Mechanical Properties of Soil

Code	Credit Hours
CE- 824	3+0

Course Description

To equip the students with the knowhow of soil properties with emphasis on conceptual understanding of soil textures, consistency, permeability, stress/strain behavior, shear strength and consolidation. The course focuses on the field/lab testing and preparation of report writing. To introduce students with basic concepts of critical state soil mechanics.

Textbook:

1. Holtz, R.D., Kovacs, W.D., (1981), An Introduction to Geotechnical Engineering, Prentice-Hall, New Jersey.
2. Reference Book:
3. Liu, C., Evett, J.B. (1997), Soil Properties: Testing, Measurement and Evaluation, Prentice Hall, New Jeresy.
4. ASTM, (2004), Annual Book of ASTM Standards, Sec 4, Vol 04.08, Soil and Rock.
5. Soil Behavior and Critical State Soil-Mechanics by David Muir Wood
6. Bowles, J.E. (1992), Engineering Properties of Soil and Their Measurement, McGraw-Hill Company.

Prerequisites

Nil

Assessment System for Theory

Quizzes	10-15%
Assignments	5-10%
Mid Terms	25-30%
Project	0-10%
ESE	45-50%

Teaching Plan

Week No	Topics	Learning Outcomes
1	Introduction	Course Outline, objectives, teaching plan, assessment method, concepts review
2	Index and Classification Properties of Soil	Soil consistency, soil classification systems, compressibility, compaction, relative density.
3-4	Permeability and Seepage	Flow of water in soils, capillary rise in soils, frost action in soils, flow nets and seepage.
5-6	Consolidation Theory	Field consolidation line, settlement of loads on clay due to primary consolidation, time rate of settlement due to primary consolidation, settlement of loads on clay due to secondary compression, settlement of loads on sands.

7-8	Shear Strength	Methods of investigating shear strength, characteristics of failure plane, shear strength of cohesionless soils, shear strength of cohesive soils.
9	**MID TERM EXAM**	
10	Advanced geo-mechanical testing	Uniaxial compressive or tensile tests, small sample triaxial compression tests, Uniaxial strain condition with radial permeability measurement, at reservoir stress conditions, Oedometer creep test.
11-12	Introduction to tensors	What is a tensor, basic operations, tensor decomposition, rank of a tensor.
13-14	Stress-Strain Behavior and Condition of Failures	Stiffness degradation, different failure criteria.
15	Elasticity and Plasticity of Soil	Constitutive behavior of soil obtained from theory of elasticity and plasticity.
16-17	Introduction to Elastic, Plastic, and Elastoplastic models of soil	Components of an elastoplastic model, Cam-Clay model
18	**End Semester Exam**	