Soil Mechanics – II

Course Code	Credit Hours
CE- 324	2-1

Course Description

This course covers essential mathematical techniques for engineering applications, beginning with the System of Linear equations and Applications with real-world civil engineering case studies. The Eigenvalues and Eigenvectors explore the concepts and applications of linear algebra in constructing curves and surfaces. Linear Programming introduces optimization principles. Basic concepts and Modelling cover linear/ non-linear differential equations and initial/ boundary value problems. Analytical methods for first-order ODEs, separable variable, homogeneous, exact, and linear equations are discussed, alongside applications such as mixing problems and temperature prediction. The subsequent section investigates the analytical methods for second order ODEs covering homogeneous and non-homogeneous, Cauchy-Euler equations, with practical applications in earthquake modeling and bridge collapse scenarios. The course concludes with an exploration of Laplace Transform and its applications in solving second-order ODEs.

Text Book:

1. Das & Sobhan (2018). Principles of Geotechnical Engineering. 9th.
2. Das & Sivakugan (2018). Principles of foundation engineering. 9th.

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 - I**.**

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	Introduction to the course Shear strength: Mohr's circle and pole method for calculating stresses
2	Shear strength: Mohr-Coulomb failure criteria, and shear strength parameters
3	Soil exploration
4-6	Settlement and consolidation: Elastic settlement, Consolidation of soils, Spring analogy, calculation of consolidation settlement, over consolidation ratio, Time rate of settlement and Terzaghi's 1D consolidation theory, degree of consolidation, Lab consolidation test
7-8	Lateral earth pressure: earth pressure at rest, Rankine's theory, effect of GWT, Coulomb's theory, Culman's method, Design of gravity retaining wall
9	**Mid Semester Exam**
10-12	Bearing Capacity of Soils: Terzaghi's theory, effect of GWT on bearing capacity of soils, Terzaghi, Meyerhoff, and Vesic method, Bearing capacity of cohesionless soils, plate load test
13-15	Pile Foundations: types of piles, methods of construction, static capacity of individual piles in cohesive soils, static capacity of individual piles in cohesionless soils
16	Drilled shafts: static capacity of drilled shafts in cohesive and cohesionless soils
17-18	**End Semester Exam**

Practical:

Experiment No	Description
1	Moisture content determination
2	Sieve analysis.
3	Hydrometer analysis.
4	Atterberg limits.
5	Specific gravity.

6	Moisture content determination.
7	Standard and Modified Compactions
8	Density in situ by core cutter sand replacement and rubber balloon method
9	Permeability by constant and variable head.