

Foundation Engineering

Prof. Mesut Pervizpour

Course URL:

<http://parameterid.com/>

Textbook:

Principles of Foundation Engineering, B.M. Das, Thomson, 7th Edition

References:

Foundation Analysis and Design, Bowles

Foundations and Earth Retaining Structures, Budhu

The Engineering of Foundations, Salgado

Foundation Engineering Handbook, Fang

Tentative Grading:

(± will be used)

Mid-term test average (2)	40%
Homework/Quizzes/Design	20%
Final Examination	40%
Total:	100%

GENERAL CONDUCT OF COURSE

1. During the semester, 2 one-hour tests will be given. The student **MUST** take both tests. Basically **NO** make-ups are granted unless absence from a test is justified with proper documentation. All tests will be based on the material covered up to the date of test. Unless otherwise instructed, closed-book tests should be expected. Students are expected to obtain 50% or higher in final exam to pass the course. Any grade review you see justified should be brought to my attention within the first week of receiving the grade.
2. Homework will be assigned and specified either as “*suggested*” or “*to be collected*” at that time. There will be in class unannounced quizzes. A design problem will be assigned where individual analysis and work will be submitted in a report format.
3. It has been my experience in the past that when students study in groups, and communicate and share resources, they seem to perform better. Obviously, this is a generalization and I am sure there are many exceptions. However, please keep this in mind and take advantage of study groups whenever you can, but remember that your submitted work should be original in representing your understanding and efforts in the course.
4. Accommodations for Students with Disabilities: If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, University Center C212 (610 758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services Office before accommodations can be granted.

COURSE DESCRIPTION

Application of theories and principles of soil mechanics to geotechnical and structural foundation design. In-situ soil testing, subsurface exploration and soil sampling. Bearing capacity, settlement, lateral earth pressure principles. Design of shallow foundations: spread footings, beams on elastic foundations, mat foundations. Introduction to retaining walls: mechanically stabilized earth, concrete and sheet pile walls, walls for excavations. Design of deep foundations: single piles, pile foundations, drilled piers and caissons.

COURSE LEARNING OUTCOMES

Upon successful completion of this course, students will be able to:

1. Obtain soil properties from various field test methods.
2. Calculate necessary bearing pressure and bearing capacity of the ground to carry column loads safely.
3. Develop complete footing design including settlement calculations, and reinforced concrete design for individual and combined footings.
4. Calculate lateral earth pressure behind rigid walls using Rankine, Coulomb, and Cullman methods.
5. Carryout design of rigid retaining walls including reinforced concrete component.
6. Carryout design of flexible retaining structures such as sheet piles, anchored sheet piles, braced cuts and MSE walls.

PROGRAM OUTCOMES

The course supports several outcomes within the Civil Engineering program:

1. An ability to apply the fundamental knowledge of mathematics, science & engineering, as well as the ability to use the techniques, skills, & modern engineering tools to solve civil eng. problems in practice (ABET-a).
2. An ability to identify, formulate & solve civil engineering problems in various civil engineering disciplines (ABET-e).
3. The ability to design a civil engineering system, component, or process to meet the requirements of safety, cost, quality, and performance (ABET-c).
4. A solid understanding of professional and ethical responsibility and recognition of the need for and ability to engage in life-long learning (ABET-f, i).
5. An understanding of professional practice issues, and knowledge of contemporary issues that relate to civil engineering practice (ABET-j).

COURSE OUTLINE

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| A. | <i>Introduction to Foundation Engineering and Performance Requirements</i> | 1 Lecture |
| | 1. Foundation Engineering and Building Codes | |
| | 2. Design and Load Requirements | |
| B. | <i>Soil Mechanics Review</i> | 1 Lecture |
| C. | <i>Site Exploration and Characterization</i> | 4 Lectures |
| | 1. Destructive Methods (Lab and field testing) | |
| | 2. Non-destructive Methods (not covered) | |
| D. | <i>Shallow Foundations and Spread Footings</i> | 7 Lectures |
| | 1. Geotechnical | |
| | a. Bearing Capacity | |
| | b. Settlement | |
| | 2. Structural | |
| | a. Reinforced concrete concepts: One-way and Two-way shear, flexure, development lengths, dowels, and load transfer | |
| | b. Design of: Square, continuous, rectangular footings, and connection to superstructure | |
| | c. Combined Footings | |
| | d. Introduction to Mat design | |
| | 3. Introduction to LRFD in Geotechnical Engineering and Shallow Foundation Design | |

FIRST EXAM

October 10

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| F. | <i>Lateral Earth Pressure and Earth Retaining Structures</i> | 12 Lectures |
| | 1. Types | |
| | 2. Lateral Earth Pressure (Rankine, Coulomb, Cullman, Other) | |
| | 3. Cantilever Retaining Walls (Geotechnical and Reinforced Concrete) | |
| | 4. Sheet Pile Walls (Cantilever and Anchored) | |
| | 5. Braced Cut (Earth pressures, and steel components) | |

SECOND EXAM

November 14

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| 6. | MSE Walls | 4 Lectures |
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FINAL EXAM (TBA)
