GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code:3164016

Semester – VI
Subject Name: Design of Foundations

Type of course: Professional Elective Course

Prerequisite: Soil Mechanics, Mechanics of Solids

Rationale:
Foundation design provides conceptual understanding of application of principles of soil mechanics in foundation design. Any civil engineering structure needs strong and stable foundation which depends on proper understanding of soil behaviour, determination and interpretation of soil parameter. This subject will enable the students to examine the site condition and prepare and interpret the bore log data. Student will also be able to design foundation under different loadings for different soil conditions.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Hrs.
1	**Soil Exploration and Geophysical Investigation** Objectives of soil exploration, methods of exploration, soil samples and soil samplers, field penetration tests, Bore log and report writing, data interpretation, Introduction to geophysical methods.	6
2	**Foundation : An Introduction** Functions of foundations. Requisites of suitable foundations. Different types of foundations. Factor affecting the selection of type of foundation. Advantages and limitations of various types of foundations. Footings subjected to eccentric loading. Conventional procedure for proportioning footings for equal settlements. Supports for shallow and deep excavations. Stress distribution in sheeting and bracing of shallow and deep excavations. Stability of bottom of excavations.	8
3	**Shallow foundations** Bearing capacity of shallow foundation on homogeneous deposits, Bearing capacity from in-situ tests, Seismic considerations in bearing capacity evaluation. Codal provisions to determine bearing, Settlement of foundations and Codal provisions, Methods to enhance bearing capacity and minimizing total and differential settlements.	10
4	**Pile and deep foundations** Classification of piles, Load carrying capacity, Group action and pile spacing. . Load carrying capacity and settlement of piles group. Static and dynamic formulae. Pile capacity by penetration tests and pile load tests (IS methods). Interpretation of pile load test (routine	12

	test), Negative skin friction and its consideration in design. Under reamed piles, compaction piles. Caissons and piers: Open (well) caissons. Box (floating) caissons. Pneumatic caissons. Construction details and design considerations of well foundations. Drilled piers and their construction details	
5	**Machine Foundation** Types of machine and suitable foundations, Soil dynamic parameters, Resonance and frequency ratio, design criteria for machine foundation, Block type machine foundation, Principles of Design of Foundations for reciprocating and impact machines as per IS code.	6

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**30**	**30**	**20**	**10**	**0**

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:

Venktatramaiah, C. Geotechnical Engineering, New Age International.
Ranjan and Rao; Basic and Applied Soil Mechanics; New Age International Publishers
Bowles J. E., Foundation Analysis and Design. 1997, the McGraw-Hill Companies, Singapore.
Das B. M., Principles of Foundation engineering", PWS Publishing Company.
Braja M. Das, Principles of Soils Dynamics, McGraw Hill, 1992.
Shamsher Prakash et al, Analysis, Design of foundations and Retaining Structures Sarita Prakashan.
Tomlinson, F. Design and Const., 6th Edition, Longman Pub., 1995.
Swami Saran, Soil Dynamics and Machine Foundation, Galgotia publications Pvt. Ltd., New Delhi 1999.
Poulos, H.G., Davis, E.H., Pile foundation analysis and design, John Wiley and Sons, New York, 1980.
Murthy, V.N.S. "Advanced Foundation Engineering", CBS Publishers and Distributors

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Select appropriate soil investigation/testing technique/method and get true sub soil parameters used for selection of type of foundation as per Codal guidelines.	20
CO-2	Select and design appropriate/suitable foundation system (shallow/deep) for different structures, that satisfy the allowable bearing capacity and settlement requirements based on soil properties,	30
CO-3	Design of shallow foundation satisfying bearing capacity and settlement requirement	30
CO-4	Design of deep foundation and understanding of Codal provisions	20

Term-Work

The students will have to solve at least five examples and related theory from each topic as an assignment/tutorial. Practical examinations shall consist of oral based on term-work and above course.

List of Practical:

- Standard Penetration Test
- Plate load test
- Auger Boring
- Laboratory California bearing ratio test
- Field California bearing ratio test
- Field Vane Shear Test
- Laboratory Vane Shear Test
- Cone penetration testing

List of Open Source Software/learning website:

https://nptel.ac.in/courses/105108069/
https://nptel.ac.in/courses/105/106/105106144/
https://www.cedengineering.com/userfiles/Geotechnical%20Engineering%20-%20Shallow%20Foundations.pdf
https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soil-mechanics-fall-2004/lecture-notes/
https://law.resource.org/pub/bd/bnbc.2012/gov.bd.bnbc.2012.06.03.pdf