

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: V CIVIL ENGINEERING

Subject Name: **Geotechnical Engineering – I**

Subject Code: **150604**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Internal Assessment (I)
3	0	2	5	70	30	50

MODULE - I	
1.	Introduction: Definition, Brief history, Scope and limitations of Geotechnics.
2.	Origin and Nature of Soil: Geological cycle, Physical and chemical agencies for soil, Formation - residual, transported, cumulose, alluvial, marine and lacustrine, loess and colluvial soils. General characteristics of different types of soils. Overview of different types of soils in Gujarat / India.
3.	Index Properties, Relationships and Tests: Phase diagram, Basic terms and definitions, Functional relationships, Determination of index properties, Relative density for granular soil.
4.	Particle Size Analysis: Size and nomenclature of soil particles as per BIS, Sieve analysis, Sedimentation analysis, Particle size distribution curve and its uses.

MODULE - II	
1.	Soil Structure: Shape of the particles, Texture and structure of the soil. Types of the structure, properties, Conditions for the formation of different structures.
2.	Soil Consistency: Consistency limits and its determination, Different indices, Field moisture equivalent, Activity, Sensitivity & Thixotropy of soil.
3.	Soil Classification: Objectives, Basis, Textural, Unified soil classification, IS classification method, group index. Field identification and General characteristics of the soil.
4.	Soil Water: Free water and held water, Structural water and absorbed water, Capillary

	water, Total stress, Neutral stress and Effective stress.
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MODULE – III	
1.	Permeability and Seepage: 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.
2.	Compaction: 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.

MODULE - IV	
1.	Shear Strength of Soil : 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.

MODULE - V	
1.	Consolidation of Soils : 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.

Note: Each module has 20% weightage.

Term Work:

Term work shall consist of laboratory work (Minimum 10 Experiments from listed below) and tutorials (minimum 25 problems) based on above course. Practical examinations shall consist of oral based on term work and above course.

Geotechnical Engineering Lab 1:

1. Visual identification and specific gravity
2. Sieve Analysis
3. Hydrometer Analysis
4. Liquid Plastic Limit Test
5. Shrinkage limit Test
6. Proctor Compaction Test

7. Relative Density
8. In site Density-Core Cutter & Sand Repl.
9. Permeability Test: Constant and Variable Head
10. CBR Test
11. Consolidation /Odometer test
12. Direct Shear Test
13. Unconfined Compression Test
14. Demonstration of Triaxial test

Reference Books:

1. P. Purushothama Raj; Soil Mechanics and Foundation Engineering; Pearson Education.
2. B.C. Punamia; Soil Mechanics & Foundation Engineering; Laxmi Pub. Pvt. Ltd., Delhi.
3. Alamsingh; Soil Mechanics & Foundation Engineering; CBS Publishers & Distributors, Delhi
4. Taylor D.W.; Fundamentals of Soil Mechanics; Asia Publishing House, Mumbai
5. V. N. S. Murthy; Soil Mechanics & Foundation Engineering; Sai Kripa Technical Consultants, Bangalore
6. Gopal Ranjan, Rao A.S.R.; Basic and applied soil mechanics; New age int. (p) ltd.
7. Arora K.R.; Soil Mechanics & Foundation Engineering; Standard Pub., Delhi
8. Das Braja M; Principles of Geotechnical Engineering; Thomson Asia Pvt. Ltd.