SCHEME OF COURSE WORK

Course Details

Course Title	**Geotechniques for Infrastructure**		
Course Code	**13CE 2113**	**L P C**	**4 0 3**
Program:	**M. Tech.**		
Specialization:	**Infrastructure Engineering and Management**		
Semester	**II**		
Prerequisites	**Geotechnical Engineering and Foundation Engineering**		
Courses to which it is a prerequisite	**None**		

Course Outcomes (COs):
At the end of the course, the student will be able to:

1	Demonstrate an ability to understand the soil structure system under raft foundation
2	Estimate the lateral load capacity of piles and pile groups.
3	Explain suitability of various foundation systems for towers and chimneys.
4	Justify the various alternative foundation systems on weak soils.
5	Analyse sheet piles and bulk heads

Program Outcomes (POs):
Post graduates will be able to:

1	Synthesize existing and new knowledge in various sub areas of structural engineering
2	Analyse complex engineering problems critically with adequate theoretical background for practical applications.
3	Evaluate a wide range of feasible and optimal solutions after considering safety and environmental factors.
4	Demonstrate the ability to pursue research by conducting experiments and extract the relevant information through literature surveys.
5	Use state-of-the-art of modern tools for interpreting the behaviour and modeling of complex engineering structures.
6	Attain the capability to work in multi disciplinary teams to achieve common goals.
7	Demonstrate the knowledge to perform the projects efficiently in multi disciplinary environment after consideration of economical and financial matters.
8	Communicate effectively on complex engineering activities to prepare reports and make presentations.
9	Engage in life-long learning independently to improve knowledge.
10	Understand the responsibility of carrying out professional practices ethically for sustainable development of society.
11	Examine critically and independently one's actions and take corrective measures by learning from

	mistakes.

Course Outcome versus Program Outcomes:

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

S - Strongly correlated, *M - Moderately* correlated, *Blank - No correlation*

Assessment Methods	Assignment / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week No.	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Foundations, their types and uses, choice of foundation systems, Purpose of selecting a raft foundation, types of rafts, use of rafts depending on loads and soil conditions, field examples	CO1	Write a short note on the computation of allowable bearing pressure for a mat foundation?	Lecture & problem solving	Test-1 Assignment
2	Lateral load test, Stiffness / rigidity of rafts, formulae, numerical problems	CO1	Describe the lateral pile load test as per IS: 2911 (Part 4) – 1985, with a neat sketch.	Lecture & problem solving	Test-1 Assignment
3	Allowable soil pressures for rafts in c=0 and c-ϕ soils, calculation of bearing capacity of raft foundation	CO1	Write a short note on the computation of allowable bearing pressure for a mat foundation?	Lecture & problem solving	Test-1
4	Lateral load carrying capacity of piles, p-y method and Evans & Duncan's methods.	CO2	Describe the p-y method?	Lecture & problem solving	Test-1 Assignment
5	Effect of pile group on lateral load carrying capacity.	CO2	Explain about the Ultimate Load Analysis of laterally loaded piles proposed by Broms, for unrestrained and restrained piles in sands	Lecture & problem solving	Test-1 Assignment

6	Behavior of pad and chimney foundations	CO3	Write a short note on the checks for safety against uplift and overturning of a chimney and pad foundation	Lecture & problem solving	Assignment
7	design of chimney and pad foundation	CO3	Write a short note on the checks for safety against uplift and overturning of a chimney and pad foundation	Lecture & problem solving	Test-1 Assignment
8	Numerical problems on chimney and pad foundation	CO3	Checks for lateral resistance, uprooting of the stub of a chimney and pad foundation	problem solving	Test-1 Assignment
9	**TEST – I**				
10	design of foundations for concrete towers and chimneys	CO3	Design a suitable foundation for a 20^0 angle tower to be used in a double circuit 132kV transmission line. The foundation is located in a medium dense sand with $\Phi = 30^0$ and $\gamma = 17kN/m^3$. Depth of GWT is 5m below the GL.	Lecture & problem solving	Test-2 Assignment
11	Foundation techniques for construction on weak and compressible soils	CO4	Explain about the foundation techniques for construction on soft soils	Lecture & problem solving	Test-2 Assignment
12	Foundation techniques on expansive soils and estimation of heave and typical structural distress patterns.	CO4	Explain the CNS layer method	Lecture & problem solving	Assignment
13	Differences between a sheet pile and a bulkhead, types of sheet piles	CO5	What is the difference between a sheetpile, cofferdam and a bulkhead?	Lecture & problem solving	Test-2 Assignment

14	Determination of depth of embedment of a sheet pile, general principles of design of cantilever sheetpiling in granular soils	CO5	Analyse a cantilever sheet pile wall in cohesionless soil	Lecture & problem solving	Test-2 Assignment
15	Design of cantilever sheetpiling in cohesive soils, free and fixed earth support methods for design of anchored bulkheads	CO5	Explain the stability analysis of an anchored sheet pile using the fixed earth support method	Lecture & problem solving	Test-2 Assignment
16	Numerical problems on design of anchored bulkheads	CO5	A cantilever sheet pile is to be installed in cohesionless soil of unit weight=2t/m^3 and $\Phi' = 30^0$. The height above the dredge level is 6m and water level above the dredge level is 3m. Estimate the depth of penetration needed for the sheet pile for stability.	problem solving	Test-2 Assignment
17	**Revision**				
18	**TEST - II**				
	END EXAM				