



ENEC12008 *Geotechnical Engineering*

Term 2 - 2023

Profile information current as at 19/04/2024 07:59 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 how geological processes that produce landforms, geological structures, rocks, and soils affect the location, design, construction, and maintenance of civil engineering projects. In this unit, you will gain knowledge of the engineering properties of soils, conduct and analyse data from geotechnical tests performed according to Australian Standards, and prepare high quality geotechnical reports. 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. In this unit, you must complete compulsory practical activities. Refer to the Engineering Undergraduate Course Moodle site for proposed dates. This unit will promote progress toward the United Nation's Sustainable Development Goal 15 - Life on the land.

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 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 - 2023

- 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: 30%

4. **Online Test**

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 Student Unit and Teaching Evaluation

Feedback

The online test was stress-free with plenty of time provided to understand and effectively answer questions.

Recommendation

This nature of the online test should be maintained in the future.

Feedback from Student Unit and Teaching Evaluation

Feedback

The lectures were very engaging with a lot of content presented but broken down in a manner that was interesting as well as easy to learn. With real-life examples, the lecturer challenged our thinking as well as assessed our understanding on the spot, making sure we all understood the concepts discussed prior to moving on to the next topic.

Recommendation

It is recommended to continue to prioritise the engaged teaching approach to provide students with the best possible learning experience.

Feedback from Student Unit and Teaching Evaluation

Feedback

The online test questions can be expanded, it felt like a lot of equations discussed in class were not needed.

Recommendation

The role of geotechnical equations in the course should be further reinforced in future offerings.

Feedback from Student Unit and Teaching Evaluation

Feedback

Students should be allowed to type their equations as opposed to only handwrite equations permitted during the test.

Recommendation

Students should be allowed to type the equations from the next offering for better structuring the equations needed to complete the test.

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 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 3.4 Professional use and management of information. (LO: 5N)

Intermediate 1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 2I 3I 4I) 1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 3I) 2.1 Application of established engineering methods to complex engineering problem-solving. (LO: 1N 3I 4I) 2.2 Fluent application of engineering techniques, tools and resources. (LO: 2I) 2.3 Application of systematic engineering synthesis and design processes. (LO: 4I) 3.2 Effective oral and written communication in professional and lay domains. (LO: 2I 5I) 3.5 Orderly management of self, and professional conduct. (LO: 2I)

Advanced 1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 1N 2A 3I 4A) 1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 1I 3A) 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 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



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 - 30%		•		•	•
4 - Online Test - 30%			•	•	

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					

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

[View textbooks at the CQUniversity Bookshop](#)

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Microsoft Excel and Word

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

Schedule

Week 1 - 10 Jul 2023

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

Week 2 - 17 Jul 2023

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

Week 3 - 24 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Soil Compaction	Budhu Chapter 5	

Week 4 - 31 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Soil Permeability	Budhu Chapter 6	

Week 5 - 07 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
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Stresses and Strains in the soil Budhu Chapter 7

Vacation Week - 14 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
No Lecture		

Week 6 - 21 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Stress Path in Soil	Budhu Chapter 8	

Week 7 - 28 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Compressibility and Settlement of Soils (Part 1)	Budhu Chapter 9	Assignment 1 Due: Week 7 Monday (28 Aug 2023) 5:00 pm AEST

Week 8 - 04 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Compressibility and Settlement of Soils (Part 2)	Budhu Chapter 9	

Week 9 - 11 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Shear Strength of Soils (Part 1)	Budhu Chapter 10	

Week 10 - 18 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Shear Strength of Soils (Part 2)	Budhu Chapter 10	

Week 11 - 25 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Two-Dimensional Flow of Water Through Soils	Budhu Chapter 14	

Week 12 - 02 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
Revision		Assignment 2 Due: Week 12 Tuesday (3 Oct 2023) 5:00 pm AEST Laboratory Assessment Due: Week 12 Thursday (5 Oct 2023) 5:00 pm AEST

Review/Exam Week - 09 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
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Exam Week - 16 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
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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. The questions are mostly numerical in nature but may include explaining theoretical concepts. 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 (28 Aug 2023) 5:00 pm AEST

Return Date to Students

Week 9 Monday (11 Sept 2023)

Weighting

20%

Minimum mark or grade

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
- Calculate basic engineering properties of soils and explain the relationship to soil behaviour
- 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.

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. The questions are mostly numerical in nature but may include explaining theoretical concepts.

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 Tuesday (3 Oct 2023) 5:00 pm AEST

Return Date to Students

Review/Exam Week Friday (13 Oct 2023)

Weighting

20%

Minimum mark or grade

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
- 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.

3 Laboratory Assessment

Assessment Type

Practical Assessment

Task Description

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, 6 and 7:

- Each group 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 group 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. Report should be as concise as possible with test procedure not exceeding one page. 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: Direct Shear Test [AS1289]

Activity 7: Unconsolidated Undrained (UU) Triaxial Test [AS1289]

Activity 8: Geology of Common Rocks and Minerals (**no written report required**)

Assessment Due Date

Week 12 Thursday (5 Oct 2023) 5:00 pm AEST

Return Date to Students

Exam Week Monday (16 Oct 2023)

Two weeks after submission.

Weighting

30%

Minimum mark or grade

50%

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 laboratory data analyses are present in the correct order
- Clear presentation of mathematical and arithmetical working linking given details of the problem to the results obtained.
- Evidence of checking results (mathematical, graphical, logic common sense)
- Plotting of data with clear axes labels and use of correct units

Evidence of understanding of the topic

- Explanation of choices made in the analysis (why is procedure required, why this particular procedure)
- Interpretation of results, for instance, test limitations, choice of stresses, discrepancy in data

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 with proper labels and annotations
- Correct use of terminology, conventions
- Clear English in the explanation of procedure and interpretation of results

Referencing Style

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

Submission

Online Group

Submission Instructions

Combine all reports in a single PDF file. Combine all Excel sheets into one single parent file with each tab representing individual tests. Include a table of contents and cover page with all team members identified. Attach a contribution statement outlining each member contribution to the final report.

Learning Outcomes Assessed

- Conduct geotechnical tests, analyse test data, and prepare geotechnical reports
- 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.

4 Online test

Assessment Type

Online Test

Task Description

The aim of this assessment is to allow students to demonstrate their understanding of various concepts, theories and processes studied/developed in the topics covered throughout the term.

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.

Assessment Due Date

Online test will take place during the exam weeks.

Return Date to Students

Two weeks after test

Weighting

30%

Minimum mark or grade

50%

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

Learning Outcomes Assessed

- 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

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