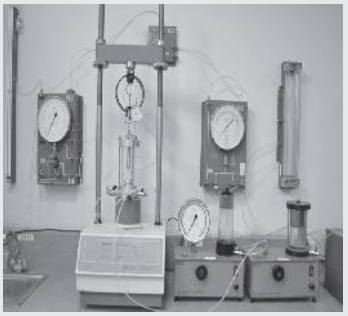
19AG205 SOIL MECHANICS



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Hours Per Week :

L	T	P	C
1	0	2	2

Total Hours :

L	T	P
15	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
2	40	2	5	2	2

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the relationships between physical characteristics and mechanical properties of soils. The objective of this course is to equip the students with the fundamental knowledge on soil physical parameters, permeability, compaction, consolidation, earth pressure and stability of slopes.To impart the students the fundamentals of soil mechanics and to enable the students to understand the basic, index and engineering properties of soil.

COURSE OUTCOMES:

Upon completion of the course, student will able to achieve the following outcomes:

COs	Course Outcomes	POs
1	Apply the physical and mechanical soil properties commonly used in engineering practices.	1
2	Evaluate and analyse the shear strength of soil for different conditions of load applied.	2
3	Analyse engineering science principles, using shear strength and compressibility parameters, to analyze the response of soil under external loading.	6
4	Perform creative studies on soil characteristics for different locations.	5

SKILLS:

- ✓ *Determine soil moisture content, bulk density, soil texture value and classify soil.*
- ✓ *Test soil compaction, consolidation and strength for different locations.*
- ✓ *Perform sieve analysis test for soil characterization.*
- ✓ *Find the response of soil under external loading principles, using shear strength and compressibility parameters.*
- ✓ *Perform studies on soil characteristics for different locations.*

UNIT - I **L-3**

Nature of soil and functional relationships**:** Formation of soils - soil type - 3 phase system - void ratio - specific gravity - dry density - porosity - water content - saturated unit weight - submerged unit weight - degree of saturation - soil structure: single grained, honey combed, flocculated and dispersed structure and their effects on the basic soil properties.

Laboratory and field identification of soils: Determination of water content by oven drying - Specific gravity using pycnometer and specific gravity bottle - Grain size analysis by sieve analysis, hydrometer analysis and pipette analysis - Atterberg limits and indices visual identification by simple field tests - Field density by core cutter, sand replacement and wax coating methods.

UNIT - II **L-3**

Classification of soils: Necessity - Principles of classification - I.S. classification - plasticity charts – Group index.

Soil water: Modes of occurrence - adsorbed and capillary water types - Total stress - Effective stress - Pore pressure - Pressure diagrams, elementary concept of Boussinesq and Westerguards analysis, new mark influence chart.

Permeability: Definition - Darcy's law - Factors affecting permeability - Laboratory determination - Stratified soils: average permeability.

Seepage analysis: Quick condition-two dimensional flow-Laplace equation, Velocity potential and stream function, Flow net construction.

UNIT - III **L-3**

Shear Strength: Shear strength, Mohr stress circle, theoretical relationship between principle stress circle, theoretical relationship between principal stress, Mohr coulomb failure theory, effective stress principle. Determination of shear parameters by direct shear test, triangle test and vane shear test. Numerical exercise based on various types of tests.

UNIT - IV **L-3**

Compaction: Composition of soils standard and modified protector test, abbot compaction and Jodhpur mini compaction test field compaction method and control. Consolidation of soil: Consolidation of soils, one dimensional consolidation spring analogy, Terzaghi's theory, Laboratory consolidation test, calculation of void ratio and coefficient of volume change, Taylor's and Casagrande's method, determination of coefficient of consolidation.

UNIT - V **L-3**

Earth pressure: Plastic equilibrium in soils, active and passive states, Rankine's theory of earth pressure, active and passive earth pressure for cohesive soils, simple numerical exercises. Stability of slopes: introduction to stability analysis of infinite and finite slopes friction circle method, Taylor's stability number.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

Measurement of the following chassis frames:

1. Determination of water content of soil.
2. Determination of specific gravity of soil.
3. Determination of field density of soil by core cutter method.
4. Determination of field density by sand replacement method.
5. Grain size analysis by sieving (Dry sieve analysis).
6. Grain size analysis by hydrometer method.
7. Determination of liquid limit by Casagrande's method.
8. Determination of liquid limit by cone penetrometer and plastic limit.
9. Determination of shrinkage limit.
10. Determination of permeability by constant head method.
11. Determination of permeability by variable head method.
12. Determination of compaction properties by standard proctor test.
13. Determination of shear parameters by direct shear test.
14. Determination of unconfined compressive strength of soil.
15. Determination of shear parameters by Tri-axial test.
16. Determination of consolidation properties of soils.
17. Practical examinations.

TEXT BOOKS:

1. B. C. Punmia and A. K. Jain,2005, "Soil Mechanics and Foundations", 16th edition, LaxmiPublishing,New Delhi.
2. N. C. Brady,2008, "The Nature and Properties of Soil", 10th edition, Macmillan Publishing Company, New York.

REFERENCES BOOKS:

1. B. M. Das and G. V. Ramana, 2010,"Principles of Soil Dynamics", 2nd edition, Cengage Learning.
2. V. N. S. Murthy,2008, "Soil Mechanics and Foundation Engineering", 1st edition, CBS Publishers,New Delhi.
3. B. Singh and S. Prakash,2010, "A Text Book of Soil Mechanics", New Chand and Bros., Roorkee.