SOIL MECHANICS

Offering Branches	CE		
Course Category:	MINORS	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
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	**Classify** the soil based on particle-size characteristics, liquid limit, and plasticity index.	K2
CO2	**Select** the clay and sandy soil for liner and filter (porous media) application based on their hydraulic behaviour	K2
CO3	**Evaluate** the settlement behavior of the soil under the application of stress	K5
CO4	**Calculate** the factor of safety and ultimate stress for any geotechnical structure	K3
CO5	**Evaluate** the shear strength parameters for field conditions	K5

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	2	2	2					2	3	2
CO2	2	2	2	2	2	2	2					2	2	2
CO3	3	3	3	3	3	3	3					3	2	3
CO4	2	2	2	2	2	2	2					2	3	2
CO5	2	2	2	2	2	3	3					3	2	3
Avg.	**2**	**2**	**2**	**2**	**2**	**2**	**2**					**2**	**2**	**2**

1- Low	2-Medium	3-High

Course Content

UNIT-1	**Soil classification:** Soil formation; Introduction to soil classification; Particle size classification as per IS-code; Unified soil classification system; Indian standard soil classification system, **Clay Chemistry:** Primary minerals; Secondary minerals, Basic structure of clay mineral, Electrical charges on clay Adsorbed water, specific surface area, Diffuse double layer. **Atterberg Limits:** Shrinkage limit, Plasticity Chart, Block Diagram, Simple definitions; some important relationships.	CO1
UNIT-2	**Hydraulic behaviour:** Fundamentals of fluid flow, Bernoulli's Equation, Laminar flow, Turbulent flow, Darcy's law and its Validity, Determination of coefficient of permeability constant and Variable head methods, Factors affecting permeability; Permeability of stratified soil deposits. **Seepage in soil:** Continuity Equation (3D and 2D), Properties of flow net, construction of flow net, use of flow net, Flow net in Anidtropic soil	CO2
UNIT-3	**Compaction:** Mechanism of compaction, factors affecting compaction, effect of compaction on engineering properties of soils **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,	CO3
UNIT-4	**Analysis of Stress-strain:** stress-strain behaviour of soils, Principal Stresses, State of stress, Definition and notation of stress, equations of equilibrium in differential	CO4

	form, stress components on an arbitrary plane, equality of cross shear, stress invariants, principal stresses, octahedral stress, planes of maximum shear, stress transformation, Theories of failure. **Analysis of Strain:** Strains in term of displacement field, engineering shear strains, strain invariants, principal strains, octahedral strains, plane state of strain, compatibility equations, strain transformation.	
UNIT-5	**Shear Strength of Soils:** Elastic and plastic deformations; Interpretation of triaxial test results; Significance of pore pressure parameters; Concept of drained and undrained loading; Unconsolidated undrained triaxial test; Consolidated undrained triaxial test; Consolidated drained triaxial test (CD); Direct shear test; Consolidated drained direct shear test on clay and sand; Shear strength of cohesive and cohesion less soils; Drained and Undrained shear strength of soils, Mohr circle of stress, Mohr-coulomb's failure theory; Determination of shear strength;. Stress path; Drained and Undrained stress path; Stress path with respect to different initial state of the soil; Effect of dilation in sands.	**CO5**

Learning Resources

Text Books	4. B.C. Punmia, Soil Mechanics and Foundations, (SI Modules), 16/e Laxmi Publications, Sixteenth edition (2017). 5. Gopala Ranjan and A.S.R, Rao, Basic and Applied Soil Mechanics, 2/e, New Age International Publishers, Third edition 2016. 6. Dr. K. R Arora, Soil Mechanics and Foundation Engineering, Standard Publisher Dist, 2009.
Reference Books	4. C. Venkataramaiah, Geotechnical Engineering, New Age International, 2006.. 5. M. Braja Das, Principles of Geotechnical Engineering,Cengage Learning, 2013. 6. P. Donald, Coduto, Geotechnical Engineering, Prentice-Hall India, 2010.
e-Resources& other digital material	3. https://nptel.ac.in/courses/105/101/105101201/ 4. http://jntuk-coeerd.in/