

CE 534 Design of Earth Structures Fall 2013

Instructor: Prof. Amy Rechenmacher, arechenm@usc.edu
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Lectures: Wednesdays, 6:30-9:15 pm.

Office Hours: by appointment

Course Website: via Blackboard, CE 534 on <https://blackboard.usc.edu/>

Textbook: there is no textbook for this course. Supplemental materials will be provided.

Course Description: The course focuses on analysis and design of geotechnical retaining structures (gravity walls, braced/supported excavations) and slope stability. Considerable emphasis will be placed on understanding soil behavioral concepts related to lateral earth pressure theories and the mobilization of soil failure for use in limit state design applications. Differences between total stress and effective stress analyses (and related strength parameters), related to short-term versus long-term performance, will be emphasized throughout the semester.

Project: Each student will be assigned a scientific publication that covers a concept, example, or case history that compliments material covered in the class. The student will be expected to read and understand the paper, and provide a 20-30 minute “lecture” to the class (via a Power Point presentation), to “teach” the class the concepts covered in the paper. *Note, the material covered in these presentations is intended to be part of the course content, and will be covered on exams.*

Homework: There will be about 5-6 homework assignments through the course of the semester. Each assignment will be due 1-2 weeks after it is assigned.

Examinations: There will be one final exam at the end of the semester.

Grading: Homework: 30% Project: 35% Final Exam: 35%

Outline of Course Topics:

- I. Review of and presentation of advanced soil strength concepts (Mohr circle, stress paths)
- II. Horizontal Stresses in soils
 - A. Limit state analysis
 - B. Movements to mobilize limit states
- III. Classical lateral earth pressure theories
 - A. Active Pressures (Coulomb, Trial Wedge, Rankine)
 - B. Passive Pressures
- IV. Overview of types of retaining structures
- V. Fill Walls
 - A. Concrete/Gravity walls

- B. Mechanically Stabilized Earth (MSE) walls
- VI. Supported Excavations (excavated/cut walls)
 - A. Sheet pile walls
 - B. Internally braced excavations (struts)
 - C. Externally braced excavations (tieback excavations)
 - D. Basal Stability
 - E. Wall movements
- VII. Slope Stability Analysis
 - A. Historical background
 - B. Methodology
 - 1. Overall equilibrium
 - 2. Method of slices (i.e. Bishop/Modified Bishop methods)
 - 3. Sliding wedge and block approach
 - C. Effect of water forces
 - D. Soil shear strength selection
 - 1. Types of shear strength
 - 2. Types of analysis: effective stress (ESA) vs. total stress (TSA)
 - 3. Comparison ESA and TSA
 - E. Factors of Safety