CE 351 –Geotechnical Engineering

Code and Name: CE 351 – Geotechnical engineering
Credit Hours: 3 (Lecture: 3, Tutorial: 1)

Textbook:
- Geotechnical Engineering: Principles and Practices: D. P. Coduto, M. R. Yeung and W. A. Kitch
Other References:
- Das, B. M., Principles of Geotechnical Engineering, Cengage Learning. 2010

Course Description:
Introduction to geotechnical engineering; basics of engineering geology; soil formation; soil composition; soil classification; excavation, grading and compacted fills; groundwater and permeability; stress distribution in soils; effective stress concept; compressibility and settlement analysis; oedometer test; soil strength.

Pre-requisites: CE211 Solid Mechanics & CE241 Fluid Mechanics
Co-requisites: None

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

1. Recognize the impact of soil excavation and compaction in economic context (4)
2. Comprehend the basic principles and theories in geotechnical engineering (1)
3. Classify a range of soil types, adopting professionally recognized systems for categorization and description (1)
4. Interpret simple 2D flow nets to predict the performance of structures and associated risks (1)
5. Formulate the principle of effective stress to a range of typical geotechnical problems in order to predict the ground response under different conditions of loading, soil type and groundwater states (1)
6. Analyze appropriate shear laboratory tests and strength criteria for soils to predict their behavior under loading (6)
7. Acquire the role of geotechnical and geological engineering within the Civil Engineering profession (1)

Topics to be covered:

- Introduction to geotechnical engineering; basics of engineering geology.
- Engineering properties of soils; phase diagrams and weight-volume relationships; plasticity and Atterberg limits.
- Soil classification systems USDA, USCS and AASHTO.
- Earthwork construction objectives, methods and equipment; soil compaction concepts, standards and specifications; earthwork quantity computations.
- Groundwater fundamentals; one-dimensional flow through soils.
- Multidimensional flow and flow nets; groundwater control.
- Mohr circle analysis; geostatic, induced and effective stress analysis; superposition.
- Changes in vertical effective stress; oedometer test; consolidation settlement.
- Terzaghi's theory of consolidation; time-dependent settlement and rate predictions.
- Strength analysis in geotechnical engineering; Mohr-coulomb failure criterion; shear strength of soils.

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.