School of Civil and Environmental Engineering

Term 3, 2020

CVEN9525 FUNDAMENTALS OF GEOMECHANICS

COURSE DETAILS

Units of Credit	6	
Contact hours	35 hours per week	
Lecture	Tuesdays,	17:00 – 21:00

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office: CE 507, Civil Engineering Building
Consultation times: Wednesdays from 9 to 11:00

INFORMATION ABOUT THE COURSE

This is an introductory course to fundamentals of soil mechanics, designed for geologist. It covers the most important topics in soil mechanics; the basic classification of soil, phase relationships, the principle of effective stress and its importance in soil mechanics and geotechnical engineering, how water flows through soil and the equations governing the one-dimensional and two-dimensional flow of water in soil. It also covers the behaviour of soil under imposed loads, in particular the time-dependent behaviour of clay, the shearing strength of soil, failure criteria, and Mohr-Coulomb failure criterion.

There is no pre- or co-requisite to this course; students are expected to have a good understanding of the fundamentals of geology.

HANDBOOK DESCRIPTION

This is a Professional Development Course. Fundamentals of Geomechanics for geologists and other professionals who wish to work in geotechnical engineering, engineering geology, and environmental engineering. Classification of soil, phase relationships, flow of water in soil, the principle of effective stress, consolidation theory, stress distribution and settlement, Mohr Circle, failure criteria, stress paths and strength of soils and lateral earth pressures.

OBJECTIVES

To introduce students to the state of the fundamentals of soil mechanics and the important concepts of soil behaviour.

By the end of the course successful students should:

- understand the fundamentals of the behaviour of soil as an engineering material,
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- be able to solve a range of soil related problems especially those involving water flow, soil settlement and soil strength,
- have a sound basis for further formal study and self-study in the geotechnical area,
- be developing a rational approach to problem solving which will lead to the development of design skills.

TEACHING STRATEGIES

The contents of this subject will be presented in a series of lectures followed by workshop questions. 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. The class meets in two sessions every day, each session include a lecture followed by problem solving workshop session.

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. A series of assignments will be given so that students can examine their understanding of the theories. Students are advised to tackle some of the assignments during the two days break between the lectures and reflect on their learning. 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 and assignment problems, and generally study the concepts taught in a soil mechanics book.

An example of the approaches to learning is:

Private Study

- Review lecture material and textbook
- Do set problems and assignments
- Join Moodle discussions of problems
- Reflect on class problems and assignments booaj¥E

2.		PE1.1, PE1.2
3.		PE1.1, PE1.3
4.		PE1.1, PE1.6
5.		PE1.3, PE2.3

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

COURSE PROGRAM

A table of lectures and workshops or practical class topics for each week, indicating the name of lecturer involved (where multiple lecturers teaching in course), online activities, such as discussion forums, and relevant readings from textbook and other reference material identified for the course.

Term 3 2020

Date	Topic	Lecture Content	Demonstration Content
14/09/2020 (Week 1)	Introduction & Phase relationships	Introduction & Phase relationships	
21/09/2020 (Week 2)	Classification/ Compaction	Classification/ Compaction	WORKSHOP 1
28/09/2020 (Week 3)	Compaction / Stress and Mohr circle	Compaction / Stress and Mohr circle	WORKSHOP 2
06/10/2020 (Week 4)	Stresses in Soil	Stresses in Soil	WORKSHOP 3
12/10/2020 (Week 5)	One-D seepage	One-D Seepage	**Quiz 1**
19/10/2020 (Week 6)		***Flexibility week for all courses (non-teaching)***	WORKSHOP 4
26/10/2020 (Week 7)	Two-D seepage	Two-D Seepage	WORKSHOP 5
02/11/2020 (Week 8)	One-D Settlement	One-D Settlement	WORKSHOP 6
09/11/2020 (Week 9)	Rate of Settlement	Rate of Settlement	WORKSHOP 7
16/11/2020 (Week 10)	Shear Strength of Soils	Shear Strength of Soils	**Quiz 2**

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Assignments	40%	#1due: 02/10/2020 #2due: 06/11/2020 #3due: 23/11/2020	phase relationships, soil classification, stress in soil

RELEVANT RESOURCES

Learning will be greatly enhanced by reading a text book on the topic. Also, people working in industry where geomechanics is used are recommended to buy a text book to add to their own library. There are many books published on the topic, and the main UNSW library has dozens.

One of the best text books, 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