



CVEN9525 FUNDAMENTALS OF GEOMECHANICS

Semester 1, 2016

Never Stand Still

Faculty of Engineering

School of Civil and Environmental Engineering

COURSE DETAILS

Units of Credit	6
Contact hours	35 hours per week
Class	Day 1, Wednesday 2 nd March 9:00 – 17:00 Old Main Building G31 (K-K15-G31)
(Lectures and tutorials)	Day 2, Thursday 3 rd March 9:00 – 17:00 Old Main Building G31 (K-K15-G31)
	Day 3, Friday 4 th March 9:00 – 17:00 Old Main Building G31 (K-K15-G31)
	Day 4, Monday 7 th March 9:00 – 17:00 Old Main Building G31 (K-K15-G31)
	Day 5, Tuesday 8 th March 9:00 – 17:00 Law 101 (K-F8-101)
Course Coordinator and Lecturer	Dr. Arman Khoshghalb email: Arman.khoshghalb@unsw.edu.au office: CE 503, Civil Engineering Building

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,
- relate to those aspects of soil behaviour which have a significant environmental impact,
- 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 tutorials. 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 tutorial classes. The class meets in two sessions every day, each session include a lecture followed by problem solving and tutorial.

In order to understand different soil mechanics topics well, it is essential for students to attend the tutorial classes and solve the tutorial 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 tutorial and assignment problems, and generally study the concepts taught in a soil mechanics book.

An example of the approaches to learning is:

Lectures	<ul style="list-style-type: none">• Find out what you must learn• Follow worked examples• Observe solution methods
Tutorials	<ul style="list-style-type: none">• Be guided by tutors• Practice solving set problems• Ask questions
Private Study	<ul style="list-style-type: none">• Review lecture material and textbook• Do set problems and assignments• Reflect on class problems and assignments
Assessments (examinations and assignments)	<ul style="list-style-type: none">• Demonstrate your knowledge and skills• Demonstrate higher understanding and problem solving

ASSESSMENT

Assessment will be based on assignments and a final exam.

Assignments: 35% **due on Friday 27 May 2016, 5:00 pm**

Final Exam: 65% (open book)

Assignments: The solutions to the assignments should be done in a work book, like an exercise book. The work book must be well organised and clear to follow. Your solutions must be neat and clearly legible. Your work book should be handed in before the due date mentioned above. Late submission will be penalised at the rate 10% per day after the due date.

Final Exam: The written final exam is held in the formal exam period and normally consists of 6 to 8 questions of different topics. The exam is an open book exam; students may bring any aid to the examination. The formal exam scripts will not be returned. The Coordinator or Lecturer reserves the right to adjust the final scores by scaling if agreed to by the Head of School.

In order to pass the subject, students must receive 40% or more in the final examination **and** receive an overall total of 50% marks or more for the subject.

Notes:

- Exam scripts will not be returned.
- A mark of at least 40% in the final examination is required before the class work is included in the final mark.
- Assignments should be either handed to the lecturer personally, or dropped into the assignment box of the lecturer (located on level 5 of the Civil Engineering Building). They may also be posted by express mail to the lecturer (a copy must be retained by the student). Email and fax submissions will not be accepted. If a self

addressed envelope is included with the assignment then the marked assignment will be returned to the student.

- Late work may not be accepted or assessed. If you have a good reason for being unable to submit your work on time, it is important that you let your course coordinator know promptly. There are two kinds of provisions made for students who have good reasons for late submission, as detailed in the next two points.
 - Students who are late with assignments may apply to the subject coordinator for an extension. You must apply for an extension before the due date. Extensions may be refused if you do not present documented medical or other evidence of illness or misadventure. An extension is only for a short period, usually no more than a week.
 - Where a longer period is needed, you should apply for Special Consideration. You must make a formal application as soon as practicable after the problem occurs and within three working days of the assessment to which it refers. The application must be made on the 'Request for Consideration' form available from NewSouth Q. The completed application form must be submitted to NewSouth Q.

COURSE PROGRAM

Table below shows the course program.

Day	Morning (9:00 am-12:30 pm)	Afternoon (1:30 pm-5:00 pm)
Day 1 Wednesday	Introduction to Soil Mechanics, Phase relationships	Compaction, Classification of soils, USCS Classification system
Day 2 Thursday	Stress and Mohr circle, Stress in soils, Effective stress concept, Stress distribution	One-dimensional seepage, Darcy's law, Soil permeability
Day 3 Friday	Two-dimensional seepage, Flow nets, Pore water pressure, Uplift forces	One-dimensional settlement of soil deposits, Normally consolidated and overconsolidated soils
Saturday		
Sunday		
Day 4 Monday	Consolidation theory, Rate of settlement	Shear strength of soils, Mohr Coulomb failure criterion, Direct shear test
Day 5 Tuesday	Shear strength of soils (cont.), Triaxial test, drained and undrained tests	Slope stability, infinite slopes, Graphical Methods

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 found in the UNSW library:

- Craig, R. F. "Soil Mechanics", CRC press, 2004
- Das, B. M., "Principles of Geotechnical Engineering", PWS publishing, 1998-2006
- Lambe and Whitman, "Soil Mechanics", Wiley, 1975
- Scott, C., "An Introduction to Soil Mechanics and Foundation Engineering", AS Publisher, 1980
- Budhu, M., "Soil Mechanics and Foundations", Wiley & Sons, 2007
- Smith, I, "Smith's Element of Soil Mechanics", Blackwell, 2006

Also, students may find the following Soil Mechanics Book in PDF (5.5MB) in a table under the "software" section" from <<http://geo.verruijt.net/>> website, as SoilMechBook.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

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations,
- 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:

<http://www.engineering.unsw.edu.au/civil-engineering/resources/academic-advice>