土壤力學 SOIL MECHANICS

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Textbook:	Das, B.M. and Sobhan, K., Principles of Geotechnical Engineering, 9th ed., Thomson, 2016; ISBN: 978-1-133-10867-2	
Reference	Holtz, R.D., Kovacs, W.D., Sheahan, T.C., An Introduction to Geotechnical Engineering, 2nd ed., Pearson, 2010; ISBN: 978-0-13-249634-6	

COURSE MATERIAL

Additional course material and reading assignments and will be posted in CEIBA. The documents will be posted in electronic version. The contents will be updated frequently, so you should check periodically for new materials.

COURSE DESCRIPTION

Soil mechanics is a fundamental course for civil engineering students to understand the general physical and mechanical behavior of soils. The objectives of this course are: (1) to introduce the subject of soil mechanics to civil engineering students; (2) to introduce the basic physical and engineering properties of soil to students; (3) to teach students how to solve certain fundamental problems related to soil classification, permeability, consolidation, shear strength; (4) to familiarize students with relevant terms and soil tests so that they can work effectively with specialists in geotechnical engineering; and (5) to provide those students who will go on to take more geotechnical relevant courses with the background needed for further study.

In this course, you will learn what soils are, how they are derived, and how they are identified and classified for engineering purpose. You will also learn the principles that govern flow of water in soils, deformation and shear strength of soils. We will discuss actual field problems during the semester and show you how the concepts that are taught in class can be applied to understand and solve real engineering problems.

LABORATORY EXERCISES

The corresponding laboratory exercises are required in this semester.

HOMEWORK ASSIGNMENTS

Homework problems will be assigned on a regular basis. Assignments will be distributed on class and can be downloaded from CEIBA. Completed assignments are due at the beginning of class on the date specified; late submission of assignments will be subtracted 2 points off for each day.

Homework is intended principally as a means of helping you to learn and understand the course material, rather than as a means of assigning points which directly determine your final grade. The assignments also are aimed at developing your engineering skills. As much as possible, your assignments will reflect real-world engineering practice where one must work with limited data, deal with uncertainty over site conditions, and compile engineering recommendations.

Students may consult with each other about homework assignments. However, each student is responsible for preparing their own homework and displaying their understanding of the principles behind the homework solution.

You will quickly learn after college that most practicing engineers spend more time and effort communicating their ideas, analyses, and results than they do performing technical calculations. To encourage the development of these vital professional skills, your homework assignments may require a written response, and not just a simple numerical answer. Prepare your homework in a professional manner and show all steps and all calculations. Data plots and other figures must be generated with a computer following the format of figures in ASCE Journal of Geotechnical and Geoenvironmental Engineering. Provide labels and make sure that plots are to scale. Any homework which is sloppy or difficult to understand will be returned without grades. Follows are several tips for writing your assignment.

- Write your name and school ID number
- Work neatly, do not crowd your work.
- Sketch and label with given data as appropriate
- State any assumption you make
- Work vertically, do not string equations horizontally
- Show all major steps in your calculations or reasoning, so it is clear how you proceed
- Box the final answer and be sure to give proper units
- Do not tear pages out of books or manuals. If a problem involves completing a figure, photocopy the figure and attach it onto your solution sheets.

EXAMINATIONS

There are two midterm exams and one final exam. Exams will consist of a mixture between discussion and technical questions to evaluate your comprehension of the material. Formula sheets, design charts and similar materials will be given on the exams when needed. In addition, you should bring a straight edge and calculator to the exams.

Also as engineers, you should inherently be neat and organized. You should certainly strive for neat work because you will probably have to return to design calculations at a variety of times in your careers and if you cannot figure out your own work you could be in severe difficulty. On exams, I will not give credit for answers I cannot read and will not change grading based on subsequent verbal explanations. It is your responsibility to communicate effectively with me on exams.

COURSE GRADE DISTRIBUTION

Participation in in-class discussions	10%
Homework (Around 9 times)	20%
First Midterm Exam	20%
Second Midterm Exam	20%
Final Exam	30%
Total	100%

*The final grade will be failed if absences from class are over 5 times without justifiable reasons

FINAL COMMENT

Good luck to all of you in this course. This course is not intended simply to throw information at you. You will be expected to read and think about material outside class, and to take part actively in class discussions. These discussions will enhance the learning process, allow sharing of experiences, and hopefully make this course more interesting. Do not hesitate to ask questions in class, or if necessary, to see your instructor outside of class. Regularly after class discussion is expected. Please do not be afraid of your teacher, I am here to help you. I want to be your friend. Any specific comments that students have on how the course might be improved are particularly welcomed.

ACADEMIC HONESTY

The engineering profession does not need, and should not tolerate, dishonesty. All students of the National Taiwan University are responsible for knowing and adhering to the academic integrity policy (honor code) of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Student Affair Council of the Department of Civil Engineering. Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion).

COURSE OUTLINE

Topics	Book Chapter
1. Introduction (1wk)	
• Introduction of soil mechanics and geotechnical engineering	
• Origin of soil and clay minerals	2.2, 2.5
2. Soil Index Properties and Classification (2wks)	
• Weight-volume relationships	3.1-3.7
• Mechanical analysis of soil	2.4, 2.6-2.8
• Atterberg limit test	4.1-4.7
• Soil classification	5.1-5.6
• Site investigation and in-situ tests	17.1-17.7
3. Permeability (2wks)	
• Bernoulli's equation and Darcy's law	7.1-7.3
• Hydraulic conductivity	7.4-7.5,7.8-7.9
• Seepage and flow net	8.1-8.6, 8.8
4. In Situ Stresses (2wks)	
• Soil total and effective stress	9.1-9.2
• Stress under seepage conditions	9.3-9.5
• Stress induced by surcharge	10.4, 10-10-10.12
5. Compressibility of Soil (3wks)	
• Consolidation theory and test	11.1-11.2, 11.4-11.5
• Void ratio-effective pressure plots	11.6-11.8
• Primary and secondary consolidation settlement	11.10, 11.13
• Time-rate of consolidation	11.14-11.5, 11.18
6. Stresses in A Soil Mass (2wks)	
• Normal and shear stresses on a plane	10.1-10.2
• Mohr circle and diagram	10.2
• The pole method	10.3
7. Soil Shear Strength (3wks)	
• Mohr-Coulomb failure criterion	12.1-12.3
• Discussion on soil drained and undrained conditions	
• Direct shear test	12.4-12.7
• Triaxial test and Skempton's pore water pressure parameters	12.8-12.12
8. Lateral Earth Pressure (1wk)	
• Introduction of earth retaining structures	13.1
• At-rest, active and passive earth pressures	13.2-13.3,13.5-13.6
9. Compaction (1wk)	
• Compaction proctor test	6.1-6.7
• Influence of compaction on soil properties	6.8
• Field evaluation	6.9-6.11
10. Slope Stability (1wk, if time permits)	
• Factor of Safety	15.1-15.2
• Stability of infinite slopes	15.3-15.4
• Analysis of finite slopes with circular failure surfaces	15.5-15.10

Example of Formal Format for Presenting Table and Figure

Table 2. Characteristics of Centrifuge Geotextile-Reinforced Slope Models

	Model B18	Model B12	Model D12	Model S9
Number of reinforcement layers	18	12	12	9
Vertical spacing (mm)	12.70	19.05	19.05	25.40
Reinforcement type	weak	weak	weak	strong
Reinforcement tensile strength (kN/m)	0.123	0.123	0.123	0.183
Relative density of sand (%)	55	55	75	55
Sand peak friction angle	35°	35°	37.5°	35°
g level at failure (N_f)	76.5	60	66	52.5
Elapsed time until failure (min)	53	43	60	39
Failure type	catastrophic	catastrophic	catastrophic	progressive

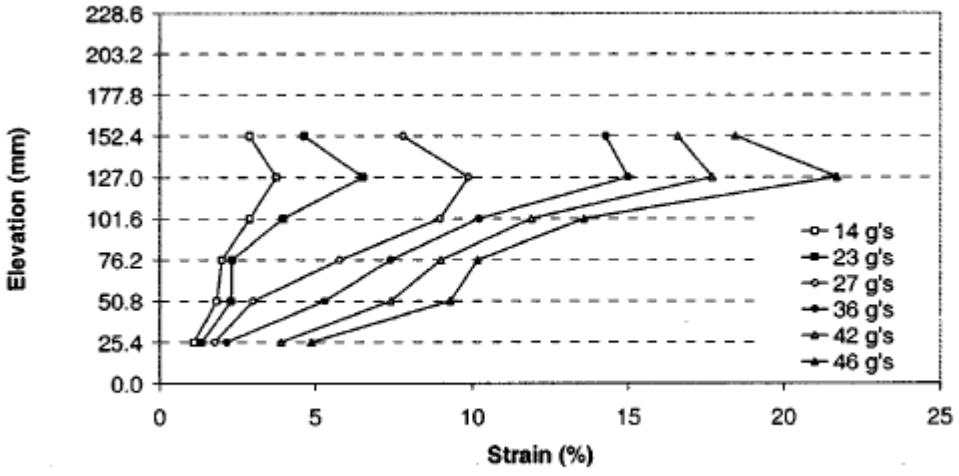

Fig. 10. Reinforcement peak strain distribution: Model S9

EXAMPLE OF FORMAL FORMAT FOR WRITING EMAIL