

CVEN3202

Soil Mechanics

Term 3, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Arman KHOSHGHALB	arman.khoshghalb@unsw.edu.au	Fridays from 3 pm to 4:30 pm	CE503	

School Contact Information

[Engineering Student Support Services](#) – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

Course Details

Units of Credit 6

Summary of the Course

An introductory course to fundamentals of soil mechanics. Topics include: description of soil, basic phase relationships, clay mineralogy, confined and unconfined seepage, principle of effective stress, consolidation theory, compaction, stress distribution and settlement, Mohr circle, failure criterion, strength of soils, soil testing, stress-strain behaviour of soils and slope stability.

Course Aims

The objective of the course is to understand the basic principles of soil mechanics and to study the behaviour of soil as an engineering material, both theoretically (through lectures) and practically (through laboratory classes).

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Describe the fundamentals of soil behaviour as an engineering material	PE1.1, PE1.2, PE1.3, PE1.5, PE2.3
2. Identify those aspects of soil behaviour that have a significant environmental impact	PE1.3, PE1.6, PE3.1
3. Solve a range of soil related problems especially those involving water flow, soil settlement and soil strength	PE1.1, PE1.2, PE2.1, PE2.2, PE3.3, PE3.5
4. Apply soil mechanics principles to a range of geotechnical engineering problems	PE2.1, PE2.3, PE2.4, PE3.4

Teaching Strategies

The contents of this subject will be presented in a series of lectures followed by workshops and coupled with laboratory sessions. The lectures explain the theory of soil behaviour and greatly assist in understanding the different concepts in classical soil mechanics. Understanding and application of each concept will be enhanced in workshops. Laboratory sessions will be held to give students a practical hands-on understanding of the content provided in lectures allowing them to perform experiments, measure properties and evaluate and report on results.

In order to understand different soil mechanics topics well, it is essential for students to attend the workshops and solve the workshop problems by themselves. It is expected that students will put in at least 1.5 hours of private study for each hour of contact. During private studies students should review and reflect on lecture material and class problems, solve workshop problems, and generally study the concepts taught in a soil mechanics book.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Quiz 1	10%	Not Applicable	2, 3, 4
2. Quiz 2	10%	Not Applicable	3, 4
3. Quiz 3	10%	Not Applicable	3, 4
4. Lab Reports	10%	Not Applicable	1, 2, 3, 4
5. Final Exam	60%	Exam period	1, 2, 3, 4

Assessment 1: Quiz 1

Start date: Week 3

Quiz from the first week of the lecture.

Assessment 2: Quiz 2

Start date: Week 7

Assessment length: 10 to 20 min

Quiz from the week 4 to week 6 of the lecture.

Assessment 3: Quiz 3

Start date: Week 10

Assessment length: 10 to 20 min

Quiz from the week 5 to week 8 of the lecture.

Assessment 4: Lab Reports

Start date: Throughout the term

4 laboratory report submissions throughout the Term.

Assessment 5: Final Exam

Start date: Exam period

Assessment length: 2 hours

Due date: Exam period

A comprehensive final exam covering all the topics taught in the course.

The final exam is open book.

Hurdle requirement

A mark of at least 30% in the final examination is required before the class work is included in the final mark.

Additional details

Further details on all assessments and assessment criteria will be provided in the first Lecture and on Moodle during the term.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
Week 1: 12 September - 16 September	Lecture	Introduction, Phase relationship, Classification of soils No Laboratory No Workshop <i>Release of learning module 1 (phase relationship)</i>
Week 2: 19 September - 23 September	Lecture	Clay mineralogy, Compaction Laboratory 1 module will be released. Workshop 1
Week 3: 26 September - 30 September	Lecture	Stress and Mohr circle, Stress in soils Quiz 1 (week 1 materials) Workshop 2 <i>Release of learning module 2 (Stress and Mohr circle)</i>
Week 4: 3 October - 7 October	Lecture	<i>(Public Holiday Labour Day - Monday 3 Oct)</i> Stress in soils (cont.), One-dimensional seepage Laboratory 2 module will be released Workshop 3 <i>Release of learning module 3 (One-dimensional seepage)</i>
Week 5: 10 October - 14 October	Lecture	Two-dimensional seepage, Consolidation theory Workshop 4 <i>Release of learning module 4 (Two-dimensional</i>

		seepage)
Week 6: 17 October - 21 October	Reading	No Lecture (Flexibility week) No Workshop
Week 7: 24 October - 28 October	Lecture	Rate of consolidation, Shear strength of soils Quiz 2 (weeks 2 to 4 materials) Laboratory 3 module will be released. Workshop 5 <i>Release of learning module 5 (Rate of consolidation)</i>
Week 8: 31 October - 4 November	Lecture	Shear strength in soils (cont.), Direct shear test Workshop 6 <i>Release of learning module 6 (Mohr-Coulomb failure criterion)</i>
Week 9: 7 November - 11 November	Lecture	Triaxial test, Stress path technique Laboratory 4 module will be released. Workshop 7 <i>Release of learning module 7 (Triaxial test)</i>
Week 10: 14 November - 18 November	Lecture	Slope stability Quiz 3 (weeks 5 to 8 materials) Workshops 8 and 9 <i>Release of learning module 8 (Slope stability)</i>

Resources

Prescribed Resources

The textbook for the course, on which most of the course PowerPoint slides are based and contains thorough explanations and dozens of worked examples, is sold in the UNSW bookshop:

Holtz, R.D., Kovacs, W.D. and Sheahan, T.C. (2011), "An Introduction to Geotechnical Engineering", Second Edition. International Edition. Pearson.

The following reference books may also be useful for additional reading, many of them can be found in the UNSW library:

- Indraratna, Heitor, and Vinod, "Geotechnical Problems and Solutions - A Practical Perspective", CRC press, 2020
- Craig, R. F. "Soil Mechanics", CRC press, 2012
- Das, B. M., "Principles of Geotechnical Engineering", PWS publishing, 1998-2006
- Lambe and Whitman, "Soil Mechanics", Wiley, 1975
- Barnes, G., "Soil Mechanics, Principles and practice", Palgrave MacMillan; 3rd Ed, 2011
- Budhu, M., "Soil Mechanics and Foundations", Wiley & Sons, 2007
- Smith, I, "Smith's Element of Soil Mechanics", Blackwell, 2006

Also, students may find the Soil Mechanics Book by Prof Verruijt in PDF from:

<http://geo.verruijt.net/software/SoilMechBook2012.pdf>

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, and informal discussions and feedback throughout the term. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

Laboratory Workshop Information

No in-person laboratory classes this Term due to the laboratory refurbishment.

Submission of Assessment Tasks

Please refer to the Moodle page of the course for further guidance on assessment submission.

UNSW has a standard late submission penalty of:

- 5% per day, for all assessments where a penalty applies, capped at five days (120 hours), after which a student cannot submit an assessment, and no permitted variation.

Academic Honesty and Plagiarism

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

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

Academic Information

Final Examinations:

Final exams in T3 2022 will be held online between 25th November - 8th December 2022 inclusive, and supplementary exams between 9th - 13th January 2023 inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

ACADEMIC ADVICE

- Key Staff to Contact for Academic Advice (log in with your zID and password): <https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw>
- [Key UNSW Dates](#) - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.
- CVEN Student Intranet (log in with your zID and password): <https://intranet.civeng.unsw.edu.au/student-intranet>
- Student Life at CVEN, including Student Societies: <https://www.unsw.edu.au/engineering/civil-and-environmental-engineering/student-life>
- Special Consideration: <https://student.unsw.edu.au/special-consideration>
- General and Program-Specific Questions: [The Nucleus: Student Hub](#)
- Book an Academic Advising session: <https://app.acuityscheduling.com/schedule.php?owner=19024765>

Disclaimer

This course outline sets out description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Mike Gal.

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	✓
PE3.2 Effective oral and written communication in professional and lay domains	
PE3.3 Creative, innovative and pro-active demeanour	✓
PE3.4 Professional use and management of information	✓
PE3.5 Orderly management of self, and professional conduct	✓
PE3.6 Effective team membership and team leadership	