

Th2. GEOTECHNICAL ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3 rd
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. Rationale

The course aims to prepare the students to comprehend the design principles associated with the civil foundations and other geotechnical structures. The students will develop competency in estimating and predicting soil strength and slope based on properties and design requirements.

B. Course Objectives

On completion of the course, students will be able to -

1. comprehend the scope of soil mechanics and define the associated terminology and inter-relation among various soil properties.
2. classify and identify soil types under different standards
3. comprehend significance of permeability and seepage and compute those.
4. describe requirement and methodology of compaction and consolidation.
5. realize the methods towards shear strength estimation and obtain strength envelop for different types of soils.
6. define terms of foundation engineering and estimate bearing capacity.

C. Topic Wise Distribution

Chapter	Name of topics	Hours
1	Introduction	02
2	Preliminary Definitions and Relationship.	06
3	Index Properties of soil	04
4	Classification of Soil	06
5	Permeability and Seepage	07
6	Compaction and Consolidation.	08
7	Shear Strength.	06
8	Earth Pressure on Retaining Structures.	07

9	Foundation Engineering.	14
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D. Course Contents:

1 Introduction

- 1.1 Soil and Soil Engineering
- 1.2 Scope of Soil Mechanics
- 1.3 Origin and formation of soil

2 Preliminary Definitions and Relationship

- 2.1 Soil as a three Phase system.
- 2.2 Water Content, Density, Specific gravity, Voids ratio, Porosity, Percentage of air voids, air content, degree of saturation, density Index, Bulk/Saturated/dry/submerged density, Interrelationship of various soil parameters

3 Index Properties of Soil

- 3.1 Water Content
- 3.2 Specific Gravity
- 3.3 Particle size distribution: Sieve analysis, wet mechanical analysis, particle size distribution curve and its uses
- 3.4 Consistency of Soils, Atterberg's Limits, Plasticity Index, Consistency Index, Liquidity Index

4 Classification of Soil

- 4.1 General
- 4.2 I.S. Classification, Plasticity chart

5 Permeability and Seepage

- 5.1 Concept of Permeability, Darcy's Law, Co-efficient of Permeability,
- 5.2 Factors affecting Permeability.
- 5.3 Constant head permeability and falling head permeability Test.
- 5.4 Seepage pressure, effective stress, phenomenon of quick sand

6 Compaction and Consolidation

- 6.1 Compaction:** Compaction, Light and heavy compaction Test, Optimum Moisture

Content of Soil, Maximum dry density, Zero air void line, Factors affecting Compaction, Field compaction methods and their suitability

6.2 Consolidation: Consolidation, distinction between compaction and consolidation.

Terzaghi's model analogy of compression/ springs showing the process of consolidation – field implications

7 Shear Strength

7.1 Concept of shear strength, Mohr- Coulomb failure theory, Cohesion, Angle of internal friction, strength envelope for different type of soil, Measurement of shear strength;- Direct shear test, triaxial shear test, unconfined compression test and vane-shear test

8 Earth Pressure on Retaining Structures

8.1 Active earth pressure, Passive earth pressure, Earth pressure at rest.

8.2 Use of Rankine's formula for the following cases (cohesion-less soil only)

(i) Backfill with no surcharge, (ii) backfill with uniform surcharge

9 Foundation Engineering

9.1 Functions of foundations, shallow and deep foundation, different type of shallow and deep foundations with sketches. Types of failure (General shear, Local shear & punching shear)

9.2 Bearing capacity of soil, bearing capacity of soils using Terzaghi's formulae & IS Code formulae for strip, Circular and square footings, Effect water table on bearing capacity of soil

9.3 Plate load test and standard penetration test

E. COURSE COVERAGE UPTO INTERNAL EXAMINATION

Chapters 1, 2, 3, 4, 5, 6

F. RECOMMENDED BOOKS

Learning Resources			
Text Books			
Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	Dr. B.C.Punmia	Soil Mechanics & Foundation Engineering	Laxmi publications (P) LTD
2	Dr. K.R.Arora	Soil Mechanics& Foundation Engineering	Standard Publishers Distributors Ltd.
3	Dr. V.N.S. Murthy	Soil Mechanics& Foundation Engineering, Vol-I	UBS Publishers Distributors Ltd.