B. Tech. Civil Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
CE206: Soil Mechanics	**L**	**T**	**P**	**CE104: Mechanics of Solids**
	3	**1**	**2**	

Course Objective: To help students understand the importance of Soil Mechanics in Civil Engineering by studying soil properties and various aspects of soil behavior under different circumstances and loadings. This is a core subject for Civil Engineers.

S. No.	Course Outcomes (CO)
CO1	Understand the importance of Soil Mechanics. Determination of Index properties, use of functional relationships. Knowing basic concepts of clay minerals and soil structure.
CO2	Identification of soils by their classification and determination of the hydraulic conductivity of soils.
CO3	Determination of seepage through soils and determination of compaction characteristics.
CO4	Determination of stress distribution below ground level due to various surcharges at the ground surface. Determination of shear strength under various drainage conditions.
CO5	Determination of various consolidation parameters and compressibility, and their field applications. Determination of Factor of Safety for infinite and finite slopes and critical failure surface.

S. No	Contents	Contact Hours
UNIT 1	**Introduction**: Introduction to soil mechanics, Rock Mechanics, and geotechnical engineering, importance in civil engineering, nature of soil, soil formation, and soil type. **Simple Soil Properties:** Basic definitions, phase relations, index properties, basic concepts of clay minerals, and soil structure	10
UNIT 2	**Classification and Identification of Soil and Rock**: Field identification, Textural Classification, Indian Standard Soil Classification system, Group Index. Hydraulic Conductivity or permeability, Darcy's law, Discharge and Seepage velocities, Laboratory methods of determination, Factors affecting hydraulic conductivity, Hydraulic conductivity of layered soils, Neutral and effective stresses, Critical hydraulic gradient, Capillary water in soils.	8
UNIT 3	**Seepage:** Laplace's equation for simple flow problems, Flow nets, Seepage calculation from flow nets, Flow nets in anisotropic soil, Seepage pressure, Uplift pressure, Seepage through earth dams, Exit gradient, Piping, Criteria for design of filters. Compaction: General principles, Laboratory determination, Factors affecting compaction, Field compaction.	8

UNIT 4	**Stress Distribution**: Boussinesq equation for vertical stress, The Westergaard equation, Stress distribution under different loaded areas, Stress Distribution: Boussinesq equation for vertical stress, The Westergaard equation, Stress distribution under different loaded areas, Concept of pressure bulb; Newmark's influence chart, contact pressure. **Shear Strength**: Introduction, Mohr's circle of stress, Mohr-Coulomb failure theory, Shear strength parameters, Various Laboratory tests for measurement of shear strength, UU, CU, and CD tests and their relevance to field problems, Plotting of test data, Shear strength characteristics of clays, and sands.	8
UNIT 5	**Compressibility and Consolidation**: Importance of compressibility, effect of soil type, stress history, and effective stress on compressibility. Factors affecting consolidation and compressibility, Normally consolidated and over-consolidated soils, Void ratio-pressure relationship, Coefficient of compressibility and Volume change, Mechanism of consolidation, Terzaghi's theory of consolidation, Determination of Coefficient of Consolidation.	8
	Total	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Basic and Applied Soil Mechanics, 5th edition, New Age International Publishers, New Delhi, Ranjan, Gopal, and Rao, A.S.R.	2023
2	Geotechnical Engineering 6th edition, New Age International Publishers, New Delhi, Venkatramaiah, C.	2018
3	Soil Mechanics and Foundations 17th edition, Laxmi Publications (P) LTD, New Delhi, Punmia, B. C., Jain, Ashok Kumar, Jain, Arun Kumar.	2021
4	Principles of Geotechnical Engineering, 10th edition, Cengage Learning, New Delhi, Das, Braja M.	2022
5	Soil Engineering In Theory and Practice Volume 1, 4th edition or later, CBS Publishers & Distributors Pvt. Ltd., New Delhi, Singh, Alam.	2020