UNSW Course Outline

ZEIT2601 Soil Mechanics and Engineering Geology - 2024

Published on the 30 Jun 2024

General Course Information

Course Code : ZEIT2601
Year : 2024
Term : Semester 2
Teaching Period : Z2
Is a multi-term course? : No
Faculty : UNSW Canberra
Academic Unit : School of Engineering and Technology
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : UNSW Canberra at ADFA
Campus : UNSW Canberra
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This is an introductory course that addresses: introductory aspects of engineering geology; engineering classification of soils and rocks; compaction behavior of soil, stresses in soils under self weight and simple loading conditions; 1 D and 2D seepage and their effects on effective

stress, and behavior of soils under1 D consolidation. Students are required to perform soil compaction, falling head and constant head permeability tests, and 1D consolidation tests using relevant Australian Standards. A demonstration is also given to show the effect of liquefaction on structure stability.

Course Aims

This course aims to introduce the basic knowledge of engineering geology, physical and mechanical properties of soils and rocks, and how to determine the properties using test methods described in relevant Australian Standards. The course also aims to train the students to write laboratory and field visit reports.

Relationship to Other Courses

Prerequisite: ZEIT1503

Students also need to pass this course to enroll a third year course ZEIT3602 Geotechnical Design

Course Learning Outcomes

Course Learning Outcomes	Engineers Australia - Professional Engineer (Stage 1)
CLO1 : Understand geological and geotechnical classifications, concepts, structures and the use of geological maps, and the influence of geological origin on the engineering behaviour of geo- materials	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.2 : Fluent application of engineering techniques, tools and resources • PEE3.1 : Ethical conduct and professional accountability • PEE3.2 : Effective oral and written communication in professional and lay domains • PEE3.4 : Professional use and management of information
CLO2 : Understand the behaviour of soil as a multiphase material with the solid phase governed by the effective stress principle and the liquid phase governed by seepage	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.2 : Fluent application of engineering techniques, tools and resources • PEE3.4 : Professional use and management of information
CLO3 : Perform 1D consolidation analysis using water flow and effective stress theory	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline

	• PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.2 : Fluent application of engineering techniques, tools and resources • PEE3.2 : Effective oral and written communication in professional and lay domains
CLO4 : Classify rocks for engineering purposes	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE3.2 : Effective oral and written communication in professional and lay domains

Course Learning Outcomes	Assessment Item
CLO1 : Understand geological and geotechnical classifications, concepts, structures and the use of geological maps, and the influence of geological origin on the engineering behaviour of geo- materials	• Quiz • Project • Final Exam
CLO2 : Understand the behaviour of soil as a multiphase material with the solid phase governed by the effective stress principle and the liquid phase governed by seepage	• Lab 1 - Compaction and Seepage Tests • Project • Final Exam
CLO3 : Perform 1D consolidation analysis using water flow and effective stress theory	• Lab 2 - Consolodation Test • Project • Final Exam
CLO4 : Classify rocks for engineering purposes	• Project • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

The course will be delivered using a mixture of in-class presentations, tutorials, two laboratory exercises, and a field trip.

It is expected that students will purchase the prescribed text, and keep abreast of each topic as it is taught in class. This will include reading the relevant section(s) of the text prior to each class (note some topics will require wider reading from different texts), attending all the lectures, tutorials, labs and field trips, discussions with peer students and lecturers and completion of all tutorials and assessment work.

Students are required to familiarize themselves with the relevant Standards prior to the laboratory tests.

A small project has been carefully selected to allow the students to apply knowledge learned in class to a real case.

The Learning Management System

Moodle is the Learning Management System used at UNSW Canberra. All courses have a Moodle site which will become available to students at least one week before the start of semester. Please find all help and documentation (including Blackboard Collaborate) at the Moodle Support page.

UNSW Moodle supports the following web browsers:

» Google Chrome 50+
» Safari 10+
** Internet Explorer is not recommended

** Addons and Toolbars can affect any browser's performance.

Operating systems recommended are:

Windows 7, 10, Mac OSX Sierra, iPad IOS10

For further details about system requirements click here.

Log in to Moodle here.

If you need further assistance with Moodle:

For enrolment and login issues please contact:
IT Service Centre
Email: itservicecentre@unsw.edu.au
Phone: (02) 9385-1333
International: +61 2 9385 1333

For all other Moodle issues please contact:
External TELT Support
Email: externalteltsupport@unsw.edu.au
Phone: (02) 9385-3331
International: +61 2 938 53331

Opening hours:
Monday – Friday 7:30am – 9:30 pm
Saturday & Sunday 8:30 am – 4:30pm

Additional Course Information

Academic Integrity and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. All students are expected to adhere to UNSW's Student Code of Conduct https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Plagiarism undermines academic integrity and is not tolerated at UNSW. *It is defined as using the words or ideas of others and passing them off as your own, and* can take many forms, from deliberate cheating to accidental copying from a source without acknowledgement.

For more information, please refer to the following:

https://student.unsw.edu.au/plagiarism

Referencing

In this course, students are required to reference following the APA 7 / Chicago NB referencing style. Information about referencing styles is available at: https://guides.lib.unsw.adfa.edu.au/

c.php?g=472948&p=3246720

Study at UNSW Canberra

https://www.unsw.adfa.edu.au/study

Study at UNSW Canberra has lots of useful information regarding:

- Where to get help
- Administrative matters
- Getting your passwords set up
- How to log on to Moodle
- Accessing the Library and other areas.

Additional Information as required

CRICOS Provider no. 00098G

The University of New South Wales Canberra.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Quiz Assessment Format: Individual	5%	Due Date: Week 4: 05 August - 09 August
Lab 1 - Compaction and Seepage Tests Assessment Format: Group Short Extension: Yes (2 days)	5%	Start Date: Not Applicable Due Date: 13/09/2024 11:59 PM
Project Assessment Format: Individual Short Extension: Yes (2 days)	30%	Start Date: Not Applicable Due Date: Not Applicable
Lab 2 - Consolodation Test Assessment Format: Group Short Extension: Yes (2 days)	10%	Start Date: Not Applicable Due Date: 18/10/2024 11:59 PM
Final Exam Assessment Format: Individual	50%	Start Date: Not Applicable Due Date: Exam week

Assessment Details

Quiz

Assessment Overview

n/a

Course Learning Outcomes

- CLO1 : Understand geological and geotechnical classifications, concepts, structures and the use of geological maps, and the influence of geological origin on the engineering behaviour of geo- materials

Detailed Assessment Description

The assessement will be on Engineering Geology related topics.

Assessment information

The one-hour quiz will be online during week 4.

Assignment submission Turnitin type

Not Applicable

Lab 1 - Compaction and Seepage Tests

Assessment Overview

n/a

Course Learning Outcomes

- CLO2 : Understand the behaviour of soil as a multiphase material with the solid phase governed by the effective stress principle and the liquid phase governed by seepage

Detailed Assessment Description

Students are required to perform laboratory tests on soil compaction and hydraulic conductivity tests as per the following Australian Standards:

AS 1289.5.1.1-2003 Methods of testing soils for engineering purposes - Soil compaction and density tests-Determination of the dry density/moisture content relation of a soil using standard compactive effort

AS 1289.6.7.2-2001 AMDT 1, Methods of testing soils for engineering purposes - Soil strength and consolidation tests - Determination of permeability of a soil

AS 1289.6.7.1-2001 Rec:2013, Methods of testing soils for engineering purposes - Method 6.7.1: Soil strength and consolidation tests-Determination of permeability of a soil-Constant head method for a remoulded specimen

The tests will be performed in groups of 3 to 4 students. Each group need to submit one lab report only.

Assessment Length

In the range of 1000 - 1500 words.

Assignment submission Turnitin type

This is not a Turnitin assignment

Project

Assessment Overview

A course Project split up into 3 parts (10% each)

Course Learning Outcomes

- CLO1 : Understand geological and geotechnical classifications, concepts, structures and the use of geological maps, and the influence of geological origin on the engineering behaviour of geo- materials
- CLO2 : Understand the behaviour of soil as a multiphase material with the solid phase governed by the effective stress principle and the liquid phase governed by seepage
- CLO3 : Perform 1D consolidation analysis using water flow and effective stress theory
- CLO4 : Classify rocks for engineering purposes

Detailed Assessment Description

A small geotechnical project will be divided into three parts to cover three major geotechnical tasks performed for a civil project.

Part 1: Geological map reading (10%), assigned in Week 4. Due date 23rd August (Friday night, Week 6).

Part 2: Effective stress analysis (10%), assigned in Week 7. Due date 27th September (Friday night, Week 9).

Part 3: Settlement of a foundation (10%), assigned in Week 11. Due date 25th October (Friday night, Week 13).

Each part of the assignment has 2 days of short extension.

Assignment submission Turnitin type

Not Applicable

Lab 2 - Consolodation Test

Assessment Overview

n/a

Course Learning Outcomes

- CLO3 : Perform 1D consolidation analysis using water flow and effective stress theory

Detailed Assessment Description

Students will perform consolidation tests on soil samples as per Australian Standards:

AS 1289.6.6.1-2020, Determination of the onedimensional consolidation properties of a soil - Standard method

Tests will be performed in groups of 3-4. Each group is required to submit one lab report only.

Assessment Length

1000-1500 words

Assignment submission Turnitin type

Not Applicable

Final Exam

Assessment Overview

n/a

Course Learning Outcomes

- CLO1 : Understand geological and geotechnical classifications, concepts, structures and the use of geological maps, and the influence of geological origin on the engineering behaviour of geo- materials
- CLO2 : Understand the behaviour of soil as a multiphase material with the solid phase governed by the effective stress principle and the liquid phase governed by seepage
- CLO3 : Perform 1D consolidation analysis using water flow and effective stress theory
- CLO4 : Classify rocks for engineering purposes

Assessment Length

3 hours

Assessment information

The exam will cover all the contents discussed in this course.

Assignment submission Turnitin type

Not Applicable

Hurdle rules

A minimum of 40% should be achieved in the final exam to pass the course.

General Assessment Information

Feedback, grades and worked solutions on the quiz will be given to students during week 4.

Late Submission of Assessment

Unless prior arrangement is made with the lecturer or a formal application for special consideration is submitted, a penalty of 5% of the total available mark for the assessment will apply for each day that an assessment item is late up to a maximum of 5 days (120 hours) after which an assessment can no longer be submitted and a grade of 0 will be applied.

Use of Generative AI in Assessments

SIMPLE EDITING ASSISTANCE:

For assessment tasks, you may use standard editing and referencing software, but not Generative AI. You are permitted to use the full capabilities of the standard software to answer the question (such as Microsoft Office suite, Grammarly, etc.).

If the use of generative AI such as ChatGPT is detected, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

Grading Basis

Standard

Requirements to pass course

To pass the course, a minimum of 40% should be achieved in the final exam.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Activity	Monday 1300 - 1500 Introduction of the course; Geological process 1500 - 1600 Geological process Wednesday 1000 - 1200 Geological structures
Week 2 : 22 July - 26 July	Activity	Monday 1300 - 1500 Geological structures Tutorial 1500 - 1600 Wednesday 1000 - 1200 Geological mapping
Week 3 : 29 July - 2 August	Activity	Monday 1300 - 1500 Geological mapping tutorial 1500 - 1600 Rock classification Wednesday 1000 - 1200 Rock classification tutorial
Week 4 : 5 August - 9 August	Activity	Monday 1300 - 1500 field trip 1500 - 1700 field trip Wednesday 1000 - 1200 Three phase relationship
Week 5 : 12 August - 16 August	Activity	Monday 1300 - 1500 Three phase relationship and compaction theory 1500 - 1700 Field trip Wednesday 1000 - 1200 1D water flow
Week 6 : 19 August - 23 August	Activity	Monday 1300 - 1500 Compaction and permeability tests 1500 - 1700 Compaction and permeability tests Wednesday 1000 - 1200 1D water flow
Week 7 : 9 September - 13 September	Lecture	Monday 1300 - 1600 Effective stress theory Wednesday 1000 - 1200 Effective stress theory
Week 8 : 16 September - 20 September	Activity	Monday 1300 - 1600 Consolidation theory - 1D deformation Wednesday (Military training day) 1000 - 1200
Week 9 : 23 September - 27 September	Activity	Monday 1300 - 1600 Consolidation theory - time effect Wednesday 1000 - 1200 Consolidation theory - time effect
Week 10 : 30 September - 4 October	Activity	Monday 1300 - 1700 Consolidation lab tests Wednesday 1000 - 1200 Consolidation theory
Week 11 : 7 October - 11 October	Activity	Monday 1300 - 1500 2D stresses in soils 1500 - 1700 Wednesday 1000 - 1200 2D stresses in soils
Week 12 : 14 October - 18 October	Activity	Monday 1300 - 1500 2D flow in soils 1500 - 1700 Wednesday 1000 - 1200 2D flow in soils
Week 13 : 21 October - 25 October	Activity	Monday 1300 - 1500 Revision 1500 - 1700 Wednesday 1000 - 1200 Past exam review

Attendance Requirements

Please note that lecture recordings are not available for this course. Students are strongly encouraged to attend all classes and contact the Course Authority to make alternative arrangements for classes missed.

Course Resources

Prescribed Resources

Compulsory text:

Braja M. Das and Nagaratnam Sivakugan, Fundamental of Geotechnical Engineering, 5th Edition, 2017, Cengage Learning.

Tony Waltham, Foundations of Engineering Geology, Third Edition, 2009, CRC Press (Electronic book is available in the Academy library).

Standards

AS 1289.5.1.1-2003 Methods of testing soils for engineering purposes - Soil compaction and density tests-Determination of the dry density/moisture content relation of a soil using standard compactive effort

AS 1289.6.6.1-2020, Determination of the onedimensional consolidation properties of a soil - Standard method

AS 1289.6.7.2-2001 AMDT 1, Methods of testing soils for engineering purposes - Soil strength and consolidation tests - Determination of permeability of a soil

AS 1289.6.7.1-2001 Rec:2013, Methods of testing soils for engineering purposes - Method 6.7.1: Soil strength and consolidation tests-Determination of permeability of a soil-Constant head method for a remoulded specimen

Recommended Resources

Harvey J. C., Geology for Geotechnical Engineers, Cambridge University Press, 1982

Please note that there are many textbooks available in the library. You are encouraged to read other textbooks if you find one topic is hard for you to understand.

Course Evaluation and Development

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by listening to our own students. Students will be asked to complete the myExperience survey towards the end of this course.

Students can also provide feedback during the semester via: direct contact with the lecturer, the "On-going Student Feedback" link in Moodle, Student-Staff Liaison Committee meetings in schools, informal feedback conducted by staff, and focus groups. Student opinions really do make a difference. Refer to the Moodle site for this course to see how the feedback from previous students has contributed to the course development.

Important note: Students are reminded that any feedback provided should be constructive and professional and that they are bound by the Student Code of Conduct Policy

https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Jianfeng Xue		R128 B20	51145225	Available on Wednesdays 1400-1600 or by appointment	No	Yes