COURSE DETAILS

Units of Credit: 6
Contact hours: 35 hours
Classes (lectures and tutorials): Short Course, 2-4 April and 7-8 May, 9:00 – 17:00 Room 109, Civil Engineering Building
Course Coordinator and Lecturer: Dr Hossein Taiebat
e-mail: h.taiebat@unsw.edu.au
office: CE 501d, Civil Engineering Building
phone: 9385 5942

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

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 AND EXPECTED LEARNING OUTCOMES

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 weekend 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:

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Tutorials</th>
<th>Private Study</th>
<th>Assessments (examinations and assignments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Find out what you must learn</td>
<td>• Be guided by tutors</td>
<td>• Review lecture material and textbook</td>
<td>• Demonstrate your knowledge and skills</td>
</tr>
<tr>
<td>• Follow worked examples</td>
<td>• Practice solving set problems</td>
<td>• Do set problems and assignments</td>
<td>• Demonstrate higher understanding and problem solving</td>
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</tbody>
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**ASSESSMENT**

Assessment will be based on assignments and final exam.

- **Assignments:** 30%
- **Final Exam:** 70% (open book)

Assignments: The solutions to the assignments will be done in a work book, like an exercise book. The first page of the book should be reserved for a list of the assignments and the question number. Your answer to the question should be written on this list. Your work book should be handed in, in Week 10, Tuesday 20 May. 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 too 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.

**COURSE PROGRAM**

Table below shows the course program.

<table>
<thead>
<tr>
<th>Day</th>
<th>Morning (9:00-12:30)</th>
<th>Afternoon (1:30-5:00)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday, 2/04</td>
<td>Introduction to Soil Mechanics, nature of soil, phase relationships.</td>
<td>Classification of soil, soil grading plasticity, USCS classification system.</td>
</tr>
<tr>
<td>Thursday, 3/04</td>
<td>Stresses in a dry soil, geostatic stresses, Mohr circle.</td>
<td>Water in soil, pore pressures, effective stress principle.</td>
</tr>
<tr>
<td>Friday, 4/04</td>
<td>One-dimensional seepage, Darcy's law, soil permeability.</td>
<td>Two-dimensional seepage, flow nets, pore pressure, uplift forces.</td>
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<tr>
<td>Saturday, 5/04</td>
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<tr>
<td>Sunday, 6/04</td>
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<td></td>
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<tr>
<td>Monday, 7/04</td>
<td>Settlement of soil deposits, normally and over-consolidated soils.</td>
<td>Consolidation theory, rate of settlement.</td>
</tr>
<tr>
<td>Tuesday, 8/04</td>
<td>Introduction to shear strength, Mohr Coulomb failure law. Shear strength of cohesionless soils, direct shear testing.</td>
<td>Shear strength of cohesive soils, triaxial testing, drained and undrained strength.</td>
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</table>
RELEVANT RESOURCES

No textbooks are required as the topics covered in this course can be found in many standard soil mechanics texts. The following reference books may be useful for additional reading, many of them can be found in the UNSW library


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

COMMON SCHOOL INFORMATION

Common School information may be found at:


To navigate to this website from the Civil and Environmental Engineering School Home page:

-> Current Students -> General Information -> Common School Info for Undergraduate Students

The Common School Information site has information on the following:

1. Dates to Note - important dates relating to enrolling and disenrolling, and a University website (via MyUNSW) with a calendar of other important UNSW dates (session dates, recess weeks, stuvac dates and exam periods).

2. School Contacts
   i. for enrolment or timetable difficulties,
   ii. referral chain of contacts for course difficulties:
   iii. Course Coordinator/Lecturer -> Year Coordinators -> Grievance Officer,
   iv. Advanced Standing, and
   v. Mentoring.

3. Course Requirements
   i. attendance at lectures, tutorials and laboratory classes,
   ii. participation in tutorials, and
   iii. completion of assessment work.

4. Notes on Assessment
   i. plagiarism (with link to UNSW Learning Centre web site on plagiarism),
   ii. keep a copy of written submissions,
   iii. submitting assignments, and
   iv. late submissions (obtaining extensions and special consideration)

5. Supplementary Exams – includes link to School website with School policy on supplementary exams.
   i. Special Consideration – includes link to UNSW website (New South Q) for downloading forms, requirements for lodging special consideration forms.

6. Solutions to Problems – Troubleshooters
   i. Learning Centre,
   iii. student counsellors, and
   iv. student support services.

7. CEVSOC – student committee membership and link to (unofficial) student CEVSOC website.