DEPARTMENT OF CIVIL ENGINEERING
SCHEME OF COURSE WORK

Course Title	**Geotechnical Engineering-I**		
Course Code	**20CE1113**	**L T P C**	**: 3 0 0 3**
Program:	**B. Tech**		
Specialization:	**Geotechnical Engineering**		
Semester	**V**		
Prerequisites	**Engineering Mechanics**		
Courses to which it is a prerequisite	**: None**		

Course Outcomes (COs):

At the end of the course, the student will be able to:

CO1	Classify soil and their engineering properties.
CO2	Understand importance of permeability, seepage and its effects.
CO3	Understand stress behavior of soils under external load applications.
CO4	Analyse settlement behaviour of soil under compaction and consolidation.
CO5	Distinguish failure mechanism under the influence of different loading and drainage conditions.

Program Outcomes (POs):

Graduates will be able to:

1	Apply the knowledge of mathematics, science, engineering fundamentals to solve complex civil engineering problems.
2	Attain the capability to identify, formulate and analyse problems related to civil engineering and substantiate the conclusions.
3	Design solutions for civil engineering problems and design system components and processes that meet the specified needs with appropriate consideration to public health and safety.
4	Perform analysis and interpretation of data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions.
5	Select and apply appropriate techniques from the available resources and modern civil engineering and software tools, and will be able to predict and model complex engineering activities with an understanding of the practical limitations.
6	Carry out their professional practice in civil engineering by appropriately considering and weighing the issues related to society and culture and the consequent responsibilities.
7	Understand the impact of the professional engineering solutions on environmental safety and legal issues.
8	Transform into responsible citizens by resorting to professional ethics and norms of the engineering practice.
9	Function effectively in individual capacity as well as a member in diverse teams and in multidisciplinary streams.
10	Communicate fluently on complex engineering activities with the engineering community and society, and will be able to prepare reports and make presentations effectively.
11	To demonstrate knowledge and understanding of the engineering and management principles and apply the same while managing projects in multidisciplinary environments.
12	Engage them in independent and life-long learning in the broadest context of technological change while continuing professional practice in their specialized areas of civil engineering.

Program Specific outcomes:

1.	Collect, process and analyse the data from topographic surveys, remote sensing, hydrogeological investigations, geotechnical explorations, and integrate the data for planning of civil engineering infrastructure.
2.	Analyse and design of substructures and superstructure for buildings, bridges, irrigation structures and pavements.
3.	Estimate, cost evaluation, execution and management of civil engineering projects.

Course Outcome versus Program Outcomes & Program Specific outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	2	2	1	2	2	2	-	2	-	2	-	-	2	2	2
CO-2	2	2	2	2	1	-	-	-	-	-	-	-	1	2	-
CO-3	3	2	2	2	-	-	-	-	-	-	-	-	1	2	-
CO-4	3	3	2	2	2	-	-	-	-	-	-	-	1	2	-
CO-5	1	2	2	2	1	-	-	-	-	-	-	-	2	2	-

3 - Strongly correlation, 2 - Moderately correlation, 1- low correlation, Blank - No correlation

Assessment Methods:	Assignment / Seminar / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week No.	TOPIC / CONTENTS	CO	Sample questions	Teaching-Learning Strategy	Assessment Method & Schedule
1	**INTRODUCTION:** Soil formation – soil structure and clay mineralogy	CO1	Explain clay mineralogy	▫ Lecture/ Discussion	
2	Adsorbed water – Mass- volume relationship – Relative density.	CO1	Explain the term adsorbed water. Write the expression for relative density.	▫ Lecture ▫ Problem solving	
3	**INDEX PROPERTIES OF SOILS:** Moisture Content, Specific Gravity, Insitu density, Grain size analysis	CO1	Write about index properties of soils.	▫ Lecture Problem solving	
4	Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils	CO1 CO1	Write about Sieve analysis. Explain the IS classification of soils	▫ Lecture	Assignment
5	**PERMEABILITY:** Soil water – capillary rise – flow of water through soils – Darcy's law- permeability – Factors affecting permeability.	CO2	Explain the factors affecting permeability.	▫ Lecture Problem solving	
6	Laboratory determination of coefficient of permeability – Permeability of layered systems.	CO2	Determine the expression of coefficient of permeability by using laboratory methods.	Lecture Problem solving	
7	**SEEPAGE THROUGH SOILS:** Total, neutral and effective stresses – quick sand condition– Seepage	CO2	Explain Quick Sand Condition. Write about the seepage of soils.	Lecture Problem solving	Assignment

	through soils				
8	Flownets: Characteristics and Uses	CO2	Explain the characteristics and uses of Flownets.	▫ Lecture Problem solving	
9	**MID TEST - I**				
10	**STRESS DISTRIBUTION IN SOILS:** Boussinesq's and Westergaard's theories for point loads and areas of different shapes	CO3	Deduce the Boussinesq's expression for stress distribution of soils. Write the Westergaard's expression of stress distribution for different shapes.	▫ Lecture	
11	Newmark's influence chart.	CO3	Write about Newmark's Influence chart.	▫ Lecture	Assignment
12	**COMPACTION:** Mechanism of compaction – factors affecting – effects of compaction on soil properties.	CO4	Explain the various factors affecting compaction of soil properties.	▫ Lecture	
13	Field compaction Equipment – compaction control.	CO4	Write about field compaction equipment.	▫ Lecture	
14	**CONSOLIDATION:** stress history of clay; compressibility of soils; Terzaghi's 1-DTheory.	CO4	Write about compressibility of soils	▫ Lecture	
15	Consolidation tests; preconsolidation pressure. e-p and e-log p curves – Total settlements.	CO4	Write about preconsolidation pressure.	▫ Lecture	
16	**SHEAR STRENGTH OF SOILS:** Mohr – Coulomb Failure theories – Types of laboratory strength tests – strength tests based on drainage conditions –	CO5	Explain the strength tests based on drainage conditions.	▫ Lecture	Assignment
17	Shear strength of sands – Critical Void Ratio – Liquefaction- shear strength of clays. Pore pressure coefficients	CO5	Explain liquefaction of soils. Write about shear strength of soils.	▫ Lecture	
18	**MID TEST - II**				
	END EXAM				