

Devi Ahilya University Indore, India Institute of Engineering & Technology				III Year B.E. (Civil Engineering) (Full Time)			
Subject Code and Name	Instruction Hours Per Week			Credit			
5VLRE1: Geotechnical Engineering - I	L	T	P	L	T	P	Total
Duration of Theory Paper: 3 hours	3	1	2	3	1	1	5

**Course objective:**

1. Understand the fundamental principles of soil mechanics and their applications in geotechnical engineering.
2. Describe the soil properties.
3. Discuss about the seepage analysis and flow nets.
4. Know about the components of settlement and behavior of soils.
5. Define the shear strength and pore pressure parameters.
6. Understand the stress analysis and failure mechanisms.

**COURSE CONTENTS**

**UNIT -1**

Definition and scope of soil mechanics, soil origin and it's composition, influence of clay minerals on engineering behavior. Soil texture and structure. Three phase system, index properties and their determination. Classification systems based on partical size, texture, consistency limits unified and AASHTO. Details of it's classification.

**UNIT-2**

Soil properties, density, void ratio porosity, moisture- content, grain size analysis. Dry and wet sieve analysis and sedimentation soil consistency. Atterberg Limits, explanation of various indices like Flow- Index, plasticity- index, toughness index, liquid index, activity ratio.

**UNIT-3** Capillary and gravitational water. Permeability of soil, Darcy's law, laboratory determination of permeability and affecting factors. Seepage and flow net, effective neutral and total pressure, quick sand phenomenon. Compaction characteristics of soil, moisture/density relationship,

factor affecting compaction and control. Compressibility and consolidation of soil, Terzaghi's one Dimensional Consolidation theory, pressure valid ratio relationship.

#### UNIT-4

Strength of soils, stress distribution beneath loaded areas by Boussinesq and water guard's analysis, Newmark's influence chart, contact pressure distribution Mohr-coulomb's theory of shear failure of soils. Measurement of shear strength. Shear box test, triaxial and unconfined compression test, vane shear test. Measurement of pore pressure parameters, critical void ratio, liquefaction.

#### UNIT-5

Stability of slopes, infinite and finite slopes, types of slope failures, rotational slips, stability number, effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis, stability of earth dams.

#### Books and references: -

1. Soil Mech. & found. By Dr. B.C. Punmia Lakshmi Publications, Delhi
2. Modern Geotech Engg. By Dr. I Aram Singh- IBT Publishers Delhi
3. Geotech. Engg. By C Venkatramaiah- New Age International Publishers, Delhi
4. Soil Testing for Engg. By T.W. Lambe- John Wiley and Sons. Inc
5. Soil Mech. & Found. By S.K. Garg-Khanna Publishers, Delhi
6. Geotechnical Engineering- Shashi.k.Gulhati & Manoj Datta- MC Craw Hill Education(India) Pvt. Ltd. New Delhi.

#### COURSE OUTCOME:

Students earned credits will develop ability to

CO.No.	CO	PO
CO1	Apply Soil classification systems.	PO1,PO8
CO2	List the soil properties	PO2,PO3,PO12
CO3	Confess about the seepage analysis and static pressure in water.	PO1,PO2,PO3
CO4	Determine the components of settlements and behavior of soils.	PO1,PO2,PO3
CO5	Perceive the concept of shear strength and it's measurements.	PO1,PO2
CO6	Analysis the total stress for slope failure mechanism.	PO1,PO2,PO8

#### LIST OF EXPERIMENTS:-

1. Determination of moisture content of soil
2. Determination of specific gravity of soil
3. Determination of field density by sand replacement method

4. Determination of field density by core cutter method
5. Sieve analysis of soil and sedimentation analysis
6. Determination of liquid limit of soil by Casagrande method and cone penetrometer
7. Determination of plastic limit and shrinkage limit of soil.
8. Determination of permeability of soil by:  
(a) constant head method (b) variable head method
9. Determination of OMC of soil by Standard proctor compaction test.

**CO-PO Relationship**

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	2							1				
CO2	1	2	2	1	1							1
CO3	2	2	2	1	1							1
CO4	2	2	2	1	1							1
CO5	2	2	2	1	1							1
CO6	2	2	2	1	1			1				1