



# ENEC20003 Geotechnical Engineering Design

## Term 2 - 2018

Profile information current as at 25/04/2024 07:22 pm

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

Anti-Requisite: 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 2 - 2018

- Melbourne
- Mixed Mode
- Perth
- 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. **Examination**

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 Moodle website

##### Feedback

Students found the new topics that were added compared to the last offering of this course very informative and useful. E.g.: Numerical Analysis, Soil Reinforcement and Ground Improvement.

##### Recommendation

Continue to add more useful topics for Term 2, 2018.

#### Feedback from Moodle website

##### Feedback

This course is designed in such a way that students can gain knowledge in various areas such as software, laboratory test, research topic etc.

##### Recommendation

Continue to keep the same quality every year.

#### Feedback from Moodle website

##### Feedback

The assessment items were designed effectively to help students with their final year project.

##### Recommendation

Continue to keep the same quality every year.

## 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 **Engineers Australia's Stage 1 Competency Standard for Professional Engineers**.

## Alignment of Learning Outcomes, Assessment and Graduate Attributes



### Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
<b>1 - Written Assessment - 30%</b>	•	•			•

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
2 - Written Assessment - 20%		•		•	
3 - Practical Assessment - 20%			•		•
4 - Examination - 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%	○	○	○		○	○	○	
4 - Examination - 30%	○	○	○		○	○		

## Textbooks and Resources

### Textbooks

**There are no required textbooks.**

### IT Resources

**You will need access to the following IT resources:**

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Access to a spreadsheet program such as Excel
- Word; Powerpoint; a concept mapping tool such as Visio or FreeMind; a video recording tool or device for recording presentations not completed in class
- 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](mailto:m.mirzababaei@cqu.edu.au)

## Schedule

### Week 1 - 09 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
Shallow foundations-bearing capacity-Part I	Chapter 16	Workshop: Introduction to numerical analysis in geotechnical engineering-Part I

### Week 2 - 16 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
Shallow foundations-bearing capacity-Part II	Chapter 16	Workshop: Introduction to numerical analysis in geotechnical engineering-Part II

### Week 3 - 23 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
Deep foundations-part I	Chapter 18	Workshop: Introduction to numerical analysis in geotechnical engineering-Part III

### Week 4 - 30 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
Deep foundations-part II	Chapter 18	Workshop: Geotechnical modelling module I

### Week 5 - 06 Aug 2018

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

Retaining walls-part I	Chapter 15	Workshop: Geotechnical modelling module II
<b>Vacation Week - 13 Aug 2018</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
<b>Week 6 - 20 Aug 2018</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Retaining walls-part II	Chapter 15	Workshop: Presentations (session I)
		<b>Team project</b> Due: Week 6 Monday (20 Aug 2018) 1:00 pm AEST
<b>Week 7 - 27 Aug 2018</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Soil reinforcement-part I		Workshop: Presentations (Session II)
<b>Week 8 - 03 Sep 2018</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Soil reinforcement-part II		Workshop: Geotechnical modelling module III
<b>Week 9 - 10 Sep 2018</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Slope stability	Chapter 13	Workshop: Geotechnical modelling module IV
		<b>Numerical analysis</b> Due: Week 9 Monday (10 Sept 2018) 1:00 pm AEST
<b>Week 10 - 17 Sep 2018</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Mechanics of unsaturated soils		Workshop: Geotechnical modelling module V
<b>Week 11 - 24 Sep 2018</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Ground improvement techniques	Chapter 11	Workshop: Geotechnical modelling module VI
		<b>Laboratory report</b> Due: Week 11 Monday (24 Sept 2018) 1:00 pm AEST
<b>Week 12 - 01 Oct 2018</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Site investigation	Chapter 12	Review
<b>Review/Exam Week - 08 Oct 2018</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
<b>Exam Week - 15 Oct 2018</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>

## Term Specific Information

Please read the geotechnical engineering unit (undergraduates) prior to taking this unit. Practical Classes for on-campus students will be scheduled after week 5. Detail of the laboratory timetable will be available in Week 4

## Assessment Tasks

### 1 Team project

#### Assessment Type

Written Assessment

#### Task Description

For this assessment, students will form teams and will conduct a research on the available topics on the unit website. 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.

#### Assessment Due Date

Week 6 Monday (20 Aug 2018) 1:00 pm AEST

Report should be formally submitted in a single Microsoft Word document by one of the team members.

#### Return Date to Students

Week 9 Monday (10 Sept 2018)

#### Weighting

30%

#### Minimum mark or grade

50%

#### Assessment Criteria

##### **The following criteria will be assessed for the submissions:**

- The format of the report and including cover page, table of contents, abstract, literature, conclusion and examples (if any);
- The coherence of the research;
- Completeness of the research and its details;
- Complete Referencing; and
- Quality of the presentation.

**Professional presentation:** The following will demonstrate the components and requirements of the presentation.

- 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 Learning Outcomes. After submission of the team report, students will present their report orally as a team and all are required to contribute to delivering the presentations. Students must be well prepared to answer any questions raised by the lecturer during the presentation about the topic of their research. Individual

Initially, team submission will be assessed and a grade will be given to each team. Then individual grade will be determined based on the contribution and performance of each student during the presentation (i.e., quality of the presentation and answers to the raised questions). Each student's contribution will be determined by peer assessment. It may be possible that the individual grade is higher than the team mark component. 50% of the total grade is attributed to the team report, 25% for the team presentation and the other 25% is attributed to the individual students' performance during the presentation.

**Example:** Team A (4 students) has gained 80% on its team report. During the presentation, team received 70% for their presentation and the performance values of the students were 50%, 100%, 90% and 70%, respectively. The final grade of each student for the team project (out of 30%) will be: Student 1:  $(80*50\%+70*25\%+50*25\%)*30\%=21$  out of 30 Student 2:  $(80*50\%+70*25\%+100*25\%)*30\%=24.8$  out of 30 Student 3:  $(80*50\%+70*25\%+90*25\%)*30\%=24$  out of 30 Student 4:  $(80*50\%+70*25\%+70*25\%)*30\%=22.5$  out of 30

#### Referencing Style

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

#### Submission

Online

**Submission Instructions**

One of the team members (project manager) should submit the project online.

**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
- Cognitive, technical and creative skills
- Research
- Self-management
- Ethical and Professional Responsibility
- Leadership

## 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 skills to develop a numerical analysis for a foundation design, determination of foundation settlement, soil reinforcement, slope stability, retaining structures and site investigation.

**Assessment Due Date**

Week 9 Monday (10 Sept 2018) 1:00 pm AEST

**Return Date to Students**

Week 12 Monday (1 Oct 2018)

**Weighting**

20%

**Minimum mark or grade**

50%

**Assessment Criteria**

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

- Criterion accuracy and correct results;
- Correct application of mathematics and arithmetic;
- Clear answers; and
- Correct results.

**In addition, the assessment as a whole will be assessed against the following criteria:**

- Evidence of correct procedures;
- The correct order of necessary steps in the analysis;
- Clear presentation of the mathematics;
- Details of the problem with the obtained results; and
- Presentation of pieces of evidence for checking results (mathematics and graphs).

**Evidence of understanding of the topic:**

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

Students are required to submit MS Excel, Word and software code for this assessment.

**Referencing Style**

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

**Submission**

Online

## 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
- Communication
- Cognitive, technical and creative skills
- Research
- Self-management
- Ethical and Professional Responsibility

## 3 Laboratory report

### Assessment Type

Practical Assessment

### Task Description

Practical exercises assist students in achieving the Learning Outcomes for this unit. Students are required to complete required laboratory activities as per instructions given in the Practical Instruction Sheets. The Practical Instruction Sheets and report requirements are available on the unit website. Students will handle soil and rock samples and it is possible that their 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 this compulsory assessment task and fail the unit. Students must attend the lab session 10 minutes 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 11 Monday (24 Sept 2018) 1:00 pm AEST

### Return Date to Students

Exam Week Friday (19 Oct 2018)

### 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 maximum of 3 pages (Word/PDF file).
- A complete submission for practical assessment includes 2 files (in a zipped folder):
  - a) An Excel File with all analysis and graphs. All cells must be formula based to track the calculations,
  - b) A Word/PDF file to explain the procedure, results and conclusions (maximum 3 pages).

Please also note that practical report is of individual submission and each student should do their own analysis and explanations based on the test they have carried out.

### 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
- Communication
- Cognitive, technical and creative skills
- Self-management
- Ethical and Professional Responsibility
- Leadership

## **Examination**

### **Outline**

Complete an invigilated examination.

### **Date**

During the examination period at a CQUniversity examination centre.

### **Weighting**

30%

### **Length**

180 minutes

### **Minimum mark or grade**

50%

### **Exam Conditions**

Closed Book.

### **Materials**

Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).

Calculator - all non-communicable calculators, including scientific, programmable and graphics calculators are authorised

## 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