

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
Syllabus for B. Tech in Civil Engineering
 (Applicable from the academic session 2018-2019)

CE(PC)401	Soil Mechanics – I	2L + 1T	3 Credits
Course Outcome	After going through this course, the students will be able to: 1. Classify soil as per grain size distribution curve and understand the index properties of soil. 2. Apply the concept of total stress, effective stress and pore water pressure for solving geotechnical problems. 3. Assess the permeability of different types of soil and solve flow problems. 4. Estimate the seepage loss, factor of safety against piping failure using flow net related to any hydraulic structure. 5. Determine vertical stress on a horizontal plane within a soil mass subjected to different types of loading on the ground surface and also the maximum stressed zone or isobar below a loaded area. 6. Apply the concept of shear strength to analyze different geotechnical problems and determine the shear strength parameters from lab and field tests.		
Prerequisite	Engineering Mechanics		
Module 1	PHYSICAL PROPERTIES OF SOILS: Soil Formation Introduction, Origin of Soil, Formation and Types of soil, Formative classification, Typical Indian Soil, Some Special Types of Soils, Structure and Composition, Clay Mineralogy. Soil as a Three Phase System Basic Definitions, Weight - Volume Relationship, Measurement of Physical		10L + 5T

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	<p>Properties of Soil: Insitu Density, Moisture Content, Specific Gravity, Relative density, Functional Relationships.</p> <p>Index Properties of Soil Introduction, Particle Size Distribution, Mechanical Analysis - Sieve Analysis, Sedimentation Analysis – Hydrometer and Pipette Methods. Consistency of Soil – Atterberg Limits, Different Indices, Discussion on Limits and Indices.</p> <p>Classification of Soil Classification by Structure, Particle Size Classification, Textural System, PRA System (AASHTO Classification), Unified Classification System, As per IS Code Recommendation, Field Identification of Soil, Classification by Casagrande's Plasticity Chart.</p>			
Module 2	<p>Soil Hydraulics Modes of Occurrence of Water in Soil – Free Water, Held Water, Structural Water, Capillary Water, Gravitational Water, Adsorbed Water, Pore Water, Pore Water Pressure, Effective Pressure, Total Pressure, Effective Pressure under Different Conditions and in Different Cases of Flow through Soils, Critical Hydraulic Gradient, Quick Sand Condition.</p>			3L + 1T
Module 3:	<p>Permeability Introduction, Darcy's Law, Coefficient of Permeability, Discharge Velocity, Seepage Velocity, Factors Affecting Permeability. Determination of Coefficient of Permeability – Constant Head and Falling Head Methods, Permeability of Stratified Soil Deposits, Field Determination of Permeability – Unconfined and Confined Aquifers.</p>			3L + 1T
Module 4:	<p>Seepage Analysis Introduction, Seepage, Seepage Pressure, Two Dimensional Flow, Laplace's Equations, Continuity equation, Flow Nets, Flow through Earthen Dam, Estimation of Seepage, Construction, Properties and Use of Flow Nets, Piping and Heaving, Uplift due to Seepage, Design of Fillers.</p>			3L + 1T
Module 5:	<p>STRESS DISTRIBUTION IN SOILS Introduction, Geostatic Stress, Boussinesq's Equation, Determination of Stress due to Point Load, Vertical Stress Distribution on a Horizontal Plane, Isobar and Pressure Bulb, Vertical Stress Distribution on a Vertical Plane, Vertical Stress under Uniformly Loaded Circular Area, Vertical Stress Beneath a Corner of a Rectangular Area, Equivalent Point Load Method, 2:1 Method, Newmark's Influence Chart, Vertical Stress Beneath Line and Strip Loads. Westergaard Analysis, Comparison of Boussinesq and Westergaard Theories, Contact Pressure.</p>			4L + 2T
Module 6	<p>SHEARING STRENGTH OF SOILS Shear Strength of Soil Introduction, Basic Concept of Shear Resistance and Shear Strength of Soil, Mohr Circle of Stress, Sign Conventions, Mohr - Coulomb Theory, Relationship between Principal Stresses and Cohesion. Determination of Shear Parameters of Soil Stress Controlled and Strain Controlled Tests, Laboratory Determination of Soil Shear Parameters- Direct Shear Test, Triaxial Test, Classification of Shear Tests Based on Drainage Conditions, Unconfined Compression Test, Vane Shear Test as per Relevant IS Codes. Stress- Strain Relationship of Clays and Sands, Concept of Critical Void Ratio. Skempton's Pore Pressure Parameters. Sensitivity and Thixotropy of clay. Concept of Stress path.</p>			5L + 3T
Reference	Sl.	Book Name	Author	Publishing House
	1	Textbook of Soil Mechanics and Foundation Engineering (Geotechnical Engineering Series)	V.N.S. Murthy	CBS Publishers
	2	Soil Mechanics and Foundations	Punmia, B.C. and Jain A. K	Laxmi Publications (P) Ltd
	3	Basic and Applied Soil Mechanics	Gopal Ranjan & A.S.R. Rao	New Age International Pvt.Ltd, Publishers
	4	Principles of Geotechnical Engineering	B.M. Das	Thomson Brooks / Cole