22BEAS204 SOIL MECHANICS

Hours Per Week :

L	Т	Р	С	
1	0	2	2	

PREREQUISITE KNOWLEDGE: Nil

COURSE DESCRIPTION AND OBJECTIVES:

This course offers study of the behaviour of soils under the influence of loading forces, soil- water interaction and knowledge on design of foundations, retaining walls, earth dams, clay liners and geosynthetics for waste containment. The objective of this course is to provide a basic understanding of the physical and mechanical characteristics of soils and how to relate these to the engineering behaviour of soil and understanding of the meaning and measurement of parameters for geotechnical engineering design.

MODULE-1

5L+0T+0P=5 Hours

UNIT-1

FUNDAMENTALS OF GEOTECHNICAL ENGINEERING:

Soil formation and soil types, Phase diagrams, Simple definitions, important relationships.

Introduction, Particle size classification as per IS code, Unified soil classification system, Indian standard soil classification system.

UNIT-2

3L+0T+16P=19 Hours

PROPERTIES OF SOIL:

Mechanical analysis - Sieve analysis, Stroke's law, Hydrometer analysis, and Atterberg's limits.

Determination of coefficient of permeability constant and variable head method. Compaction of soils: Laboratory tests, Effects of compaction, Factors affecting compaction, Compaction in the field, Compaction specification and field control. Shear strength of soils: Stress at a point, Mohr circle of stress, Measurement of shear strength, Shear strength of clayey soils & sands, Drainage conditions and strength parameters.

PRACTICES:

- Estimate the water content in a given sample by oven drying method.
- Determine the specific gravity by Density bottle method & Pycnometer method.
- Examine gradation analysis by Mechanical sieve & Hydrometer analysis.
- Determination of Atterberg's Limit & Free Swell Index.
- Interpretation of Field Unit weight by Core cutter & Sand Replacement method.
- Evaluate permeability of a given soil sample by Constant Head & Variable Head Permeability methods.
- Determine compaction of a given sample by Standard Proctor and Modified Proctor test.



Source : https://lh3. googleusercontent.com/ oPwFRGRcNvM

MODULE-2

SKILLS:

- ✓ Identify and classify soils.
- ✓ Determine permeability for different soils.
- ✓ Assess the compaction characteristics of soils.
- Measure the effective stresses in soils at different conditions.
- ✓ Measures shear strength parameters of soil at different drainage conditions.

PERMEABILITY, STRESS DISTRIBUTION AND CONSOLIDATION :

Capillary rise, Darcy's law and its validity, Factors affecting permeability, Permeability of stratified soil deposits: Total, Neutral and effective stresses, Seepage force, Quick sand condition, Flow nets – Characteristics and uses.

UNIT-2

UNIT-1

4L+0T+16P=20 Hours

4L+0T+0P=04 Hours

Introduction, Boussin equation, Vertical stress distribution diagrams, Vertical Stress beneath loaded areas, Newmark's influence chart, approximate stress distribution method for loaded areas, Westergaard's equation. Consolidation: Introduction, Time rate of consolidation, Consolidation test, Computation of settlement.

PRACTICES:

• Find unconfined compression test for a soil sample.

STRESS DISTRIBUTION AND CONSOLIDATION OF SOILS:

- Determine direct shear test.
- Determine Vane shear test.
- Examine Triaxial test by: Unconsolidated Undrained, Consolidated Undrained, Consolidated Drained.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify the index properties and classification of soil along with the basic concepts of geotechnical engineering.	Apply	1	1, 2, 5, 6
2	Analyze the compressibility, consolidation and shear strength parameters.		2	1, 2, 5
3	Assess the basic properties of soil.	Evaluate	1	1, 2
4	Determine the permeability and seepage analysis.	Evaluate	1, 2	1, 2, 5
5	Compute the settlement in shallow foundation.	Create	2	1, 2, 5, 6, 8

TEXT BOOKS:

- 1. Arora. K. R, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, Delhi, 7th re-print edition, 2020.
- 2. Venkatramaiah. C, "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 5th edition, 2017.

REFERENCES:

- 1. Venkatramaiah. C, "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 5th edition, 2017.
- 2. Manoj Datta, S. Gulhati, "Geotechnical Engineering", Tata McGraw Hill Education Ltd., 1st edition, 2008.
- 3. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Soil Mechanics and Foundation", Laxmi Publications Pvt. Ltd., New Delhi, 16th edition, 2005.
- 4. Gopal Ranjan and A. S. R. Rao, "Basic and Applied Soil Mechanics", New Age International Pvt. Ltd., New Delhi, 2nd edition, 2004.