



CE 451 – Foundation Engineering

Code and Name: CE 451 – Foundation engineering

Credit Hours: 3 (Lecture: 3, Tutorial: 1)

Textbook:

- Foundation Design: Principles and Practices: Coduto, D.P., 2nd Edition, Pearson, 2013

Other References:

- Das, B. M., *Principles of Foundation Engineering*, Cengage Learning. 7th Edition, 2007

- Murthy, V. N. S., *Geotechnical Engineering, Principles and Practices of Soils Mechanics and Foundation Engineering*.

Course Description:

Introduction to Foundation Engineering; General Requirements of Foundations and Selection of Foundation Types; Site Exploration and Characterization; Bearing Capacity Theories; Foundation Settlement; Geotechnical Design of Spread Footings; Lateral Earth Pressure Theories and Geotechnical Design of Retaining Walls; Stability of Earth Slopes.

Pre-requisites: CE313 Reinforced Concrete Design, CE351 Geotechnical Engineering, CE352 Geotechnical Engineering Lab

Co-requisites: None

Course Learning Outcomes:

With relation to ABET Student Outcomes (From Fall 2019-SOs: 1-7)

1. Identify the requirements for the successful design of foundation elements (2)
2. Apply the basics concepts of soil mechanics to analyze soil-retaining structures (1)
3. Evaluate factors affecting the planning of subsurface investigations and analyze the results of in-situ tests and transform measurements and associated uncertainties into relevant design parameters (6)
4. Evaluate the bearing capacity and settlement of shallow foundations (1)
5. Design of spread footing considering geotechnical requirements (2)
6. Design and assess stability of retaining walls (2)
7. Evaluate stability for simple slopes (1)
8. Demonstrate the ability for self-directed learning to synthesize the concepts of allowable stress design, appropriate factors of safety, and margin of safety (7)

Topics to be covered:

- Introduction to foundation engineering, Building codes, Foundation classifications, Designs loads, Performance requirements, spread footings.
- Site exploration through laboratory and in-situ testing.
- Shallow foundations, Bearing pressure consideration.
- Bearing capacity failures, bearing capacity analysis, groundwater effects, Selection of soil strength parameters.
- Overview of settlement analysis methods, Settlement analysis based on laboratory and in-situ tests.
- Geotechnical design of spread footings for concentric downward loads, Lightly-loaded footings, Footings on or near slopes, Footings on rocks.
- Externally and internally stabilized earth retaining systems, Horizontal stresses in soils, Classical lateral earth pressure theories, Surcharge loads, Groundwater effects.
- External stability of cantilever retaining walls, Drainage and waterproofing.
- Modes of slope instability, Slope stability analysis, Stabilization measures

Grading Policy:

The grading for the course is: 60% coursework and 40% Final Exam. The course work consists of two Midterm Exams, where each midterm exam is worth 20%. It also includes quizzes, and projects for the remaining 20% that is modified by the course instructor.

