

20CE3402-GEOTECHNICAL ENGINEERING

Offering branches	CE	Year: II	Sem: II											
Course Category:	Professional Core	Credits:	3											
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0											
Prerequisites:	20BS1304- Applied Mechanics	Continuous Evaluation:	30											
		Semester End Evaluation:	70											
		Total Marks:	100											
Course Outcomes														
Upon successful completion of the course, the student will be able to:														
CO1	Identify the soil and decide whether it is appropriate for construction or not	K2												
CO2	Design the porous medium of any hydraulic structure	K6												
CO3	Determine the long and short-term analyses to know the exact state of stress on the soil	K3												
CO4	Estimate the settlement of the foundation by understanding the consolidation mechanism of clay	K4												
CO5	Estimate the short-term and long-term analyses and understand how to prevent soil structures from catastrophic failure	K4												
Contribution of Course Outcomes towards achievement of Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2		1	1	1				1	2	1
CO2	2	2	2	2		3	3	3				3	2	3
CO3	3	3	3	3		2	2	2				2	3	2
CO4	2	2	2	2		3	3	3				3	2	3
CO5	2	2	2	2		3	3	3				3	2	3
Avg.	2	2	2	2		3	3	3				3	2	3
1- Low			2-Medium					3-High						
Course Content														
UNIT-1	<p>Soil Properties: Physical properties of soil – void ratio, porosity, degree of saturation, water content, module weights, specific gravity – their functional relationships, relative density. Indian standard classification for fine grained and coarse grained soils for general engineering purposes.</p> <p>Soil Structure, Clay Minerals, introduction of Clay Chemistry, Determination and various indices – plasticity index, consistency index, liquidity index – uses and applications of consistency limits in soil engineering, activity ratio</p>												CO1	
UNIT-2	<p>Soil Hydraulics: Bernoulli's Principle and Equation, Darcy's law and its limitations, determination of coefficient of permeability, laboratory methods-constant head and variable head permeameter tests, factors influencing coefficient of permeability, permeability of stratified soils, stress principle for saturated soils-total, neutral and effective stresses, no flow, downward flow and upward flow conditions, quick sand conditions, critical hydraulic gradient, piping failures in dams founded on permeable formations</p>												CO2	
UNIT-3	<p>Consolidation: Oedometer Tests, e-p and e-log p curves – compression index, coefficient of compressibility and coefficient of volume change, Terzaghi's assumptions for one dimensional consolidation, equation and application, coefficient of consolidation, degree of consolidation vs time, initial compression, primary compression and secondary compression, normally consolidated, over consolidated and under consolidated clayey deposits,</p> <p>Compaction: Mechanism of compaction, factors affecting compaction, effect of compaction on engineering properties of soils, field compaction equipment and quality control.</p>												CO3	

UNIT-4	Shear Strength of Soils: Stress at a point, Mohr circle of stress, Mohr-coulomb's failure theory, shear tests – direct shear box, unconfined compression, tri-axial compression, and field vane shear tests, shear parameters, types of shear tests in the laboratory based on drainage conditions, shear strength of sands, critical void ratio, thixotropy and dilatancy of sands.	CO4
UNIT-5	Stress-Strain and Elastic Deformation: State of stress, Material failure theory, Material Responses to Normal Loading and Unloading, Plane Strain Condition, Axisymmetric Condition, Soderberg-Goodman model, Boussinesq theory for the determination of vertical stresses due to point loads	CO5
Learning Resources		
Text Books	<ol style="list-style-type: none"> 1. B.C. Punmia, Soil Mechanics and Foundations, (SI Modules), 16/e Laxmi Publications, Sixteenth edition (2017). 2. Gopala Ranjan and A.S.R. Rao, Basic and Applied Soil Mechanics, 2/e, New Age International Publishers, Third edition 2016. 3. Dr.K.R.Arora, Soil Mechanics and Foundation Engineering, Standard Publisher Dist, 2009. 	
Reference Books	<ol style="list-style-type: none"> 1. C. Venkataramaiah, Geotechnical Engineering, New Age International, 2006. 2. M. Braja Das, Principles of Geotechnical Engineering, Cengage Learning, 2013. 3. P. Donald, Coduto, Geotechnical Engineering, Prentice-Hall India, 2010. 	
e-Resources & other digital material	<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/105/101/105101201/ 	