



23CE3503: GEOTECHNICAL ENGINEERING– I (SYLLABUS)

Course Code	23CE3503	Year	III	Semester	I
Course Category	Professional Core	Branch	CIVIL	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	-
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks:	100

Course Objectives:

The objective of this course is to:

1. To enable the student to determine the index properties of the soil and classify it.
2. To impart the concept of seepage of water through soils and determine the discharge of water through soils.
3. To impart the principles of compaction and consolidation of soils and determine the magnitude and the rate of consolidation settlement.
4. To enable the student to understand the concept of shear strength of soils, determine the shear parameters of sands and clays and the areas of their application.

Course Outcomes:

Course will enable the student to:

CO	Statement	Blooms level
CO 1	Understand and interpret the soil properties, phase relationships, index properties, and classification systems for engineering use	L4
CO 2	Examine the flow of water through soils, understand capillary action, effective stress principles, and determine permeability in soil systems.	L4
CO 3	Evaluate seepage problems using flow nets and interpret the stress distribution under various surface loads.	L4
CO 4	Assess compaction and consolidation characteristics of soils.	L4
CO 5	Compare shear strength behavior under various drainage conditions and interpret stress-strain responses.	L4

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	-	-	1	1	1	1	-	1	2	-
CO2	3	2	2	-	-	1	1	1	1	-	1	2	1
CO3	3	2	2	1	-	1	1	1	1	-	1	2	1
CO4	3	2	2	2	1	1	1	1	1	-	1	2	1
CO5	3	2	2	2	1	1	1	1	1	-	1	2	1



Syllabus

Unit No	Content	Mapped COs
I	Introduction: Soil formation – Structure of Soils – Texture of Soils – Three phase system and phase relationships. Index Properties and Classification Tests of Soils: Index properties – Density Index - Grain size analysis – Sieve and Hydrometer methods – Consistency of Clay Soils – Activity of Clays – Thixotropy of clays - soil Classification – Unified soil classification and I.S. Soil classification.	CO1
II	Soil moisture and Capillarity: Soil moisture and modes of occurrence – Total, Neutral and Effective Pressures – Capillary Rise in soils. Permeability: Flow of water through soils – One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems.	CO1, CO2
III	Seepage and Flow Nets: Flow net for one-dimensional flow – two-dimensional flow – Basic equation for Seepage – Flow nets & Characteristics and Uses – Quicksand condition –Seepage forces Stress Distribution in Soils: Stresses induced by applied loads - Boussinesq's and Westergaard's theories for point loads and areas of different shapes– Newmark's influence chart – 2:1 stress distribution method. - Pressure Blubs.	CO3
IV	Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control. Consolidation: Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (c_v) - Over consolidated and normally consolidated clays.	CO4, CO5
V	Shear Strength of Soils: Basic mechanism of shear strength - Mohr – Coulomb Failure theories – total and effective shear strength parameters – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination- various drainage conditions – stress paths.	CO2, CO4, CO5



Learning Resource(s)	
Text Book(s)	
1. 'Soil Mechanics and Foundation Engineering by Dr. K.R. Arora, Standard Publishers and Distributors, New Delhi. 2. Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao, New Age International Publishers. 3. 'Soil Mechanics and Foundation Engineering' by V.N.S.Murthy , CBS publishers 4. 'Geotechnical Engineering' by C. Venkataramaiah, New Age International Publishers.	
Reference Book(s)	
1. 'Fundamentals of Soil Mechanics' by D.W.Taylor., Wiley. 2. 'An introduction to Geotechnical Engineering' by Holtz and Kovacs; Prentice Hall 3. Principles of Geotechnical Engineering, BrajaM.Das, Cengage Learning	
Web Materials:	
1. https://archive.nptel.ac.in/courses/105/101/105101201/ 2. https://archive.nptel.ac.in/courses/105/105/105105168/	