



# **ENEC12008 *Geotechnical Engineering***

## **Term 2 - 2020**

Profile information current as at 23/04/2024 10:39 pm

All details in this unit profile for ENEC12008 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

This unit explains why geological processes that produce landforms, geological structures, rocks, and soils affect the location, design, construction, and maintenance of civil engineering projects. In the unit, you will conduct geotechnical tests, analyse test data, prepare geotechnical reports, and discuss the engineering characteristics and properties of soil. You will select appropriate approaches for analysing the behaviour of soils in civil engineering applications. You will need to use appropriate 'civil engineering language' in context and document the process of modelling and analysis of geotechnical problems. You will present information in a professional manner and communicate, work, and learn, both individually and in teams. You will be required to have access to a computer and to make frequent use of the internet, particularly if you are a distance (FLEX) student. Distance students will complete the practical work at a residential school.

### Details

Career Level: *Undergraduate*

Unit Level: *Level 2*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

### Pre-requisites or Co-requisites

Prerequisites: [ENEG11006 Engineering Statics OR PHYS11184 Engineering Physics A OR ENAG11005 Mechanics] AND [MATH11218 Applied Mathematics OR MATH11160 Technology Mathematics]

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

### Offerings For Term 2 - 2020

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

### Class Timetable

#### [Regional Campuses](#)

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

#### [Metropolitan Campuses](#)

Adelaide, Brisbane, Melbourne, Perth, Sydney

### Assessment Overview

#### 1. **Written Assessment**

Weighting: 20%

#### 2. **Written Assessment**

Weighting: 20%

#### 3. **Practical Assessment**

Weighting: 20%

#### 4. **Take Home Exam**

Weighting: 40%

### 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 contents were presented in a manner which made it very easy to learn and understand.

**Recommendation**

This is a great complement! The contents will be continued to be explained so that the underlying principles are understood by all students.

#### Feedback from Moodle

**Feedback**

An overview of a sample exam and recapping of the tutorials will be beneficial.

**Recommendation**

Although previous exam questions were provided on Moodle, it appears that some students needed solutions for them. For future offerings, previous exam solutions will be provided. An overview of the completed tutorials will also be provided. The lecturer hopes to email/contact students and ask the tutorial problems they would like to revise. Based on this, the specific tutorial problems will be revisited/focused on near the end of the term.

#### Feedback from Moodle

**Feedback**

The tutorials were very effective and helped learning. The lecturer provided tremendous learning support.

**Recommendation**

The tutorials were meticulously explained with a comprehensive discussion of the practical variances possible. This key aspect of the tutorials will be maintained in future offerings.

## Unit Learning Outcomes

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

1. Identify and discuss the implications of geological factors affecting the location, design, construction, and maintenance of civil engineering projects
2. Conduct geotechnical tests, analyse test data, and prepare geotechnical reports
3. Calculate basic engineering properties of soils and explain the relationship to soil behaviour
4. Analyse the behaviour of soil in response to engineering applications using appropriate theories and national standards
5. Communicate, work and learn both individually and in teams, document the process of modelling, testing, and analysis and present the information in a professional manner.

The Learning Outcomes for this unit are linked with Engineers Australia's Stage 1 Competency Standard for Professional Engineers, Stage 1 Competency Standards for Engineering Technologists, and Stage 1 Competency Standards for Engineering Associates.

## Alignment of Learning Outcomes, Assessment and Graduate Attributes



### Alignment of Assessment Tasks to Learning Outcomes

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

### Alignment of Graduate Attributes to Learning Outcomes

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

### Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Written Assessment - 20%	•	•	•	•		•		•		
2 - Written Assessment - 20%	•	•	•	•		•				
3 - Practical Assessment - 20%	•	•	•	•	•	•				
4 - Take Home Exam - 40%	•	•	•	•						

## Textbooks and Resources

### Textbooks

ENEC12008

#### Prescribed

##### Soil Mechanics and Foundations

Edition: 3rd (2010)

Authors: Muni Budhu

John Wiley and Sons, INC.

United States of America

ISBN: 978-0-470-55684-9

Binding: Hardcover

#### Additional Textbook Information

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

[View textbooks at the CQUniversity Bookshop](#)

### IT Resources

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

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)

## Referencing Style

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

For further information, see the Assessment Tasks.

## Teaching Contacts

**Shah Neyamat Ullah** Unit Coordinator

[s.ullah@cqu.edu.au](mailto:s.ullah@cqu.edu.au)

## Schedule

### Week 1 - 13 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
<b>Soil Description and Investigation</b>	Budhu Chapters 2 and 3	

### Week 2 - 20 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
<b>Soil Classification and Phase Relationships</b>	Budhu Chapter 4	

### Week 3 - 27 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
<b>Soil Compaction</b>	Budhu Chapter 5	

### Week 4 - 03 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
<b>Soil Permeability</b>	Budhu Chapter 6	

Week 5 - 10 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Stresses and Strains in the soil	Budhu Chapter 7	
Vacation Week - 17 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
No Lecture		
Week 6 - 24 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Stress Path in Soil	Budhu Chapter 8	
Week 7 - 31 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Compressibility and Settlement of Soils (Part 1)	Budhu Chapter 9	<b>Assignment 1</b> Due: Week 7 Monday (31 Aug 2020) 5:00 pm AEST
Week 8 - 07 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Compressibility and Settlement of Soils (Part 2)	Budhu Chapter 9	
Week 9 - 14 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Shear Strength of Soils (Part 1)	Budhu Chapter 10	
Week 10 - 21 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Shear Strength of Soils (Part 2)	Budhu Chapter 10	
Week 11 - 28 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Two-Dimensional Flow of Water Through Soils	Budhu Chapter 14	
Week 12 - 05 Oct 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Revision		<b>Assignment 2</b> Due: Week 12 Monday (5 Oct 2020) 5:00 pm AEST <b>Laboratory Report</b> Due: Week 12 Tuesday (6 Oct 2020) 5:00 pm AEST
Review/Exam Week - 12 Oct 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Exam Week - 19 Oct 2020		
Module/Topic	Chapter	Events and Submissions/Topic
		<b>End of term Examination</b> Due: Exam Week Monday (19 Oct 2020) 11:45 pm AEST

## Term Specific Information

Students must be able to defend their understanding and submission workings in a subsequent 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 Assignment 1

#### Assessment Type

Written Assessment

#### Task Description

The aim of this assignment is to allow students to demonstrate their understanding of various concepts, theories and processes studied/developed in the topics covered from week 1 to week 6 from the Study Schedule.

The purpose of assignment questions is to give students an opportunity to show the depth of their understanding of the unit learning outcomes. This should be done by presenting answers clearly, showing the procedure used, explaining the approach to the problem, choices made, checking and interpretation of results.

Some questions may require students to carry out research. All resources used (including the text) should be referenced appropriately. Students are cautioned that copying another student's answer will be dealt with under the Plagiarism Procedures.

#### Assessment Due Date

Week 7 Monday (31 Aug 2020) 5:00 pm AEST

#### Return Date to Students

Week 9 Monday (14 Sept 2020)

#### Weighting

20%

#### Assessment Criteria

**Each question in this assignment will be assessed separately for the criterion accuracy and correct results.**

- Correct application of mathematics and arithmetic
- Answers clearly identified
- Correct results

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

#### Evidence of correct procedures:

- All necessary steps in analysis are present in 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 understanding of the topic

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

#### Professional presentation

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

## Referencing Style

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

## Submission

Online

## Submission Instructions

The submission should be in a single PDF document. Any spreadsheet or Excel graphs must be transferred to the main PDF document.

## Learning Outcomes Assessed

- Identify and discuss the implications of geological factors affecting the location, design, construction, and maintenance of civil engineering projects
- Conduct geotechnical tests, analyse test data, and prepare geotechnical reports
- Calculate basic engineering properties of soils and explain the relationship to soil behaviour
- Analyse the behaviour of soil in response to engineering applications using appropriate theories and national standards
- Communicate, work and learn both individually and in teams, document the process of modelling, testing, and analysis and present the information in a professional manner.

## Graduate Attributes

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

## 2 Assignment 2

### Assessment Type

Written Assessment

### Task Description

The aim of this assignment is to allow students to demonstrate their understanding of various concepts, theories and processes studied/developed in the topics covered from week 6 to week 12 from the Study Schedule.

The purpose of assignment questions is to give students an opportunity to show the depth of their understanding of the unit learning outcomes. This should be done by presenting answers clearly, showing the procedure used, explaining the approach to the problem, choices made, checking and interpretation of results.

Some questions may require students to carry out research. All resources used (including the text) should be referenced appropriately. Students are cautioned that copying another student's answer will be dealt with under the Plagiarism Procedures.

### Assessment Due Date

Week 12 Monday (5 Oct 2020) 5:00 pm AEST

### Return Date to Students

Exam Week Monday (19 Oct 2020)

### Weighting

20%

### Assessment Criteria

**Each question in this assignment will be assessed separately for the criterion accuracy and correct results.**

- Correct application of mathematics and arithmetic
- Answers clearly identified
- Correct results

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

#### Evidence of correct procedures

- All necessary steps in analysis are present in 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 understanding of the topic

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

### Professional presentation

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

### Referencing Style

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

### Submission

Online

### Submission Instructions

The submission should be in a single PDF document. Any spreadsheet or Excel graphs must be transferred to the main PDF document.

### Learning Outcomes Assessed

- Identify and discuss the implications of geological factors affecting the location, design, construction, and maintenance of civil engineering projects
- Conduct geotechnical tests, analyse test data, and prepare geotechnical reports
- Calculate basic engineering properties of soils and explain the relationship to soil behaviour
- Analyse the behaviour of soil in response to engineering applications using appropriate theories and national standards
- Communicate, work and learn both individually and in teams, document the process of modelling, testing, and analysis and present the information in a professional manner.

### Graduate Attributes

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

## 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 the laboratory activities as per instructions given in the Practical Instruction Sheets. The Practical Instruction Sheets and report requirements will be given on the unit Website. Due to government and university restrictions, special online laboratory activities will be regularly arranged. Students are expected to attend such sessions.

### For Activities 1, 2, 3, 4, 5:

- Each student must prepare a **technical description** of the test and associated procedures, and should prepare a **data sheet** to be used to record results during the test.
- Each student must prepare a short **test report for each experiment** using the team data sheet for each test. **This includes calculations and discussion on the results only, not test procedure description.** Personal 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:
  - **File 1)** Excel File with all analysis and graphs. All cells must be formula based to track the calculations
  - **File 2)** PDF file to explain the procedure, results and conclusions.
- Reports should be such that it can be understood clearly without resorting to the Excel Sheets.

### List of Activities:

**Activity 1:** Sieve Analysis

[AS 1289.3.6.1-2009]

**Activity 2:** Atterberg Limits (Liquid limit, Plastic limit, linear shrinkage) tests.

[AS 1289.3.1.1-2009; AS 1289.3.9.1-2002; AS 1289.3.2.1-2009; AS 1289.3.3.1-2009; AS 1289.3.3.2-2009; AS 1289.3.4.1-2008]

**Activity 3:** Compaction test

[AS 1289.5.1.1-2003]

**Activity 4:** Consolidation test

[AS 1289.6.6.1-1998]

**Activity 5:** Permeability Tests (Falling head and Constant head)

[AS 1289.6.7.2, AS 1289.6.7.1]

**Activity 6:** Geology of Common Rocks and Minerals (no written report required)

### **Assessment Due Date**

Week 12 Tuesday (6 Oct 2020) 5:00 pm AEST

### **Return Date to Students**

Exam Week Tuesday (20 Oct 2020)

### **Weighting**

20%

### **Minimum mark or grade**

50%

### **Assessment Criteria**

**Each report will be assessed separately for the criterion accuracy and correct procedure as required in the Instruction.**

- Correct application of mathematics and arithmetic
- Results clearly identified and explained
- Correct results/explanation

**Also, the report as a whole will be assessed against the following criteria:**

#### **Evidence of correct procedures**

- All necessary steps in experiment and reporting are followed in correct order
- Clear presentation of results obtained.
- Evidence of checking results (mathematical, graphical, logic common sense)

#### **Evidence of understanding of the topic**

- Explanation of possible error in the experiment
- Interpretation of results

#### **Professional presentation**

- appropriate use of diagrams, clear diagrams
- Correct use of terminology, conventions
- Equation, images, data and tables, and the quality of presentation and layout.
- Proper referencing of sources of information (if required, Harvard style should be used)
- Clear English in the explanation of procedure and interpretation of results

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

#### **Referencing Style**

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

#### **Submission**

Online

#### **Submission Instructions**

The submission should be in a single PDF document. Excel sheets can be added when requested but the report must be independent of any spreadsheet. All Excel graphs, sample data analyses must be added to the main PDF report.

#### **Learning Outcomes Assessed**

- Identify and discuss the implications of geological factors affecting the location, design, construction, and maintenance of civil engineering projects

- Conduct geotechnical tests, analyse test data, and prepare geotechnical reports
- Calculate basic engineering properties of soils and explain the relationship to soil behaviour
- Analyse the behaviour of soil in response to engineering applications using appropriate theories and national standards
- Communicate, work and learn both individually and in teams, document the process of modelling, testing, and analysis and present the information in a professional manner.

#### **Graduate Attributes**

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Team Work
- Information Technology Competence

## 4 End of term Examination

#### **Assessment Type**

Take Home Exam

#### **Task Description**

The end-of-term take home examination is arranged to evaluate the understanding of the overall content discussed in class. This assessment is timed and students will need to submit their work online through the course website within the stipulated time. Students require access to a web camera so that online invigilation can be carried out and any queries can be promptly answered during the assessment period. The answer scripts will have to be scanned and attached as a single PDF file on the course website.

#### **Assessment Due Date**

Exam Week Monday (19 Oct 2020) 11:45 pm AEST

See examination time and Moodle website for further instructions.

#### **Return Date to Students**

See Moodle website for further instructions on how to return your examination script.

#### **Weighting**

40%

#### **Minimum mark or grade**

50%

#### **Assessment Criteria**

The problems in the examination are expected to be similar to the assessment problems, judging a thorough understanding of physical and mathematical concepts discussed in this course. The students will be judged on the following criteria:

- Accuracy and clarity in all calculations
- Use of correct equations
- Correct use of technical language, nomenclature and discipline specific symbols
- Drawing and illustration of results
- Correct answer of any short conceptual questions
- Explanation of results

#### **Referencing Style**

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

#### **Submission**

No submission method provided.

#### **Submission Instructions**

A single PDF file needs to be submitted.

#### **Graduate Attributes**

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

## Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the [Student Academic Integrity Policy and Procedure](#). This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

### What is a breach of academic integrity?

A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

### Why is academic integrity important?

A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

### Where can I get assistance?

For academic advice and guidance, the [Academic Learning Centre \(ALC\)](#) can support you in becoming confident in completing assessments with integrity and of high standard.

### What can you do to act with integrity?



#### Be Honest

If your assessment task is done by someone else, it would be dishonest of you to claim it as your own



#### Seek Help

If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)



#### Produce Original Work

Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem