GEOTECHNICAL ENGINEERING – I

Lectures : 4 Periods/Week	Sessional marks : 40
Semester End Exam. : 3 Hours	Semester End Exam. marks: 60
	Credits : 4

Course Objectives:

- To introduce the subject including genesis and historical aspect to the student.
- To understand the significance of the basic principles of soil mechanics and their applications.
- To go through basic definitions, simple tests, plasticity characteristics, flow of water through soils, permeability, seepage and effective stress principle.
- To bring out the importance of concepts of stresses due to vertical loads, compression, consolidation and shear strength of soil and their applications.

Course Outcomes:

Students will be able to:

- Classify the soil.
- Assess engineering properties of soils like permeability, compaction, consolidation, shear strength and their importance.
- Calculate vertical stresses increase due to applied loads, useful to determine settlement of structures

UNIT – 1

Introduction

Soil formation and soil types; Regional soil deposits of India

Basic Definitions and Relations

Phase diagrams; Simple definitions; some important relationships; Index Properties; Grain size distribution; Atterberg Limits; Significance of other Soil Aggregate properties

UNIT – II

Soil Classification

Introduction; Particle size classification as per IS-code; Unified soil classification system; Indian standard soil classification system

Permeability

Capillary rise; Darcy's law and its Validity; Determination of coefficient of permeability - constant and variable head methods, indirect methods, Factors affecting permeability; Permeability of stratified soil deposits.

Seepage through Soils

Principle of effective stress; physical meaning of effective stress; Types of head, seepage forces and quicksand condition.

UNIT – III

Compaction of Soils

Introduction; Laboratory tests; Factors affecting compaction; Structure and engineering behaviour of compacted cohesive soils; Compaction in the field; Compaction specifications and field control.

Vertical Stresses below Applied Loads

Introduction; Boussinesq's equation; vertical stress distribution diagrams; vertical stress beneath loaded areas; Newmark's influence chart; Approximate stress distribution methods for loaded areas; Westergaard's equation

UNIT – IV

Compressibility of Soil And Consolidation

Introduction; Compressibility; Time-rate of consolidation; Consolidation test; Computation of settlement; extrapolation of field consolidation curve; Settlement analysis.

Shear Strength of Soils

Introduction; Stress at a point- Mohr Circle of stress; Mohr–coulomb Failure Criterion; Modified failure envelope; Measurement of Shear Strength- Direct shear test, Triaxial test, Unconfined compression test and vane shear tests; Shear strength of Clayey soils; Shear Strength of Sands, Drainage conditions and Strength parameters, critical void ratio, liquefaction

NOTE

Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

1. Basic and Applied Soil Mechanics – Gopal Ranjan and A.S.R.Rao, New Age International Publishers, 2011.

REFERENCES

1. Foundation Analysis & Design by Bowles, J.E., McGraw- Hill , 1995.
2. A Text book of Soil Mechanics and Foundations by B.C.Punmia, Laxmi Publications,2005.
3. A Text book of Soil Mechanics and Foundation Engineering by K.R.Arora, Standard Publishers & Distributors, 2011.
4. A Text book of Soil Mechanics and Foundation Engineering – P.Purushotthama Raj, Pearson Education

WEB REFERENCES:

www.iitm.ac.in