University of Tennessee at Chattanooga
College of Engineering and Computer Science
ENCE 4610 - Foundation Analysis and Design (3)
40672 – Fall 2016
TR 0800-0915, EMCS 404

Catalog Description
Fundamentals of soil mechanics as applied to the analysis and design of foundation systems; subsurface investigations; design of shallow and deep foundations. Retaining structures and lateral earth pressures. Lecture 3 hours. Fall semester. Prerequisites: ENCE3610 with a grade of C or better.

Instructor
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Website for Course Slides:
http://www.vulcanhammer.net/utc/ence461/f2016/
Office Hours as posted on Blackboard
More information on the instructor can be found at
http://www.vulcanhammer.info/welcome.php

Textbooks
- Verruijt, A., *Soil Mechanics*. Delft, The Netherlands: VSSD, 2012.
- Fellenius, Bengt. *Basics of Foundation Design*. (The "Red Book".) February 2014 (Downloadable)
- NAVFAC DM 7.02, *Foundations and Earth Structures*. Naval Facilities Engineering Command, Alexandria, Virginia, 1986.

Course Objectives[1]
At the completion of the course, students will have demonstrated the ability to:
- Design a shallow foundation for maximum allowable capacity. (5)
- Design a deep foundation for geotechnical capacity, and (for driven piles) evaluate drivability. (5)
- Design a retaining wall for structural and geotechnical capacity and integrity. (5)
- Apply one or more of the above to a design project, depending upon the nature of the project (11)

Course Outline
1) Introduction
2) Shallow Foundations
   a) General
   b) Bearing Capacity and Settlement of Shallow Foundations
   c) Mat Foundations
3) Retaining Walls
   a) Lateral Earth Pressures
   b) Types of Retaining Walls
   c) Design Methods
4) Deep Foundations
   a) General
   b) Capacity, Static Methods
   c) Capacity, Dynamic Methods

[1] Numbers in parentheses indicate relationship to UTC civil engineering program outcomes, April 2011, listed at end of syllabus

d) Field Verification Methods

e) Axial and Lateral Settlement of Deep Foundations

f) Foundations in collapsible and expansive soils

5) Structural Design

a) Structural Design of Spread Footings

b) Structural Considerations in Deep Foundations

6) Geotechnical Design using LRFD

Evaluation

- Eight (8) Homework Assignments @ 5% each: 40%
- Two (2) Tests @ 15% each: 30%[2]
- One (1) Design Project: 30%

Course Policies

- Due date for homework assignments will be announced when assignment is given, and posted on Blackboard. No late homework will be accepted.
- Homework may be turned in either on paper or electronically. If electronically, the following ***must*** be adhered to for you to receive full credit:
  - ✓ The homework should be in ***one*** Adobe Acrobat pdf file, Version 5.0 or earlier. Ten (10) points will be taken off for failure to adhere to this.
  - ✓ The file name must include your name and the assignment designation.
  - ✓ It must be submitted via the Blackboard system. This is for your protection as much as mine: the submission time is noted, which establishes whether your homework was on time or late.
  - ✓ If you scan your homework, make sure your scans[3] are legible and have enough contrast to be read. (If your homework isn't legible before you scan it, take care of that first.)
- Letter Grading System:[4]
  - 90 – 100: A
  - 80 – 90: B
  - 70 – 80: C
  - 60 – 70: D
  - < 60: F
- Attendance is required with the exception of special arrangements made before class as the only excused absences.
- Homework Format:
  - → When applicable, all problems must include a figure. All figures are to be neat and legible.
  - → Also when applicable, all problems must include the following:
    a. Given
    b. Find
    c. Solution.
  - → Putting more than one problem on a page is permitted. However, *the problems must be presented in the same order as they were given and numbered in the assignment*. Problems should be clearly demarcated between one problem and the next.
  - → On the first page of each problem set or test, in the upper right hand corner write the following:
    - Your Name
    - Course Number

[2] Unannounced quizzes for extra credit may be given at any time.

[3] Sorry looking cell phone camera photos are a good way to put the instructor in a bad mood.

[4] I have been known, in dire circumstances, to "move the goalposts" when the class is facing the abyss.

- Problem Set or Test Number.

→ Each time you use an equation, write down what it is: don't just put a bunch of numbers on the page and expect anyone to know what you did.

→ You are encouraged to work homework with someone but your turned in work must be your own work. All work is subject to the honor code; however, on problems solved with software, if you turn in an identical software solution to anyone else in the class, both (or all) of you are subject to an automatic twenty-five (25) point collusion penalty.

- You are required to keep and assemble a three-ring (or other suitable binding) notebook with the following divisions in it:

→ Homework

→ Quizzes

→ Tests

The project report will be collected electronically.

You will turn this notebook in at the final exam. It is not necessary, when turning in the notebook, to include printed copies of the lecture slides. If you furnish all of the work (including tests) electronically by the end of the semester, the notebook requirements is waived for you.

- All quizzes and exams are open book(s) and open notes. You obviously may use a calculator, but no laptops or any other internet-accessing devices (iPhone, iPad, iPod Touch, Droid, Google Glass, etc.) can be used during a quiz or exam (see following paragraph for penalty.) The exception to this will be if the test is electronic on UTC Learn, where you can use the computer you take the test on.
- You are studying now so that you may enter and practice the engineering profession later. The engineering profession is highly regarded by the public because those who practice it do so with ethical and social consciousness. The same is expected of students in this course. Any direct copying of homework, tests or exams will be considered a violation of the honor code and a course grade of "F" will be given.

Student Outcome Objectives

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.