School of Civil and Environmental Engineering

Term 3, 2021

CVEN3202
SOIL MECHANICS

COURSE DETAILS

Units of Credit	**6**		
Contact hours	6 hours per week (4 hours lecture and 2 hours workshop)		
Class	Monday	14:00 – 16:00	Online
	Wednesday	16:00 – 18:00	Online
Workshop	Thursday,	16:00 – 18:00	Online; As per your workshop grouping.
	Wednesday,	10:00 – 12:00	
Lab Classes	-		Online
Course Coordinator and Lecturer	Dr. Arman Khoshghalb Office: CE 503, Civil Engineering Building		
	Consultation times: Fridays 12:00 to 14:00 (on Ultra BB)		

HANDBOOK DESCRIPTION

See link to virtual handbook - https://www.handbook.unsw.edu.au/undergraduate/courses/2021/CVEN3202/

OBJECTIVES

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).

TEACHING STRATEGIES

The contents of this subject will be presented in a series of lectures followed by workshops. 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.

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.

An example of the approaches to learning is:

Private Study	• Review lecture materials and textbook • Reflect on class problems and workshop questions • Solve workshop questions • Attempt learning modules on Moodle • Attempt practice questions on Moodle • Try questions from past exam papers available on Moodle • Attempt simulations available on Moodle
Lectures	• Learn main concepts • Observe solution methods • Follow worked examples • Hear announcements about the course
Workshops	• Be guided by Demonstrators • Practice solving workshop questions • Ask questions
Laboratory Work	• Watch all the lab videos carefully

EXPECTED LEARNING OUTCOMES

By the end of the course successful students should:

Learning Outcome	**EA Stage 1 Competencies**
understand the fundamentals of the behaviour of soil as an engineering material,	PE1.1, PE1.2, PE1.3, PE1.5, PE2.3
relate to those aspects of soil behaviour which have a significant environmental impact,	PE1.3, PE1.6, PE3.1
be able to 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
have a sound basis for further formal study and self-study in the geotechnical engineering area,	PE1.1, PE1.4,
be developing a rational approach to problem solving which will lead to the development of design skills.	PE2.1, PE2.3, PE2.4, PE3.4

COURSE PROGRAM

Week 1: Introduction, Phase relationship, Classification of soils
No Laboratory
No Workshop
Release of learning module 1 (phase relationship)

Week 2: Clay mineralogy, Compaction
Laboratory 1 module will be released.
Workshop 1

Week 3: Stress and Mohr circle, Stress in soils
Quiz 1 (week 1 materials)
Workshop 2
Release of learning module 2 (Stress and Mohr circle)

Week 4: Stress in soils (cont.), One-dimensional seepage
(*Public Holiday Labour Day - Monday 4 Oct*)
Laboratory 2 module will be released
Workshop 3
Release of learning module 3 (One-dimensional seepage)

Week 5: Two-dimensional seepage, Consolidation theory
Workshop 4
Release of learning module 4 (Two-dimensional seepage)

Week 6: **No Lecture** (Non-teaching week)
No Workshop

Week 7: Rate of consolidation, Shear strength of soils
Quiz 2 (weeks 2 to 4 materials)
Laboratory 3 module will be released.
Workshop 5
Release of learning module 5 (Rate of consolidation)

Week 8: Shear strength in soils (cont.), Direct shear test
Workshop 6
Release of learning module 6 (Mohr-Coulomb failure criterion)

Week 9: Triaxial test, Stress path technique
Laboratory 4 module will be released.
Workshop 7
Release of learning module 7 (Triaxial test)

Week 10: Slope stability
Quiz 3 (weeks 5 to 8 materials)
Workshops 8 and 9
Release of learning module 8 (Slope stability)

ASSESSMENT OVERVIEW

Assessment will be based on three quizzes and four lab modules during the Term, and a final exam at the end of the Term, as follows:

Item	*Weighting*	*Date*	*Assessment Criteria*
Quizzes	30%		The quizzes will be assessed on the basis of technical accuracy of calculations and evidence of understanding the main concepts taught in the course. All quizzes are in **online format and open book**. Quizzes will be held in the **first half an hour of Wednesday lectures** on weeks 3, 7 and 10 (on those weeks, Wednesday Lectures will be from 16:30 to 18:00).
Quiz 1	10%	Week 3	
Quiz 2	10%	Week 5	
Quiz 3	10%	Week 8	
Lab Modules	10%	During Term	There are four lab modules that need to be completed after you have watched the video of each lab. Each lab module is worth 2.5%. You have two weeks and three attempts to complete each lab module.
Final Exam	60%	Exam period	The final exam will cover the entire course. It will be assessed against the learning outcomes of the course. The final exam is also **open** book.

Note:

1. A mark of **at least 30%** in the final examination is required before other components (quizzes, lab modules and bonus marks) are included in the final mark.
2. Supplementary Examinations for Term 3 2021 will be held on Monday 10 January – Friday 14 January 2022 (inclusive) should you be required to sit one. You are required to be available during these dates. Please do not to make any personal or travel arrangements during this period.

7. Schedule of quizzes:

Quiz	Quiz time	Consultation time before the quiz
Quiz 1	Wednesday **29th September** at 16:05	Wednesday 29th September from 12:00 to 14:00 (online on Ultra BB)
Quiz 2	Wednesday **27th October** at 16:05	Wednesday 27th October from 12:00 to 14:00 (online on Ultra BB)
Quiz 3	Wednesday **17th November** at 16:05	Wednesday 17th November from 12:00 to 14:00 (online on Ultra BB)

RELEVANT 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

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

https://my.unsw.edu.au/student/resources/KeyDates.html

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 ADVICE

(Formerly known as Common School Information)

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations: student.unsw.edu.au/special-consideration
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.

Refer to Academic Advice on the School website available at:

https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex 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
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (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