**SOIL MECHANICS**

**CIV-306**

**Instructor:**

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**Office Hours:**

Tuesdays and Thursdays from 2:00 pm to 4:00 pm

**Course Structure:**

The class meets for two 2-hour lectures per week, and a 3-hour laboratory session per week.

**Description:**

This course aims to provide a basic understanding of the principles of soil and rock mechanics, and an introduction to the fundamentals of geotechnical and foundation engineering. The topics to be covered as part of this course include soil and rock behavior and mechanical properties, engineering classification and characterization of soils and rocks, compaction theory, hydrostatic conditions in soils, soil permeability and groundwater flow, stresses in a soil and rock mass, compressibility of soils and rocks, settlement analysis, shear strength of soils and rocks, bearing capacity under foundation loads, overview of shallow and deep foundations, fundamentals of retaining structures and slope stability, subsurface exploration, and earthwork equipment and construction methods.

**Prerequisites:** CIV303 (Geology); CIV304 (Construction Materials)

**Credits:** 5

**Course Objectives:**

During this course, students will be expected to:

- Examine the importance of soil and rock characteristics to the design of soil and rock support structures through engineering
- Understand the methods for subsurface exploration and field and laboratory testing of soils and rocks, and develop subsurface investigation and laboratory testing programs
- Classify and determine the mechanical behavior of soils and rocks
- Analyze soil mechanics related engineering problems using theoretical and empirical methods
- Introduce analysis, design, and construction aspects of shallow and deep foundations, and retaining structures
- Provide modeling, engineering analysis and design, and construction solutions to geotechnical and foundation engineering problems

**Course Outcome:**

By the end of this course, the students are expected to have the following competencies:

1. Ability to revise or determine geotechnical site investigation methods and *in situ* tests appropriate for the estimation of engineering parameters
2. Ability to read and understand soil and rock boring data for design
3. Understanding of soil and rock properties and classification
4. Understanding of soil and rock behavior given a specific stress path and loading conditions
5. Ability to select an appropriate foundation or earth retaining structure for a given site and/or structure
6. Ability to analyze and predict settlement due to loading
7. Ability to analyze the bearing capacity of soils and rocks
8. Ability to assess the stability of earth and rock slopes
9. Ability to design foundations and earth retaining structures
10. Understanding of compaction theory, ground improvement, and laboratory and field methods for determining and achieving desired soil conditions
11. Understanding of earthwork equipment and construction methods

**Textbooks:**

Principles of Geotechnical Engineering
9th Edition
by Braja M. Das (Author), Khaled Sobhan (Author)
ISBN-13: 978-1305970939
Publisher: Cengage Learning; 009 edition (January 1, 2017)
Cengage Learning

An Introduction to Geotechnical Engineering
2nd Edition
by Robert D. Holtz (Author), William D. Kovacs (Author), Thomas C. Sheahan (Author)
ISBN-13: 978-0132496346
ISBN-10: 0132496348
Publisher: Pearson

**Teaching Methodology:**

- In-class lectures by the Instructor.
- Hands-on activities, individual work, and laboratory practices.
- In-class debates.
- Case analyses.
- Articles from scientific journals
- Presentations by students.
- Presentations or Seminars by field experts.

**Course Content:**

1. Introduction to Geotechnical Engineering
2. Soil Genesis and Composition
3. Soil Classification, and Properties of Rock Structures and Classification Soil Compaction
4. Soil Permeability and Seepage
5. Stresses in a Soil and Rock Mass
6. Compressibility of Soils and Rocks, and Settlement Analysis
7. Shear Strength of Soils and Rocks
8. Overview of Shallow and Deep Foundations
9. Stability of Earth and Rock Slopes
10. Earth Retaining Structures

11. Subsurface Exploration
12. Overview of Geotechnical Earthquake Engineering, Ground Improvement Methods, Dewatering and Construction Control, Remote Sensing and Instrumentation

**Grading Policy:**

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|---|---|
| Homework | 20% |
| Laboratory | 30% |
| Quizzes | 30% |
| Final Exam/Project | 20% |

**Institutional and Course Policies:**

- All work must be submitted by Close of Business (COB) on the due date. Hardcopy assignments should be submitted at the *ING* Office. Digital documents will be submitted through *Aula Virtual*. Late assignments will be accepted at the instructor's discretion, and will receive partial credit.
- Cooperative learning is encouraged and should be part of the learning process. However, plagiarism and submitting others work as your own will not be tolerated. Cheating, plagiarism, and any other dishonest behavior will be penalized, and may involve being expelled from the University. Also, the instructor will assign zero value to any work, test, assignment, homework, research, quiz, in which any type, shape or form of dishonest behavior is involved.
- Attendance to all classes is expected. Per University policy students require 80% attendance to obtain credits for the course. Recurring tardiness may be penalized at the instructor's discretion.
- Cell phones must be in vibration or in silence.
- Class discipline and non-disruptive behavior is expected and encouraged. Maturity and respect for others is required inside and outside of the classroom.
- Appropriate and careful use of classroom furniture is required at all times.
- Eating, drinking, or smoking is not permitted in classroom.