Course Type	Course Code	Name of Course	L	T	P	Credit
DC	CEC208	Geotechnical Engineering	3	0	0	9

Course Objective

The main focus of the course is to develop a thorough understanding of the basics of soil behaviour and the mechanics involved for designing of geotechnical systems.

Learning Outcomes

Upon successful completion of this course, students will be able to:
- Comprehend the soil as three-phase materials
- Understand various engineering parameters of soil
- Acquire a basic understanding of soil mechanics required for designing of geotechnical systems.

Unit No.	Topics to be Covered	Lectures	Learning Outcome
1	**Physical Properties:** Overview of soil formation, Soil structure and clay mineralogy, Soil phase relationships, Index properties of granular and fine grained soils, Soil classification systems.	5	Characterisation of soil based on engineering properties
2	**Compaction**: General principles, Factors affecting compaction, Standard and modified Proctor tests, Effect of compaction on engineering properties, Field compaction.	6	Principles and methods of compaction of soil
3	**Permeability and Seepage:** Permeability of soils, Darcy's law, Equivalent permeability in stratified soils, In-situ and laboratory permeability test, Types of heads and seepage forces, Total and effective stress, Two-dimensional Laplace's equation, Flow nets, Uplift pressure, Exit gradient and piping, Filter criteria.	8	Evaluation of flow through soil medium
4	**Compressibility and Consolidation:** Components of total settlement, Compressibility of granular and fine grained soils, Terzaghi's 1-D consolidation theory, Consolidation test, Determination of preconsolidation stress, Overconsolidation ratio, Computation of settlement, Secondary consolidation.	9	Determination of consolidation characteristics of fine grained soil
5	**Shear Strength**: Mechanism of shear resistance, Mohr-Coulomb failure criterion, Measurement of shear strength: Direct shear test, Unconfined compression test, Vane shear test, Triaxial shear test (CD, CU, UU), Pore-pressure parameters, Stress path, Shear strength of clays and sands.	9	Evaluation of shear strength parameters of soil
6	**Stress Distribution**: Boussinesq's equation, Vertical stress due to line load, strip load, Uniformly loaded circular area, Westergaard's approach, Pressure bulb concept, Approximate methods..	5	Estimation of stress distribution

Text Books:
1. Holtz, R.D., Kovacs, W.D., Sheahan, T.C. (2013). An Introduction to Geotechnical Engineering, 2nd Edition, Pearson, India.
2. Ranjan, G. and Rao, A.S.R. (2016). Basic and Applied Soil Mechanics, 3rd Edition, New Age International Publishers, India.

Reference Books:
1. Murthy, V.N.S. (2006). Geotechnical Engineering, Marcel Dekker Inc, New York, USA.
2. Budhu, M. (2010). Soil Mechanics and Foundations, John Wiley & Sons.
3. Lambe, T.W. and Whitman, R.V. (1991). Soil Mechanics, John Wiley & Sons.