Geotechnical Engineering

Course Code	Credit Hours
CE- 311	3-1

Course Description

This course will focus on the geotechnical aspects of soil mechanics. The students taking the course will learn to apply the fundamental concepts of soil behavior to evaluation, selection, and design of earth retaining structures. In addition, the course will introduce the slope stability, soil improvement and earth and rockfill dam.

Text Book:

1. Das & Sobhan (2018). Principles of Geotechnical Engineering. 9th.
2. Das & Sivakugan (2018). Principles of foundation engineering. 9th.
3. Design of Small Dams, (1987) United States Department of the interior, Bureau of Reclamation, A water Resource Technical Publication
4. Fell et al. (2005). Geotechnical engineering of dams. CRC press

Reference Book:

1. Murthy (2007). Advanced Foundation Engineering
2. Das (2014) Advanced Soil Mechanics. 4th.
3. Bowles (1997) Foundation Analysis and Designy.
4. Coduto (1999) Geotechnical Engineering, Principles and Practices.
5. Coduto (2001) Foundation Design – Principles and Practices.
6. Liu & Evett (2013) Soil and Foundations

Prerequisites :

CE-222 Soil Mechanics**.**

ASSESSMENT SYSTEM FOR THEORY

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assesment/ Viva	20%

Teaching Plan

Week No	Topics/Learning Outcomes
1-3	**Stress Distribution in Soils** • Total stress, effective stress, and pore water pressure • Vertical stresses induced due to structural loads • Approximate methods. • Westergaard and Boussinesq's theories • Pressure bulb • Stress at a point outside the loaded area • Newmark's influence charts Related numerical problems
2-4	**Shear Strength** • Concept and parameters of shear strength of soils • Mohr Coulomb's failure envelope • shear strength of cohesive and non-cohesive soils • Factors affecting shear strength of soil and its applications in engineering. • Laboratory and field tests for determination of shear strength. Related numerical problems
6-8	**Settlement Analysis** • Definition, total settlement, and differential settlement • Consolidation settlement • Elastic or immediate settlement • Primary consolidation settlements • Computation of elastic and consolidation settlement • Limits of allowable total and differential settlement Related numerical problems
9	**Mid Semester Exam**

10-13	**Lateral Earth Pressure** • Definition, pressure at rest • Active and passive earth pressures • Coulomb's and Rankine's theories • Culmann's method Related numerical problems
13-14	**Slope Stability Analysis** • Types of slopes • Factors affecting slope instability and remedial measures • Types of failure modes Introduction to Limited Equilibrium Analysis
15	**Earth and Rockfill Dams** • Definition and types of dams • Components of a dam and their functions • Coffer dams and their types General design considerations and typical cross sections.
16	**Soil Improvement** • Basic principles and objectives of soil improvement • Mechanical and chemical stabilization of soil Different methods and their application to various soil types.
17-18	**End Semester Exam**

Practical

Experiment No	Description
1	Direct shear test
2	Unconfined compression test
3	Triaxial compression test
4	SPT
5	Plate load test
6	Consolidation test
7	Electrical Resistivity