GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Structural Engineering

Course / Subject Code : ME01000091

Course / Subject Name : Advance Design of Foundation of Structures

w. e. f. Academic Year:	2024-25
Semester:	1st Semester
Category of the Course:	PEC

Prerequisite:	Soil Mechanics, Foundation Engineering and relevant IS codes
Rationale:	Foundation system is an important component of any civil engineering structure. The structural loads of buildings, bridges, towers, and other civil engineering works must be transmitted to the underlying natural soil or rock using a foundation system that is safe. Its proper selection will ultimately lead to serviceability, stability against various forces and economy of the project. The course on Analysis and Design of Foundation Systems provides the students necessary design knowledge with latest field practices and codal provisions. This will help them to analyze and design suitable foundation systems under different loads and soil conditions.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes
01	Apply various design approaches, selection of proper foundation system as per sub-soil conditions based on codal provisions and theoretical practice followed.
02	Analyze and design rigid and flexible foundation systems using elastic theories based on numerical and analytical approaches through software including soil structure interaction effect.
03	Design temporary and permanent soil retaining structures, excavation supports, foundations in water bodies and high embankments.
04	Apply conceptual knowledge of special foundations such as batter piles, shell foundations and sheet pile walls for various applications such as resisting high lateral loads.

Teaching and Examination Scheme:

Teaching Scheme(in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Limit State Design of Foundations**		
	Introduction to Limit State Design of reinforced concrete in foundations; Bearing capacity of Foundations, Settlement computations of various foundation types and their related IS Codal provisions.	04	10
2.	**Foundations Design**		
	Design of Shallow foundations: Structural design of reinforced concrete spread footings, rectangular, trapezoidal and strap beam; continuous footings, individual footings, combined footings and rafts of various types subjected to vertical and lateral loads and moments	16	40
	Soil structure interaction and 'flexible' approach to the design of foundations; Winkler foundation	07	10
	Structural design of piles including pile caps, under reamed piles, battered piles, pile-raft, Sheet Pile Walls; Cantilever and Anchored sheet pile walls	12	25
	Structural design of retaining walls; Cantilever and Counter Fort earth retaining walls with Structural and foundation stability computations	06	15
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	20	25	25	10	10

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Joseph E Bowles,"Foundation Analysis & Design", McGraw Hill, 1996
2. Shamsher Prakash et.al, Analysis and Design of Foundation and Retaining Structures, Sarita Prakashan
3. Nayak N.V., Foundation Manual for Practicing Engineers, Dhanpatrai Publications
4. Robert W Brown, Pratical Found. Engg, Handbook, McGraw Hill Pub,1996
5. Das B.N., Principles of Found Engg, 4th ed,PWS Pub.Co.,1999
6. S.P. Brahama, Foundation Engg, Tata McGraw Hill, 1985
7. Zeevert, Found.Engg for Difficult Sub Soil Condition, Van Nostrand Publin.,1975
8. Fang and Winterkorn, Found.Engg, Handbook, Van Nostrand Publn.,1975
9. H.J. Shah, Design of Reinforced Concrete Structures (Revised as per Limit State), Charotar Publishing House Pvt. Limited, 2012
10. Swami Saran, Analysis & Design Of Substructures, Oxford & Ibh Publishing Co. Pvt Ltd.

(b) Open source software and website:

1. NPTEL lecture series
2. MIT open source material

Suggested Course Practical List:

1. Tutorial work shall consist of presentations / problems / preparation of learning material based on above topics. Apart from above assignments a group of students has to undertake one open ended design problem based on engineering application.
2. Preparation of program (Excel sheet) for design of footings, rafts and pile foundations.

List of Laboratory/Learning Resources Required:

Professional Software: SETTLE , LPILE, PLAXIS 2D, STAAD-Pro, ABACUS, ANSYS

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