53:139 FOUNDATIONS OF STRUCTURES
Department of Civil & Environmental Engineering
College of Engineering
The University of Iowa
Fall Semester, 2013

Instructor

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Text

Principles of Foundation Engineering, 7th Ed.
Braja M. Das
CENGAGE Learning, 2011.
ISBN-13: 978-0-495-66812-1
ISBN-10: 0-495-688-12-5

Reference Texts (on reserve in Engineering Library)

1. *Foundations and Earth Retaining Structures,* M. Budhi, John Wiley, 2008.
2. *The Engineering of Foundations* R. Salgado, McGraw-Hill, 2008.
3. Principles of Geotechnical Engineering, 8th ed. B.M. Das and K. Sobhan; 2014 (earlier editions also acceptable).
4. *Soil Strength and Slope Stability*, J.M. Duncan and S.G. Wright, John Wiley, 2005.
5. *Practical Foundation Engineering Handbook, 2nd*. Ed., R.W. Brown, McGraw-Hill, 2001.

Course Grading

Homework Assignments (10)	30%
In-class participation & quizzes	5%
Semester Project	30%
Exams (midterm and final)	35%
Total	**100%**

Course Learning Objectives:

In this course, you will learn a considerable amount on the following topics:

1. Soil and structural mechanics in the context of analyzing structural foundations and retaining structures.
2. Which soil properties are important in geotechnics and how to measure/estimate them.
3. The different types of structural foundations, when each is used, and how to design them so that they have adequate capacity, and so that they do not undergo too much settlement.
4. How to analyze and design different types of earth retaining structures and their relative advantages and disadvantages.
5. Common failure mechanisms and scale effects that occur in geotechnical engineering.
6. Integrate physical understanding with accepted analysis and design techniques.

Course Schedule:

Period #	Date	Topic	Reading
1	08/20	Phase Relations; Soil Types; Hydraulic conductivity;	Chapter 1
2	08/22	Effective stress concept; Soil compressibility behavior;	
3	08/24	Consolidation modeling; shear strength models for soils;	
4	08/27	Drained and undrained shear strength behaviors	Chapter 1
5	08/29	Infinite Slope Stability Analysis	Reference Material
6	08/31	Planar Failure Mechanisms	
*	09/03	Labor Day, No Class	
7	09/05	Circular Slope Failure Mechanisms	Reference Material
8	09/07	Slope Stability Analysis with Methods of Slices	
9	09/10	Slope Stability Analysis with Software, FEM	
10	09/12	Subsurface Explorations; Costs, Depths	Chapter 2
11	09/14	Methods for obtaining specific soil parameters	
12	09/17	Seismic methods	
13	09/19	Shallow Foundations, Bearing Failure Mechanisms	Chapter 3
14	09/21	Terzaghi's Model for Bearing Capacity	
15	09/24	General Bearing Capacity Equations & Examples	Chapter 3
16	09/26	Sizing of Foundations;	
17	09/28	Eccentric Loads	
18	10/01	Elastic Settlement of Shallow Foundations;	Chapter 5
19	10/03	Temporal Settlement Effects on Clays and Sands;	
20	10/05	Scale Effects in Settlements	
21	10/08	Mat Foundations and Compensation;	Chapter 6
22	10/10	Rigid/Flexible Assumptions;	
23	10/12	Rigid & Flexible Methods of Analysis/Design	
24	10/15	Lateral Earth Pressures;	Chapter 7
25	10/17	Models for Rankine's Active/Passive Earth Pressures	
26	10/19	Coulomb's Active/Passive Earth Pressures Stability	
27	10/22	Checks on Gravity & Cantilever Walls	Chapter 8
28	10/24	Reinforced Earth Structures, Analysis and Design;	
29	10/26	Practical considerations.	
30	10/29	Usage & Construction of Sheetpile Walls;	Chapter 9
31	10/31	Earth Pressure Assumptions & Equilibrium	
32	11/02	Stability Analysis w/ and w/o Anchors	
33	11/05	Overview of Deep Foundations;	Chapter 11
34	11/07	Models for End Bearing Capacity;	
35	11/09	Models for Skin Friction Capacity;	
36	11/12	Full Scale Field Testing of Piles;	
37	11/14	Pile Driving Formulae;	
38	11/16	Group Effects and Pile Caps;	
39	11/26	Settlements of Piles;	
40	11/28	Models for Lateral Deflections	
41	11/30	Models for Lateral Capacity	
42	12/03	Project Presentations I	
43	12/05	Project Presentations II	
44	12/07	Project Presentations III	
Final Exam	TBA	2-hour Final Exam (date, time, location TBA)	

Homework Expectations

- All regular homework assignments must be submitted on engineering paper or unlined plain paper.
- Since the processes by which you solve a problem and obtain an answer are as important as your final answer, **neatly** show the major steps in each problem so your logic and reasoning can be followed.
- Pay attention to usage of significant figures in your final answers. Reporting of answers with excessive significant figures will be penalized.
- Late assignments will generally not be accepted unless cleared before the due date.
- If you cannot solve any of the homework problems, it is better to submit the incomplete problem with questions than to copy and submit the work of peers or bootleg copies of the homework solutions (see Academic Misconduct Policy below).
- If you use software such as Mathematica to perform your assignments, you must insert explanatory comments so that your process can be understood and the final answers with appropriate units and significant figures are clearly identified.

Class Attendance Policy

- Class attendance and participation in lectures improves overall course performance. Therefore come to class regularly and participate if you wish to do well.
- However, whenever you are ill with flu-like symptoms, please stay home until 24 hours after your fever has ended. If you miss class and submission of an assignment due to flu-like illness, notify the instructor about this and no penalty will be assessed.

Accommodations:

- Students with disabilities are encouraged to meet privately with the instructor to discuss course adaptations or accommodations.

Expected Course Outcomes: At the conclusion of this course, you should be able to:

1. Recognize which mechanical soil properties are important for a specific undertaking, and how to measure or estimate those properties;
2. Perform stability analysis of earthen slopes using methods of slices;
3. Size shallow spread footings and calculate their ultimate capacity and settlement history under specified loads;
4. Analyze and design mat foundation systems;
5. Successfully design a variety of types of earth retaining structures;
6. Design deep foundation systems for structures based on piles or drilled shafts.

Academic Misconduct Policy:

- Submitting work that is not your own is considered academic misconduct. While collaboration on homework assignments is acceptable, blatant copying, either of classmates' work or bootleg copies of homework solutions is not. If this is detected on assignments, you will receive zero credit on those assignments.
- Cheating of any form on exams is an especially serious form of academic misconduct and will result in a failing course grade of F.