

Branch Name:	Civil Engineering
Semester/Year:	Semester V / Third Year
Subject Title:	Geotechnical Engineering – I
Subject Code:	1ET1060504
Pre-requisite:	-

Course Objective:

- To study about physical and chemical properties of soil.
- To study about compaction and consolidation of soil.
- To understand the shear strength of soil.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weightage (%)
1	<u>Introduction</u> Definition, Brief history, Scope and limitations of Geotechnics.	01	2
2	<u>Index Properties, Relationships and Tests</u> Phase diagram, Basic terms and definitions, Functional relationships, Determination of index properties, Relative density for granular soil.	03	8
3	<u>Particle Size Analysis</u> Size and nomenclature of soil particles as per BIS, Sieve analysis, Sedimentation analysis, Particle size distribution curve and its uses.	03	6
4	<u>Soil Structure</u> Shape of the particles, Texture and structure of the soil, Types of the structure, properties, Conditions for the formation of different structures.	02	4
5	<u>Soil Consistency</u> Consistency limits and its determination, Different indices, Field moisture equivalent, Activity, Sensitivity & Thixotropy of soil.	03	6
6	<u>Soil Classification</u> Objectives, Basis, Textural, Unified soil classification, IS classification method, group index. Field identification and General characteristics of the soil.	03	6
7	<u>Soil Water</u> Free water and held water, Structural water and absorbed water, Capillary water, Total stress, Neutral stress and Effective stress.	02	4

8	<u>Permeability and Seepage</u> Darcy's law and its validity, Factors affecting permeability, Laboratory permeability tests, Introduction to field permeability test, Permeability of stratified soil masses, Laplace equation (2-D), Seepage pressure, Quick condition, Flow net, its characteristics and application.	06	14
9	<u>Compaction</u> Definition, Theory of compaction, Factors affecting compaction, Laboratory compaction tests, Effect of compaction on soil properties, Placement water content, Placement layer thickness, Field control of compaction, Proctor's needle, Methods of compaction used in field.	06	16
10	<u>Shear Strength of Soil</u> Mohr's strength theory, Mohr- coulomb's strength theory, Modified Mohr coulomb's theory, Direct shear test, Unconfined compression test, lab. Vane shear test, Introduction to triaxial compression test, Shear tests based on drainage conditions.	06	18
11	<u>Consolidation of Soils</u> Compressibility of soils, Definitions and mechanism of consolidation, Spring analogy, Void ratio and effective stress relation, Related indices, Assumptions of Terzaghi's one dimensional consolidation theory, Time factor, One dimensional consolidation tests, Laboratory and theoretical time curves, Determination of pre-consolidation pressure, Estimation of consolidation settlement and rate of settlement for uniform pressure increment in a clay layer.	07	16

Course Outcome:

After learning the course the students should be able to:

1. The course covers for basic information about soil like its structure, texture, physical properties, chemical properties, engineering properties, and index properties.
2. The course also discusses compaction and settlement by consolidation of soil.
3. To calculate shear strength of soil.

List of Reference Books:

1. Soil Mechanics & Foundation Engineering –B.C. Punamia, Laxmi Pub. Pvt. Ltd., Delhi.
2. Soil Mechanics & Foundation Engineering –K.R. Arora, Standard Pub., Delhi.
3. Soil Mechanics & Foundation Engineering – Alam singh, CBS Publishers & Distributors, Delhi.
4. Soil Mechanics & Foundation Engineering – V. N. S. Murthy, CRS Press, Taylor & Francis Group, New York.
5. Basic and applied soil mechanics – Gopal Ranjan, A.S.R. Rao, New age int. (p) ltd.
6. Principles of Geotechnical Engineering –Braja M Das, Thomson Asia Pvt. Ltd.
7. Soil Mechanics and Foundation Engineering – P.Purushothama Raj, Pearson Education.

List of Experiments:

1. Sieve Analysis
2. Specific Gravity Test
3. Atterberg's Limit Test
4. Proctor Compaction Test
5. Relative Density Test
6. In Site Density-Core Cutter and Sand Replacement Test
7. Permeability Test: Constant and Variable Head

8. CBR Test
9. Consolidation / Odometer Test
10. Direct Box Shear Test
11. Unconfined Compression Test
12. Demonstration of Triaxial Test

E-Resources :

1. <http://nptel.ac.in/>
2. <http://ocw.mit.edu/courses/civil-and-environmental-engineering/>