

B. Tech. II Year: Semester –IV

Subject Name: Fundamentals of Soil Mechanics

Subject Code: BTCL13402

Type of course: PCC IV

Prerequisite: Basic knowledge of geological cycles

Rationale: The course of action of the curriculum is to make students acquainted with types, significance and characteristics of Soil mechanics.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course.

Content:

Sr. No.	Content	Teaching Hrs.	Module Weightage
1	Geology in Civil Engineering: Branches and scope of geology, Surface processes and landforms, Weathering and Erosion; Introduction to geological agents and their actions, Processes responsible for volcanism, earthquake and plate tectonics, types of plate boundaries, processes and features associated with plate boundaries. Geological Structure - Study of geological faults, folds, joints and active faulting, their origin, types and engineering consideration, Geological investigations during planning for tunnels, dams-reservoirs-runways-roads and buildings, landslide and mass movement, its types, mitigation and prevention.	10	15 %
2	Mineralogy and Petrology: Types and physical properties of major rock forming minerals, occurrence and use of minerals. Introduction to major rock	6	15%

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	types (Igneous, sedimentary and metamorphic rocks); their genesis, classification and structures; engineering properties of rocks, advantages and disadvantages of different rock types at constructions sites.		
3	Basics of Geotechnical Engineering: Introduction, origin and formation of soil, Phase diagram and relationships, terminology and their inter relationships. Determination of Index properties-Specific gravity, water content, density, unit weight, Consistency indices - Atterberg limits and plasticity chart, Relative density, activity, sensitivity and thixotrophy.	8	15 %
4	Particle size analysis and soil classification system Introduction, Size and nomenclature of soil particles as per IS, Particle size analysis (sieve and sedimentation analysis), Particle size distribution curve and its uses. Textural, Unified and BIS soil classification, IS classification method, group index. Field identification and general characteristics of the soil. Soil Structure and Mineralogy: Types of the soil structure, properties, conditions for the formation of different structures. Shape of the particles, Texture and structure of the soil, clay mineralogy.	8	20 %
5	Soil water, Permeability and Seepage analysis: Introduction, Free water and held water, Structural and absorbed water, Capillary Adsorbed water, capillary water, Stress condition in soil, Darcy's law and its validity, coefficient of permeability, field and laboratory methods to determine coefficient of permeability, seepage pressure, quick sand condition, Flow net and its applications.	7	20 %
6	Compaction: Introduction, Standard and modified proctor's compaction tests, factors affecting compaction, Effect of compaction on soil properties, Field compaction methods and equipment.	6	15 %

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	30	15	15	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

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Reference Books:

Sr. no.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Soil mechanics and Foundations	Dr B.C. Punmia, Ashok Jain, Arun Jain	Laxmi Publications(P) Ltd, New Delhi ISBN-13: 978-8170087915 ISBN-10: 8170087910	2005	17 th
2	Soil Mechanics & Foundation Engineering	Arora, K.R	Standard Publication, New Delhi ISBN-13: 81-8014-112-8	2014	7 th
3	Principles of Geotechnical Engineering	Braja M. Das	Thomson Business Information India (P) Ltd., India ISBN-10:8131500500 ISBN-13 978-8131500507	2002	5 th
4	Soil Mechanics Laboratory Testing	Shroff. A. V., Shah D. Fratta, J. Aguetant, and L. R. Smith	Boca Raton, CRC Press, USA eBook ISBN9780429147333	2007	1 st
5	Basic Soil Mechanics & Foundations	Singh Alam,	CBS Publishers & Distributors, New Delhi. ISBN 13:9788123901275	2014	1 st

Course Outcomes: After successful completion of this course, the students will be able to

Sr. No.	CO statement	Marks % Weightage
CO-1	Understand the various natural processes and their influences on the surfacial features also identify different soil forming rocks and minerals.	20%
CO-2	Identify, classify, understand the behavior of soil and evaluate the properties of soil.	30%
CO-3	Understand basics principles of permeability and seepage. Know types of soil water found in nature, it's permeability characteristics and seepage determination	25%
CO-4	Will be able to understand principles of soil compaction and its significant.	25%

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Mapping with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	2	2	-	-	-	-	2	-	-	-	-	-	1	-	1
CO-2	2	2	1	1	-	2	1	2	1	1	-	-	2	1	2
CO-3	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
CO-4	1	1	-	-	-	-	-	1	1	-	-	-	2	1	1

Rationale*: All CO's are compatible and matching to the derived POs to several extents. The study of this subject enables to impart knowledge to the civil engineering students about fundamental science of earth and earth material, mechanism involved soil engineering, its properties, and characteristics.

List of Open learning website:

- <https://nptel.ac.in/courses/105/105/105105106/>
 - Geology,
 - Mineralogy,
 - Petrology
- <https://nptel.ac.in/courses/105/101/105101201/>
 - Basics of soil Mechanics,
 - Classification,
 - Particle Size Distribution,
 - Permeability and Seepage
 - Compaction

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Bachelor of Technology



FOR LAB SESSIONS:

List of Experiments:

1. Determination of Moisture Content
2. Determination of Specific Gravity
3. Field Density Test
4. Grain Size Analysis
5. Determination of Consistency Limits
6. Density/Relative Density Index
7. Determination of Coefficient of Permeability Test
8. Standard Proctor compaction test.

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