INSTITUTE OF AERONAUTICAL ENGINEERING



(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

SOIL MECHANICS LABORATORY								
V Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
ACED24	Core	L	Т	Р	С	CIA	SEE	Total
		0	0	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45				Total Classes: 45		
Prerequisite: Nil								

I. COURSE OVERVIEW:

This course will show how to conduct the various types of tests used for soil testing. Each experiment of soil testing is presented with brief introduction covering the important details of the experiment, the theory and the purpose for which it is to be performed, followed by the detailed explanation of apparatus required, procedure and specimen calculations. These should enable students to perform the experiment and compute the results of experiments very easily.

II. COURSE OBJECTIVES:

The students will try to learn:

- I. Principles and procedures for conducting soil processing and moisture content tests, specific gravity tests, and field density tests.
- II. Methods to perform grain size analysis, determine consistency limits, and conduct laboratory compaction and permeability tests.
- III. The techniques for laboratory permeability tests and gain an understanding of shear strength testing.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

- CO 1 Perform soil processing and moisture content tests, specific gravity tests, field density tests, and grain size analysis effectively.
- CO 2 Analyze grain size data, determine consistency limits, and conduct laboratory compaction and permeability tests with proficiency.
- CO 3 Choose the suitable method for determining soil permeability to assess drainage characteristics, predict the rate of consolidation, and anticipate soil bed settlement.
- CO 4 Develop the skills necessary to perform shear strength tests and gain knowledge of consolidation tests.
- CO 5 Apply their knowledge to real-world geotechnical engineering projects, ensuring the safe and efficient use of soil in construction.
- CO 6 Analyze and interpret geotechnical data, making informed engineering decisions for various applications.

COURSE CONTENT:

Week - 1: DETERMINATION OF MOISTURE CONTENT OF SOILS

Determine the natural moisture content of the given soil sample.

Week – 2: DETERMINATION OF SPECIFIC GRAVITY OF SOILS

Determine the specific gravity of soil fraction passing 4.75 mm I.S sieve by density bottle.

Week - 3: DETERMINATION OF ATTERBERG'S LIMITS OF LIQUID AND PLASTIC LIMIT OF SOILS

Determine liquid limit, plastic limit, shrinkage limit, classify the soil and to find flow index and toughness index.

Week - 4: DETERMINATION OF ATTERBERG'S LIMITS OF SHRINKAGE LIMIT OF SOILS

Determine shrinkage limit, classify the soil and to find flow index and toughness index.

Week -5: DETERMINATION OF FIELD DENSITY- CORE CUTTER AND SAND REPLACEMENT METHOD

Determine the mass density of soils by core cutter method and replacement method.

Week - 6: GRAIN SIZE ANALYSIS OF SOILS

Classify the Coarse-Grained soils based on sieve analysis.

Week - 7: PERMEABILITY OF SOIL: CONSTANT AND VARIABLE HEAD TEST

Determine coefficient of permeability of given soil sample at desired density by a suitable method.

Week - 8: DETERMINATION OF OMC AND MDD OF SOIL USING COMPACTION TEST

Determine the optimum moisture content and maximum dry density of a soil by proctor test.

Week – 9: DETERMINATION OF CALIFORNIA BEARING RATIO OF SOILS

Determine the California bearing ratio by conducting a load penetration test in the laboratory.

Week - 10: DETERMINATION OF CONSOLIDATION PARAMETERS IN SOILS

Determine the settlements due to primary consolidation of soil by conducting one dimensional test.

Week - 11: DETERMINATION OF UNCONFINED COMPRESSION STRENGTH IN SOILS

Determine the unconfined compressive strength of cohesive soil sample and its sensitivity.

Week -12: DETERMINATION OF SHEAR PARAMETERS USING TRIAXIAL COMPRESSION TEST

Determine shear strength parameter i.e. angle of shearing resistance and cohesion of a given soil sample.

Week - 13: DETERMINATION OF SHEAR PARAMETERS USING DIRECT SHEAR TEST

Determine shear strength parameters of the given soil sample at known density and moisture content by direct shear test.

Week - 14: DETERMINATION OF SHEAR PARAMETERS USING VANE SHEAR TEST

Determine the shear strength of clay specimen.

V. TEXT BOOKS:

- 1. Das, B M., and N Sivakugan, "Fundamentals of Geotechnical Engineering", Cengage Learning, 2016.
- 2. Murthy, V. N. S, "Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering", CRC press, 2002.

VI. REFERENCE BOOKS:

- 1. Das, B M. "Soil Mechanics Laboratory Manual", Engineering Press at OUP, 2021.
- 2. Kalinski, Michael E. "Soil Mechanics: Lab Manual", John Wiley & Sons, 2nd Edition, 2011.

VII. ELECTRONICS RESOURCES:

- 1. https://onlinecourses.nptel.ac.in/noc23_ce72/preview
- 2. https://onlinecourses.nptel.ac.in/noc22_ce60/preview

VIII. MATERIAL ONLINE:

- 1. Course template
- 2. Lab Manual