014 *Structural and Geotechnical Design*

Term 1 - 2024

Profile information current as at 16/05/2024 02:49 am

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 STB2010 and GeoStudio 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. This unit provides an opportunity to promote the United Nations Sustainable Development Goal 11: sustainable cities and communities.

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 - 2024

- 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 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. **Written Assessment**

Weighting: 30%

2. **Written Assessment**

Weighting: 50%

3. **Presentation**

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 Unit evaluation

Feedback

Because of the delay in returning marked assignments, students are unable to understand their mistakes. This prevents students to learn from their mistakes and impacts their performance in the subsequent assignments and/or exams.

Recommendation

The order of assignments will be altered in the next offering, which will help in returning the marked assignments within the return deadlines. Feedback on the viva will be made available to students immediately after the viva.

Feedback from Unit evaluation

Feedback

Too many assignments in this unit.

Recommendation

RC design has already been removed. The laboratory reports will be discontinued from 2023.

Unit Learning Outcomes

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

1. Demonstrate a commitment to ethical practice by promoting principles 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 the 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 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

3.1 Ethical conduct and professional accountability. (LO: 3N)

Intermediate

1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 3I)

1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 2I 3I 4I)

3.5 Orderly management of self, and professional conduct. (LO: 4I)

Advanced

1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 3A 4I)

1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 2A 3A 4I 5A)

1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 2A 3A 5A)

1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline. (LO: 1A 3I)

2.1 Application of established engineering methods to complex engineering problem solving. (LO: 3A 5A)

2.2 Fluent application of engineering techniques, tools and resources. (LO: 3A 5A 6A)

2.3 Application of systematic engineering synthesis and design processes. (LO: 2A 3A 4A 5A)

2.4 Application of systematic approaches to the conduct and management of engineering projects. (LO: 2I 3A 5A)

3.2 Effective oral and written communication in professional and lay domains. (LO: 3A 4A)

3.6 Effective team membership and team leadership. (LO: 3A 4A)

Note: LO refers to the Learning Outcome number(s) which link to the competency and the levels: N - Introductory, I - Intermediate and A - Advanced.

**Refer to the Engineering Undergraduate Course Moodle site for further information on the Engineers Australia's Stage 1 Competency Standard for Professional Engineers and course level mapping information
<https://moodle.cqu.edu.au/course/view.php?id=1511>**

Alignment of Learning Outcomes, Assessment and Graduate Attributes

 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 - Written Assessment - 30%	•	•	•			•
2 - Written Assessment - 50%	•			•	•	•
3 - Presentation - 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						

Textbooks and Resources

Textbooks

ENEC14014

Prescribed

Soil Mechanics and Foundations

Edition: 3rd (2010)

Authors: Muni Budhu

John Wiley & Sons

USA

ISBN: 978-0-470-55684-9

Binding: Hardcover

ENEC14014

Supplementary

Foundation Design: Principles and Practices

Edition: 3rd (2015)

Authors: Coduto, D. P., Kitch, W. A., Yeung, M. R.

Pearson

USA

ISBN: 9780133411898

Binding: Hardcover

ENEC14014

Supplementary

Reinforced and Prestressed Concrete

Edition: 3rd (2018)

Authors: Yew-Chaye Loo, Sanaul H. Chowdhury

Cambridge University Press

Melbourne , VIC , Australia

ISBN: 9781108405645

Binding: Hardcover

Additional Textbook Information

This edition has been written based on the Australian Standard for Concrete Structures AS3600–2009. Since then the AS3600 was updated and a new version is released in 2018 as Australian Standard for Concrete Structures AS3600-2018. Therefore, this textbook may not necessarily reflect recent amendments and addenda to AS3600-2018. However, an errata for this book will be provided through the unit 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)
- Finite Element Software for Structural Analysis: SPACE GASS
- Geotechnical software for slope stability: Geostudio

Referencing Style

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

Teaching Contacts

Sarkar Noor E Khuda Unit Coordinator
s.noorekhuda@cqu.edu.au

Schedule

Week 1 - 04 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Introducing the course and discussion on soil bearing capacity Lecture 2: Masonry Design Tutorial 1: Geotechnical Engineering Tutorial 2: Structural Engineering	Geotechnical Design: Bearing Capacity of Shallow Foundation Structural Design: Masonry Design (AS3700-2018)	

Week 2 - 11 Mar 2024

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

Week 3 - 18 Mar 2024

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

Week 4 - 25 Mar 2024

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

Week 5 - 01 Apr 2024

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

Vacation Week - 08 Apr 2024

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

Week 6 - 15 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Retaining Wall II Lecture 2: Prestressed Concrete Design I Tutorial 1: Geotechnical Engineering Tutorial 2: Structural Engineering	Geotechnical Design: Retaining Wall (continued) Structural Design: Introduction to Prestressed Concrete Design	Masonry Design Assignment Due: Week 6 Monday (15 Apr 2024) 10:00 pm AEST

Week 7 - 22 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Slope Stability Lecture 2: Prestressed Concrete Design II Tutorial 1: Geotechnical Engineering Tutorial 2: Structural Engineering	Geotechnical Design: Slope Stability Structural Design: Estimation of Prestress Force and Tendon Profile	

Week 8 - 29 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Site Investigation Lecture 2: Prestressed Concrete Design III Tutorial 1: Geotechnical Engineering Tutorial 2: Structural Engineering	Geotechnical Design: Site Investigation Structural Design: Ultimate Design Checks	Each student in the PC design class will receive notification of their specific presentation time. The presentation will take place between weeks 10 - 12.

Week 9 - 06 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Lecture 1: Soil Testing Lecture 2: Prestressed Concrete Design IV Tutorial 1: Geotechnical Engineering Tutorial 2: Structural Engineering	Geotechnical Design: Soil Testing Structural Design: Losses in Prestressed Beam	

Week 10 - 13 May 2024

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

Week 11 - 20 May 2024

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

Week 12 - 27 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
No lectures in this week		Geotechnical Engineering Assignment Due: Week 12 Monday (27 May 2024) 11:00 pm AEST

Review/Exam Week - 03 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic
--------------	---------	------------------------------

Exam Week - 10 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic
--------------	---------	------------------------------

Term Specific Information

Please follow the Unit Website of ENEC14014 for more information.

Assessment Tasks

1 Masonry Design Assignment

Assessment Type

Written Assessment

Task Description

This assignment aims to allow the students to demonstrate their understanding of various concepts, theories, software, and processes developed in the masonry design covered in the unit. This may include but is not limited to structural analysis, calculation of design actions, and design of masonry members for all gravitational and lateral loads. The assignment details, including the required pieces of work, will be available on the unit website by the end of week 1.

Assessment Due Date

Week 6 Monday (15 Apr 2024) 10:00 pm AEST

Submit the assessment item on or before the due date and time. Late submission penalty is 5% per day of the allotted mark. Extension requests greater than 14 days will be denied except under exceptional circumstances. Any extension request submitted on the day of submission will be denied.

Return Date to Students

Week 8 Monday (29 Apr 2024)

Marked report will be returned within 2 weeks of submission

Weighting

30%

Minimum mark or grade

50%

Assessment Criteria

Each main step in project tasks will be assessed separately for the following items:

- Correct application of mathematics and arithmetic
- Reference to correct Standards and/or principles
- Problem clearly identified and explained in the answer
- 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
- Explain mathematical and arithmetic calculations clearly, connecting given problem information to the obtained results
- 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, e.g., limitations, the direction of vectors

Referencing Style

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

Submission

Online

Learning Outcomes Assessed

- Demonstrate a commitment to ethical practice by promoting principles 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.

2 Geotechnical Engineering Assignment

Assessment Type

Written Assessment

Task Description

This assignment aims to allow the students to demonstrate their understanding of various concepts, theories, and processes developed in Geotechnical Engineering topics covered in the unit. This may include but is not limited to consolidation, slope stability, site investigation, earth retaining wall, and foundation design.

The details of the assignment, including the required pieces of work, will be available on the unit website by end of week 2.

Assessment Due Date

Week 12 Monday (27 May 2024) 11:00 pm AEST

Submit the assessment item on or before the due date and time. Late submission penalty is 5% per day of the allotted mark. Extension requests greater than 14 days will be denied except under exceptional circumstances. Any extension request submitted on the day of submission will be denied.

Return Date to Students

Exam Week Monday (10 June 2024)

Marked report will be returned within 2 weeks of submission

Weighting

50%

Minimum mark or grade

50%

Assessment Criteria

Each main step in the project will be assessed separately for the following items:

- Correct application of mathematics and arithmetic
- Reference to correct Standards and/or principles
- Problem clearly identified and explained in the answer
- 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
- Explain mathematical and arithmetic calculations clearly, connecting given problem information to the obtained results
- 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

Referencing Style

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

Submission

Online

Learning Outcomes Assessed

- Demonstrate a commitment to ethical practice by promoting principles 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 the stability of slopes
- Accurately model and analyse structural and geotechnical systems using industry-standard software and Australian Standards.

3 PC Design Project

Assessment Type

Presentation

Task Description

This assignment aims to allow the students to demonstrate their understanding of various concepts, theories, software, and processes developed in prestressed concrete covered in this unit. This may include but is not limited to structural analysis, calculation of design actions and design of prestressed concrete members.

This work will be assessed through a formal presentation, which contains evidence of all the work that the student has performed. Students must read the task carefully and follow instructions and time frames as specified to complete the task successfully.

Details of the task, including required pieces of work, will be available on the unit website by end of week 6.

Students must be prepared to answer questions raised by the facilitator/lecturer. The questions will be based on the work submitted for this assignment. Due to the nature of the assessment item, each question will be marked either satisfactory or unsatisfactory.

All presentations will be recorded for assessment review purposes and may be stored for 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%

Assessment Criteria

The tasks will be marked for the quality of the presentation and the Q&A session following the presentation. The marking criteria of the presentation will be available on the unit website. The presentation will be assessed for the following items:

- 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.

A quick Q&A session will be followed the presentation. Each question in the Q&A session will be assessed separately for criterion accuracy, comprehension, 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
- Ability to answer questions on software used

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 a 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 $0.7 \times 20 = 14$ marks for this assessment item.

Referencing Style

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

Submission

Online

Learning Outcomes Assessed

- Determine and justify loads and load combinations for a structural system
- Analyse and design concrete and masonry structural components using appropriate Australian Standards

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