COURSE CODE	**CE-224**
COURSE NAME	**SOIL MECHANICS**
CREDIT HOURS	Theory: 2 Practical: 1 Total: 3
CONTACT HOURS	Theory: 32 Practical: 48 Total: 80

PREREQUISITE:

MODE OF TEACHING:

Instruction: Two hours of lecture per week 66%

Practical/ Laboratory Demonstration: Three hours of Lab work per week 33%

COURSE DESCRIPTION:

This course provides an elementary introduction to Soil Mechanics and provides the basic mechanics necessary for the detailed study of Geotechnical Engineering. This course aims to provide an understanding of the nature of soils as engineering materials; common soil classification schemes; the importance of water in the soil and the effects of water movement; and the stress-strain-strength response of soils.

COURSE OBJECTIVES:

The objective of this course is to provide the students with an in-depth knowledge and understanding of the various types of soils, their classifications, compaction, permeability and shear strength parameters.

RELEVANT PROGRAM LEARNING OUTCOMES (PLOs):

The course is designed so that students will achieve the PLOs:

1	Engineering Knowledge	✓	7	Ethics	☐
2	Problem Analysis	✓	8	Individual and Collaborative Team Work	☐
3	Design/Development of Solutions	☐			
4	Investigation	✓	9	Communication:	☐
5	Tool Usage	☐	10	Project Management and Finance	☐
6	The Engineer and the World	✓	11	Lifelong Learning	☐

COURSE LEARNING OUTCOMES:

1. Upon successful completion of the course, the students will be able to:

S.No	CLO	Domain	Taxonomy Level	PLO
1	Discriminate soils using various soils classification systems and differentiate the soil compaction methods	Cognitive	4	1
2	Analyze problems of seepage through	Cognitive	4	2

	soils and soil stresses			
3	Conduct tests in the laboratory and in the field to determine various properties of the soil for use in geotechnical characterization of soils.	Psychomotor	4	4
4	Show concern for safety guidelines and safety of others in the Lab and field investigations.	Affective	3	6

PRACTICAL APPLICATIONS:

All structures that we see around us are founded on soil. This course aims to provide an understanding of the nature of soils as engineering materials; common soil classification schemes; the importance of water in the soil and the effects of water movement; and the stress-strain-strength response of soils. These all factors combined forms the basis for design of shallow and deep foundations for building, roads, bridges and any other civil engineering structure resting on ground.

TOPICSCOVERED WITH THEIR CONTRIBUTION TO PLOs:

Theory:

Week	Topic Covered	Reading Assignment/ Home Work		CLO No.	Assessment Methodology
1-2	**Introduction** • Introduction to soil mechanics and geotechnical engineering • Significance of geotechnical engineering • Soil formation, transportation, sorting, and deposition • Types of soil deposits and their properties • Soil types, soil structure and clay minerals.	Textbook# 1 Ch# 2	Assignment 1	1	Assignments, Quizzes, MSE, ESE
3-5	**Index and Physical Properties** • Basic physical and index properties of soil • Water content, void ratio, porosity, degree of saturation, air voids, unit weights, specific gravity etc. • Phase relationships, and numerical examples • Particle size and shapes, sieve Analysis, hydrometer Analysis. • Consistency and various states of fine-grained soils	Textbook# 1 Ch# 2 & 3	Assignment 2 Quiz 1 Quiz 2	1	

	• Atterberg's limits • Related numerical examples.				
4-7	**Soil Classification Systems** • Importance of soil classification • Grain size distribution, gradation curves and interpretation • Soil classification systems, textural classification system, AASHTO soil classification system, Unified soil classification system, and description of their subgroups. Related numerical examples	Textbook# 1 Ch# 5	Assignment 3 Quiz 3	1	
9	**Mid Semester Exam**				
10-12	**Compaction of soils** • Compaction of soils • Fundamentals of compaction • Standard and modified proctor compaction tests • Moisture density relationship • Compaction standards • Factor effecting compaction • Field control and measurement of in situ density and field compaction Numerical examples and assignments	Textbook# 1 Ch# 6	Assignment 4	1	Assignments, Quizzes, MSE, ESE
13-14	**Permeability and Seepage** • Permeability and Seepage • Darcys's law • Factors affecting permeability • Laboratory and field determination of permeability • Seepage forces • Introduction to flow net Related numerical examples	Textbook# 1 Ch# 7 & 8	PBL Assignment 5	2, 4	
15-16	**In-situ Stresses** Stress condition in soil: effective and neutral stresses, stresses in saturates soils with upward and downward seepages	Textbook# 1 Ch# 9 &10	Quiz 5	2	
17-18	**End Semester Exam**				

Practical:

S No.	Practical	Assessment Methodology	Learning Domain/ Taxonomy Level

1	To determine moisture content of soil in laboratory	Lab Manual, Lab Quiz, Lab Rubrics, OEL	P3, A2
2	To determine specific gravity of fine-grained soils in the laboratory		P3, A2
3	To determine particle size distribution of soils using sieve and hydrometer analyses.		P3, A2
4	To determine Atterberg's consistency limits of soils		P3, A2
5	To determine laboratory compaction characteristics of soils using standard and modified Proctor compaction test procedures		P3, A2
6	To determine in-place/in-situ/field density of soils		P3, A2
7	To determine permeability of soils using standard constant head and falling head permeability tests		P3, A2

TEXT AND MATERIAL:

Textbook (s)

1. Das & Sobhan (2018). Principles of Geotechnical Engineering. 9th.
2. Das (2009). Fundamentals of Geotechnical Engineering. 3rd
3. Whitlow (2001). Basic soil mechanics, 4th.

References Material:

1. Mitchell & Soga (2005). Fundamentals of soil behavior, 3rd.
2. Holtz & Kovac (1981) An Introduction to Geotechnical Engineering.
3. Whitlow (2001) Basic Soil Mechanic
4. Terzaghi (1943) Theoretical Soil Mechanics.

ASSESMENT SYSTEM:

Assessment System for Theory

	Without Project (%)	**With Project/Complex Engineering Problems (%)**
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

Assessment System for Lab

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assessment/ Viva	20%