



GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL (Geotechnical ENGINEERING) (43)

Master of Engineering

Subject Code: 3734305

Semester – III

Subject Name: Analysis and Design of Foundation Systems

Type of course: Program Elective-V

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.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE(E)	PA (M)	ESE (V)	PA(I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	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	Design of Shallow foundations: Structural design of reinforced concrete spread footings, rectangular, trapezoidal and strap beam;	08	22
3	Soil pressure for structural design; Conventional structural design of continuous footings, individual footings, combined footings and rafts of various types subjected to vertical and lateral loads and moments; Design of circular rafts;	08	18
4	Soil structure interaction and 'flexible' approach to the design of foundations; Winkler foundation	06	14
5	Structural design of piles including pile caps, under reamed piles, battered piles, piers and caissons;	09	20
6	Structural design of retaining walls; Cantilever and counter fort earth retaining walls with Structural and foundation stability computations	05	08
7	Sheet Pile Walls, Cantilever and Anchored sheet pile walls, Introduction to shell foundations;	02	08



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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
5	15	20	15	10	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Joseph E Bowles, "Foundation Analysis & Design", McGraw Hill, 1996
2. Swami Saran, "Analysis and Design of Substructures-Limit State Design, Oxford & IBH Publishing Co. Pvt. Ltd (New Delhi) CBS publishers and Distributors Pvt. Ltd.
3. Shamsher Prakash et.al, Analysis and Design of Foundation and Retaining Structures, Sarita Prakashan
4. Nayak N.V., Foundation Manual for Practicing Engineers, Dhanpatrai Publications
5. Robert W Brown, Practical Found. Engg, Handbook, McGraw Hill Pub, 1996
6. Das B.N., Principles of Found Engg, 4th ed, PWS Pub.Co., 1999
7. S.P. Brahma, Foundation Engg, Tata McGraw Hill, 1985
8. 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

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	The student will be able to understand difference between various design approaches, selection of proper foundation system as per sub-soil conditions based on codal provisions and theoretical practice followed.	25
CO-2	The student will be able to analyze and design rigid and flexible foundation systems using elastic theories based on numerical and analytical approaches through software.	25



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CO-3	The student will be able to distinguish between temporary and permanent soil retaining structures, design of excavation supports, foundations in water bodies and high embankments.	20
CO-4	The student will be able to suggest and discuss details of special foundations such as batter piles, shell foundations and sheet pile walls for various applications such as resisting high lateral loads.	20
CO-5	The student will understand a role of geotechnical engineer as structural design engineer and its implication for proper execution of any project with full ethics and professional practices. (As this CO is non measurable and can not be mapped)	10

List of Experiments/Tutorial:

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.

List of Open Source Software/learning website:

1. NPTEL lecture series
2. MIT open source material