SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology
Civil Engineering

B. Tech. Semester VI

Subject Name : Foundation Engineering and Design **Subject Code:**BTCL14604

Type of course: PEC-II
Prerequisite : Applied Soil Mechanics (BTCL13501)
Rationale : The subject deals with selection of appropriate type of foundation as per sub-soil profile and type of structure. Any civil engineering structure needs strong and stable foundation which depends on proper understanding of soil behavior, determination and interpretation of soil parameters, determination of stresses in soil. The design of any foundation system is based on understanding of soil parameters and its implication based on through interaction with type of structure.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage %
1.	**Sub surface Exploration:** Objectives of exploration program, methods of exploration-Auger boring, wash boring and rotary drilling-depth of boring, soil samples and soil samplers-representative and undisturbed sampling, field penetration tests: SPT, SCPT, DCPT. Introduction to geophysical methods, Bore log and report writing, data interpretation.	8	18
2.	**Bearing capacity of soil :** Introduction, significant depth, design criteria, types of bearing capacity failures, bearing capacity theories (Prandtl, Rankine, Terzaghi, Skempton), bearing capacity determination using IS Code, Effect of Water table on Bearing Capacity, Presumptive bearing capacity. Settlement, components of settlement & its estimation, permissible settlement, Proportioning of footing for equal settlement.	10	22
3.	**Design of Shallow Foundations:** Introduction and fundamentals of bearing capacity, Bearing capacity of raft/mat foundation as per codal provisions, Concept of contact pressure under rigid and flexible footings. Floating foundation.	10	22

4.	**Pile foundations :** Introduction, load transfer mechanism, classification of piles , factors influencing selection of pile, their method of installation and their load carrying characteristics for cohesive and granular soils, pile load carrying capacity calculation using static formula, dynamic formulae (ENR and Hiley), penetration test data & Pile load test (IS 2911). Pile group: carrying capacity, efficiency and settlement. Negative skin friction.	**9**	**20**
5.	**Retaining walls:** Types of flexible and rigid earth retention systems: counter fort, gravity, diaphragm walls, sheet pile walls, soldier piles and lagging.	**8**	**18**

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**20**	**30**	**15**	**10**	**5**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **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 Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Soil mechanics and Foundations	Dr B.C. Punmia, Ashok Jain, Arun Jain	Laxmi Publications(P) Ltd, New Delhi ISBN-13: 978-8170087915 ISBN-10: 8170087910	2005	17th
2	Basic Soil Mechanics & Foundations	Singh Alam,	CBS Publishers & Distributors, New Delhi. ISBN 10:8123901275ISBN 13:9788123901275	2014	1st
3	Soil Mechanics & Foundation Engineering	B.N.D. Narasinga Rao	John Wiley and Sons ISBN:978-81-265-3956-7 ISBN:978-81-265-8196-2	2015	1st

4	Foundation Analysis and Design	Bowles JE	The McGraw-Hill Companies, Singapore ISBN-10:0079122477	1997	5th
5	Craig's Soil Mechanics	Craig RF	Taylor and Francis, New York, USA ISBN:0-415-32702-4 ISBN:0-415-32703-2	2004	7th
6	Soil Mechanics & Foundation Engineering	Raj, P. Purushothama	Pearson Education India, ISBN-10 : 8131711773 ISBN-13 : 978-8131711774	2007	1st
7	Soil Mechanics & Foundation Engineering	V. N. S. Murthy	CBS Publishers ISBN-10 : 8123913621 ISBN-13 : 978-8123913629	2018	1st

Course Outcome: After successful completion of the course, the student will be able to:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks weightage %
CO-1	Select appropriate soil investigation technique or method and get true sub soil parameters used for selection of type of foundation as per codal provisions. *.(R,U,A.N, Cognitive level)*	18
CO-2	Select and design appropriate foundation system (shallow/Deep) for different structures that satisfy the allowable bearing capacity and settlement requirements based on soil properties. *.(R,U,A.N,E,C Cognitive level)*	22
CO-3	Designe Shallow footing as per codal provisions.*(R,U,A.N, E,C, Cognitive level)*	22
CO-4	Design vertical piles and pile groups for various types of loading, soil conditions and settlement requirements. *.(R,U,A.N,E,C-Cognitive level)*	20
CO-5	Design and analyze the retaining walls and sheet piles under static loads.*(R,U,A.N E,C-Cognitive level)*	18

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	2	2	1	1	1	1	1	2	2	1	2	3	1	1
CO-2	3	2	2	1	1	1	1	1	2	2	1	2	3	1	1
CO-3	3	2	2	1	1	1	1	1	2	2	1	2	3	1	1
CO-4	3	2	2	1	1	1	1	1	2	2	1	2	3	1	1
CO-5	3	2	2	1	1	1	1	1	2	2	1	2	3	1	1
Rationale *	15	10	10	5	5	5	5	5	10	10	5	10	15	5	5

Rationale: Majority of the COs are satisfying the well-defined POs and PSOs up to certain extent. Selection of appropriate type of foundation is to be carried out as per sub-soil profile and type of structure.

LIST OF PRACTICALS:

1. Soil exploration by Boring
2. Standard Penetration Test
3. Static and Dynamic Cone Penetration test (SCPT-DCPT)
4. Plate load test
5. Design of Shallow Footing
6. Design of pile foundation

List of Open Source/learning website:

- https://nptel.ac.in/courses/105/103/105103182/
    - Sub surface Exploration
- https://nptel.ac.in/courses/105/101/105101083/
    - Design of Shallow Foundations
    - Design of Deep Foundations
    - Design of Retaining Structures