# 16AG204 SOIL MECHANICS

Hours Per Week :

| L | T | P | C |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

Total Hours :

| L | T | P |
|---|---|---|
| 30 | 15 | 30 |

| WA/RA | SSH/HSH | CS | SA | S | BS |
|---|---|---|---|---|---|
| 5 | 40 | 5 | 8 | 5 | - |

## 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.

## Course Outcomes:

The student will be able to:

- understand the relationships between physical characteristics and mechanical properties of soils.
- measure the physical and mechanical soil properties commonly used in engineering practices.
- understand the shear test of soil.
- apply engineering science principles, using shear strength and compressibility parameters, to analyze the response of soil under external loading.

## 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.*

**ACTIVITIES:**

- *Perform various soil tests using drier, handling balancer, sieves etc.*
- *Preparation of soil samples, perform compaction and consolidation strength tests.*
- *Classify soil based on analysis of different soil properties.*
- *Differentiate soil characteristics based on analysis of soil test results.*

**UNIT- 1** **L-06,T-03**

**INTRODUCTION OF SOIL MECHANICS** : Introduction of soil mechanics, Field of soil mechanics, Phase diagram, Physical and index properties of soil, Classification of soils, General classification based on particles size, Textural classification and I.S. soil classification system, Stress condition in soils, Effective and neutral stress, Elementary concept of Bousinesque and Wester guards analysis, New mark influence chart.

**UNIT- 2** **L-06,T-03**

**SHEAR STRENGTH :** Mohr stress circle, Theoretical relationship between principle stress circles, Theoretical relationship between principal stress Mohr-coulomb failure theory, Effective stress principle, Determination of shear parameters by direct shear to be circle, Theoretical test, Numerical exercise based on various types of tests.

**UNIT- 3** **L-06,T-03**

**COMPACTION AND CONSOLIDATION :** Compaction, Composition of soils, Standard and modified Proctor test, Abbot compaction and Jodhpur mini compactor, Field compaction method and control, Consolidation of soil- one dimensional consolidation spring analogy, Terzaghi's theory, Laboratory consolidation test, Calculation of void ratio and coefficient of volume change, Taylor's and Casagrande method, Determination of coefficient of consolidation.

**UNIT- 4** **L-06,T-03**

**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 exercise.

**UNIT- 5** **L-06,T-03**

**STABILITY OF SLOPES :** Introduction to stability analysis of infinite and finite slopes, Friction circles method, Taylor's stability number.

## LABORATORY EXPERIMENTS

**LIST OF EXPERIMENTS** **Total hours: 30**

1. Determination of water content of soil.
2. Determination of specific gravity of soil.
3. Field density of soil: core cutter method.
4. Field density: sand replacement method.
5. Grain size analysis: sieving (Dry sieve analysis).
6. Grain size analysis: hydrometer method.
7. Liquid limit: Casagrande's method.
8. Liquid limit: cone penetrometer and plastic limit.
9. Shrinkage limit.
10. Permeability: constant head method.
11. Permeability: variable head method.
12. Compaction properties: standard proctor test.
13. Shear parameters: direct shear test.
14. Unconfined compressive strength of soil.

15. Shear parameters :Tri-axial test.

16. Consolidation properties of soils.

**TEXT BOOKS:**

1. B. C. Punmia and A. K. Jain, “Soil Mechanics and Foundations”, 16th edition, Laxmi Publishing, New Delhi, 2005.

2. V. N. S. Murthy, “Soil Mechanics and Foundation Engineering”, 1st edition, CBS Publishers, New Delhi, 2008.

**REFERENCE BOOKS:**

1. N. C. Brady, “The Nature and Properties of Soil”, 10th edition, Macmillan Publishing Company, New York, 2008.

2. B. M. Das and G. V. Ramana, “Principles of Soil Dynamics”, 2nd edition, Cengage Learning, 2010.

3. B. Singh and S. Prakash, “A Text Book of Soil Mechanics”, New Chand and Bros., Roorkee, 2010.

**WEB LINKS:**

1. http://nptel.ac.in/courses/105103097/

2. http://ecoursesonline.iasri.res.in/course/view.php?id=8