基礎工程 FOUNDAITON ENGINEERING

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Textbook:	B.M. Das, Principles of Foundation Engineering, 8th ed, Thomson, ISBN: 978049566812	
Reference	D. P. Coduto, Foundation Design: Principles and Practices, 3rd ed, Prentice Hall, ISBN: 0135897068 內政部營建署編輯委員會，建築物基礎構造設計規範，內政部營建署營建雜誌, ISBN:8013240436	

COURSE MATERIAL

Reading assignments and additional course material 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

Foundation engineering is a core course for civil engineering students and an important and challenging subject for engineering practices. The objective of this course is to introduce the failure modes, load transfer mechanism and design methods of shallow foundations, mat foundations, retaining structures, deep excavations and pile foundations. The detail of each subject will be covered in the relevant graduate courses.

This class will first start with a review of basic soil mechanics that we discussed in last semester. Methods of site investigation to obtain soil samples and in-situ soil properties will be discussed. Afterward, the analytical methods and design considerations of aforementioned subjects will be introduced. In this course, you will learn how to plan a site investigation, how to classify and characterize soils for foundation design, how to estimate the capacity of foundations, and how to estimate the settlement of the soil under the foundation load. We will discuss actual field problems and show you how the concepts that are taught in class can be applied to solve real engineering problems. Our goal is to help students to develop their engineering judgments and a proper attitude for practical work. Successful learning of this course involves an appropriate blend of understanding of material properties, analytical methods, and practical observations.

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.

FIELD TRIP

A field trip to a foundation construction site will be arranged at the end of semester. Students required to prepare a summary report after the trip. The format of the summary report is as Font: Times New Roman; Size: 12; Paragraph: Single; Length: Maximum 10 pages.

The following information is suggested to be included:

- ❑ Site location and subsurface conditions (soil and groundwater)
- ❑ Special problems and challenging in this project
- ❑ Description of foundation type and construction method
- ❑ In-situ or laboratory soil tests and input soil properties
- ❑ Design method and stability analyses
- ❑ In-situ Monitoring
- ❑ Discussion on alternative foundation types
- ❑ Cost-effect analysis
- ❑ Your observation and lessons learned from field trip

EXAMINATIONS

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 7 times)	20%
First Midterm Exam	20%
Second Midterm Exam	20%
Final Exam	20%
Field Trip Report	10%
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 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 Honor Code (Student Affair) Council. 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 foundation engineering	1
• Review of soil mechanics	2.12, 2.17-2.20
2. Site Investigation and Monitoring (2wk)	
• Site investigation, boring, and sampling	3.11-3.14
• In situ test (SPT, CPT and vane shear test)	3.15-3.18, 3.20-3.21
• Site investigation and monitoring in practice	業界教師陳建勝先生講授
3. Shallow Foundation (3wks)	
• Types of shallow foundation	4.1-4.2
• Terzaghi's bearing capacity theory	4.3-4.4
• General bearing capacity theory	4.6-4.7
• Effect of water, eccentrically loads and layered soil	4.5, 4.10-4.11
• Stress increase by foundation load	6.1-6.9
• Elastic settlement of shallow foundations	7.1-7.4
4. Mat Foundation (1wks)	
• Types of mat foundations	8.1-8.3
• Concept of compensated foundation	8.7
• Bearing capacity of mat foundation	8.4
5. Retaining Structure (3wks)	
• Types of retaining structures	13.1
• Earth pressure theory	12.1-12.5,12.10-12.11
• Stability analyses of retaining walls	13.2-13.7
6. Geosynthetics-Special Topic (1wks)	
• Applications of geosynthetics	
• Geosynthetics-reinforced soil structures	13.10-13.12, 13.15-13.17
7. Sheet Pile Walls (1wks)	
• Introduction of sheet pile walls	14.1-14.3
• Earth pressure distribution	14.4
8. Deep Excavation (**Braced Cuts**) (2wk)	
• Introduction of deep excavations	15.1-15.2
• Peck's earth pressure envelope and strut load design	15.3-15.5
• Stability analyses of deep excavation	15.7-15.8
• Deep excavation in practice	業界教師林永光先生講授
9. Pile Foundation (3wk)	
• Introduction of pile foundations	9.1-9.2, 9.5, 10.1-10.4
• Load transfer mechanism	9.6, 10.5
• Pile load tests	9.16
• Pile axial capacity	9.7-9.13, 10.6-10.9
10. Slope Stability (1wk, if time permits)	Soil mechanics textbook
• Introduction of slope stability	15.1-15.2
• Infinite slope	15.3
• Finite slope with circular surface	15.5, 15.7,15.11-15.12

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

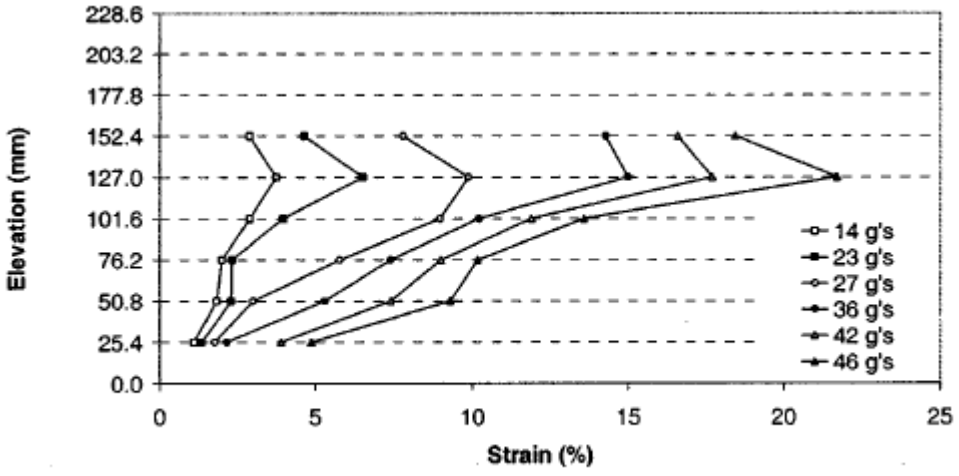

Fig. 10. Reinforcement peak strain distribution: Model S9

EXAMPLE OF FORMAL FORMAT FOR WRITING EMAIL