



ENEC20003 Geotechnical Engineering Design

Term 3 - 2022

Profile information current as at 24/04/2024 03:00 am

All details in this unit profile for ENEC20003 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

Geotechnical Engineering Design will enable you to develop and apply your knowledge of Australian Standards and/or relevant guidance to analyse and design advanced geotechnical engineering structures involving a broad range of investigations. You will also learn to use computer software to analyse and design the geotechnical components; conduct site investigations; test and characterise geotechnical materials, design foundations, and earth retaining structures; and make assessments of geotechnical stability. You will also formulate, plan, manage, and complete projects individually and in teams in an ethical and professional manner by considering stakeholders and sustainability requirements. You will also document and communicate engineering information using appropriate language for a professional engineer. If you are enrolled in distance mode, you will be required to attend a compulsory residential school during the term.

Details

Career Level: *Postgraduate*

Unit Level: *Level 9*

Credit Points: *12*

Student Contribution Band: *8*

Fraction of Full-Time Student Load: *0.25*

Pre-requisites or Co-requisites

Antirequisite: ENEC14014 Structural and Geotechnical Design

Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the [Assessment Policy and Procedure \(Higher Education Coursework\)](#).

Offerings For Term 3 - 2022

- Melbourne
- 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 12-credit Postgraduate 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: 20%

3. **Practical Assessment**

Weighting: 20%

4. **In-class Test(s)**

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 In-class discussions and activities

Feedback

GeoStudio software access issues need to address on time.

Recommendation

The software should be made available on all computer labs as well as on student's computers using SEQUEENT.

Feedback from During teaching time

Feedback

Timetabling was done poorly as the room had no computers when the activity involved was to use computer software.

Recommendation

The computer labs need to be booked for workshops.

Unit Learning Outcomes

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

1. Design group piles, pad foundations and earth retaining structures and assess stability of slopes
2. Formulate, plan, manage and complete projects individually or in teams in an ethical and professional manner considering stakeholder requirements and principals of sustainable development
3. Apply site investigation and geotechnical testing techniques to characterise sites and geotechnical materials based on Australian Standards
4. Use appropriate software to analyse geotechnical components
5. Demonstrate a professional level of communication and leadership.

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

2.3 Application of systematic engineering synthesis and design processes. (LO: 1N)

Intermediate

1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 1I 2N)

3.3 Creative, innovative and pro-active demeanour. (LO: 1N 4I)

3.5 Orderly management of self, and professional conduct. (LO: 1I 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: 1A 3N 4A)

1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 1I 4A)

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

2.1 Application of established engineering methods to complex engineering problem solving. (LO: 1A 3N 4I)

2.2 Fluent application of engineering techniques, tools and resources. (LO: 1I 3I 4A)

3.2 Effective oral and written communication in professional and lay domains. (LO: 2A 4I 5A)

3.4 Professional use and management of information. (LO: 1I 2A)

3.6 Effective team membership and team leadership. (LO: 2A 5I)

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 Postgraduate Units 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=11382>

Alignment of Learning Outcomes, Assessment and Graduate Attributes

 N/A Level	 Introductory Level	 Intermediate Level	 Graduate Level	 Professional Level	 Advanced Level
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Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
1 - Written Assessment - 30%	•	•			•
2 - Written Assessment - 20%		•		•	
3 - Practical Assessment - 20%			•		•
4 - In-class Test(s) - 30%	•				

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes				
	1	2	3	4	5
1 - Knowledge	○	○	○	○	○
2 - Communication	○	○			○
3 - Cognitive, technical and creative skills		○		○	
4 - Research	○		○		
5 - Self-management		○	○		○
6 - Ethical and Professional Responsibility	○			○	
7 - Leadership					
8 - 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
1 - Written Assessment - 30%	○	○		○	○	○		
2 - Written Assessment - 20%	○		○		○			
3 - Practical Assessment - 20%	○			○	○			

Assessment Tasks	Graduate Attributes							
	1	2	3	4	5	6	7	8
4 - In-class Test(s) - 30%	○							

Textbooks and Resources

Textbooks

ENEC20003

Prescribed

FUNDAMENTALS OF GEOTECHNICAL ENGINEERING

Edition: 5th (2017)

Authors: Braja M. Das, Nagaratnam Sivakugan

Cengage Learning

Florence , KY , United States

ISBN: 9781305635180

Binding: Hardcover

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Geostudio software package

Referencing Style

All submissions for this unit must use the referencing style: [Harvard \(author-date\)](#)

For further information, see the Assessment Tasks.

Teaching Contacts

Mehdi Mirzababaei Unit Coordinator

m.mirzababaei@cqu.edu.au

Schedule

Week 1 - 07 Nov 2022

Module/Topic	Chapter	Events and Submissions/Topic
Shallow foundations-bearing capacity	Chapter 12	<p>Tutorial Session: Shallow foundations-bearing capacity- Continuing lecture</p> <p>Workshop Session: Tutorials for shallow foundation</p> <p>DIY: Review the following materials before week 3: Introduction to numerical analysis in geotechnical engineering</p>

Week 2 - 14 Nov 2022

Module/Topic	Chapter	Events and Submissions/Topic
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Deep foundations-bearing capacity	Chapter 14	<p>Tutorial Session: Deep foundations-bearing capacity -Continuing lecture</p> <p>Workshop Session: Tutorials for deep foundations-bearing capacity</p> <p>DIY: Review the following materials before week 3: Introduction to numerical analysis in geotechnical engineering</p>
Week 3 - 21 Nov 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Retaining walls	Chapters 11 & 13	<p>Tutorial Session: Retaining walls - Continuing lecture</p> <p>Workshop Session: Geotechnical numerical modelling module I</p>
Week 4 - 28 Nov 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Soil reinforcement	Chapter 15	<p>Tutorial Session: Tutorials for retaining walls</p> <p>Workshop Session: Geotechnical numerical modelling module I - continue</p>
Vacation Week - 05 Dec 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Week 5 - 12 Dec 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Soil reinforcement -Continuing lecture	Chapter 15	<p>Tutorial Session: Tutorials for soil reinforcement</p> <p>Workshop Session: Geotechnical numerical modelling module II</p>
Week 6 - 19 Dec 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Slope stability	Chapter 9	<p>Tutorial Session: Slope stability - Continuing lecture</p> <p>Workshop Session: Geotechnical modelling numerical module II - continue</p> <p>Team Research Project Due: Week 6 Friday (23 Dec 2022) 11:00 pm AEST</p>
Vacation Week - 26 Dec 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Week 7 - 02 Jan 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Site investigation & Ground improvement	Chapter 10	<p>Tutorial Session: Tutorials for slope stability</p> <p>Workshop Session: Geotechnical numerical modelling module III</p>
Week 8 - 09 Jan 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Site investigation & Ground improvement -Continuing lecture	Chapter 10	<p>Tutorial Session: Site investigation & Ground improvement -Continuing lecture</p> <p>Workshop Session: Geotechnical numerical modelling module III -continue</p>

Week 9 - 16 Jan 2023

Module/Topic	Chapter	Events and Submissions/Topic
Site investigation & Ground improvement -Continuing lecture	Chapter 10	Tutorial Session: Site investigation & Ground improvement -Continuing lecture Workshop Session: Geotechnical modelling numerical module IV Numerical Analysis Due: Week 9 Friday (20 Jan 2023) 11:00 pm AEST

Week 10 - 23 Jan 2023

Module/Topic	Chapter	Events and Submissions/Topic
Geotechnical numerical modelling module IV -continue		Tutorial Session: Geotechnical numerical modelling module V Workshop Session: Geotechnical numerical modelling module V - continue Laboratory report Due: Week 10 Friday (27 Jan 2023) 11:00 pm AEST

Week 11 - 30 Jan 2023

Module/Topic	Chapter	Events and Submissions/Topic
Geotechnical numerical modelling module VI		Tutorial Session: Q & A Session Workshop Session: Geotechnical numerical modelling module VI - continue

Week 12 - 06 Feb 2023

Module/Topic	Chapter	Events and Submissions/Topic
Review session		Review In-class test Due: Week 12 Friday (10 Feb 2023) 2:00 pm AEST

Exam Week - 13 Feb 2023

Module/Topic	Chapter	Events and Submissions/Topic
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Assessment Tasks

1 Team Research Project

Assessment Type

Written Assessment

Task Description

For this assessment, students will form teams and will conduct research on the given geotechnical engineering topics. These topics are related to the advanced methods for estimating the bearing capacity of the soil for foundation design, stability analyses, retaining structures design and exploration of the related Australian Standards. In some cases, students may also require using related geotechnical software packages for their report. Students are required to submit their report and also present it orally as a team.

Assessment Due Date

Week 6 Friday (23 Dec 2022) 11:00 pm AEST

Return Date to Students

Week 8 Friday (13 Jan 2023)

Weighting

30%

Minimum mark or grade

50

Assessment Criteria

The following criteria will be assessed:

- a) Format of the report and including cover page, table of contents, abstract, literature, conclusion and examples (if any);
- b) Work breakdown among team members;
- c) The coherence of the research;
- d) Completeness of the research and its details;
- e) Complete Referencing; and
- f) Quality of the presentation.

Professional presentation will have the following features:

- The research is clearly identified;
- A clear statement of each topic and its details and requirements;
- Appropriate use of diagrams and clear diagrams;
- Correct use of terminologies; and
- Clear English in the explanation of the procedure and interpretation of the results.

Grades for the assessment will be determined based on the evidence and substantiation of attainment of the LOs (learning outcomes).

After submission of the team report, students must present their individual report orally (or recorded) to the class. Students must be well prepared to answer any questions raised by the lecturer during the presentation about the topic of their research.

Individual Student's Grade:

Each team submission will be assessed and a grade will be given to each member of the team based on the submitted report that forms 70% of the assignment 1 mark. Students will also be assessed based on their **individual** presentation that forms the other 30% mark of assignment 1.

A similarity check will be always done before marking the submitted assignments for all students. Upon detection of any plagiarism including i) similarity between submitted reports within the same cohort or ii) with the previous cohorts or iii) submitted works to other institutes or iv) using the material provided by cheating websites will result in failing that assignment without marking and the student will be reported to the CQU Academic Misconduct team for further actions.

Referencing Style

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

Submission

Online Group

Submission Instructions

Please submit a Microsoft Word file only.

Learning Outcomes Assessed

- Design group piles, pad foundations and earth retaining structures and assess stability of slopes
- Formulate, plan, manage and complete projects individually or in teams in an ethical and professional manner considering stakeholder requirements and principals of sustainable development
- Demonstrate a professional level of communication and leadership.

Graduate Attributes

- Knowledge
- Communication
- Research
- Self-management
- Ethical and Professional Responsibility

2 Numerical Analysis

Assessment Type

Written Assessment

Task Description

The aim of this assessment is to allow the students to demonstrate their understanding of various concepts, theories and

processes developed in the course. This may include but is not limited to foundation design, foundation settlement, soil reinforcement, slope stability, site investigation, earth retaining wall and soil improvement techniques. Formal assessment is by submission of a portfolio which contains evidence of all the individual works that the student has performed throughout the term.

Assessment Due Date

Week 9 Friday (20 Jan 2023) 11:00 pm AEST

Return Date to Students

Week 11 Friday (3 Feb 2023)

Weighting

20%

Minimum mark or grade

50

Assessment Criteria

Each question in this assessment will be assessed separately for the:

- Accuracy;
- Correct application of mathematics and arithmetic;
- Answers clearly identified; and
- Correct results.

In addition, the assessment 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 the mathematical and arithmetical working linking is given;
- Details of the problem with the results are obtained; and
- Evidence of checking results (mathematical, graphical, logic common sense) are presented.

Evidence of an understanding of the topic:

- Explanation of choices made in the analysis (why is the procedure required, why this particular procedure); and
- Interpretation of results.

A similarity check will be always done before marking the submitted assignments for all students. Upon detection of any plagiarism including i) similarity between submitted reports within the same cohort or ii) with the previous cohorts or iii) submitted works to other institutes or iv) using the material provided by cheating websites will result in failing that assignment without marking and the student will be reported to the CQU Academic Misconduct team for further actions.

Referencing Style

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

Submission

Online

Submission Instructions

Please submit a Microsoft Word file only.

Learning Outcomes Assessed

- Formulate, plan, manage and complete projects individually or in teams in an ethical and professional manner considering stakeholder requirements and principals of sustainable development
- Use appropriate software to analyse geotechnical components

Graduate Attributes

- Knowledge
- Cognitive, technical and creative skills
- Self-management

3 Laboratory report

Assessment Type

Practical Assessment

Task Description

Practical exercises assist the students in achieving the learning outcomes for this unit. Students are required to complete the laboratory activities as per instructions given in the practical instruction sheet. The practical instruction sheet and report requirements will be given on the unit website. Students will handle soil and rock samples and it is possible that clothes become dusty and wet. Students must wear appropriate clothing for laboratory work, including closed shoes. Students who behave unprofessionally or risk the safety of other people or damage the equipment may be excluded from the laboratory class, and consequently, they may fail to complete compulsory assessment tasks and fail the unit. Students must attend the lab session before the start of the session and those who are late more than 15 minutes will be excluded and cannot attend other groups.

Assessment Due Date

Week 10 Friday (27 Jan 2023) 11:00 pm AEST

Return Date to Students

Week 12 Friday (10 Feb 2023)

Weighting

20%

Minimum mark or grade

50

Assessment Criteria

- Each student must prepare a technical description of the test and associated procedures and should prepare a data sheet to be used to record the results during the test.
- Each student must prepare a short test report for each experiment. This includes calculations and discussion on the results and the test procedure description.
- Test reports must be short and precise to point out calculations/results/graphs and discussion. The limit for explaining the procedure, results and conclusions is a maximum of 3-5 pages (Word file).
- A complete submission for practical assessment includes 2 files:

a) An Excel File including all analyses and graphs. All cells must be formula-based to track the calculations,

b) Sample calculations must be included in the MS Word report file.

c) Word file to explain the procedure, results and conclusions (maximum of 3-5 pages).

Please also note that the practical report is an individual submission and each student should do their own analysis and explanations based on the test they have carried out. PDF files are not accepted for marking.

- *A similarity check will be always done before marking the submitted assignments for all students. Upon detection of any plagiarism including i) similarity between submitted reports within the same cohort or ii) with the previous cohorts or iii) submitted works to other institutes or iv) using the material provided by cheating websites will result in failing that assignment without marking and the student will be reported to the CQU Academic Misconduct team for further actions.*

Referencing Style

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

Submission

Online

Learning Outcomes Assessed

- Apply site investigation and geotechnical testing techniques to characterise sites and geotechnical materials based on Australian Standards
- Demonstrate a professional level of communication and leadership.

Graduate Attributes

- Knowledge
- Research
- Self-management

4 In-class test

Assessment Type

In-class Test(s)

Task Description

The class test will be arranged in lieu of one of the class sessions in week 12. The class test duration is 2 hours and 30 minutes and is closed-book. The complementary information about the class-test will be provided on the unit website of ENEC20003.

Assessment Due Date

Week 12 Friday (10 Feb 2023) 2:00 pm AEST

Return Date to Students

Exam Week Friday (17 Feb 2023)

Weighting

30%

Minimum mark or grade

50

Assessment Criteria

The in-class test will examine the understanding of students of all covered topics in the provided lectures. The numerical analysis lectures will not be examined. The in-class test is not an open-book style and all necessary resources will be provided as required.

Referencing Style

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

Submission

No submission method provided.

Learning Outcomes Assessed

- Design group piles, pad foundations and earth retaining structures and assess stability of slopes

Graduate Attributes

- Knowledge

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