

Branch Name:	Civil Engineering
Semester/Year:	Semester VI / Third Year
Subject Title:	Geotechnical Engineering - II
Subject Code:	1ET1060605
Pre-requisite:	Geotechnical Engineering - I

Course Objective:

- To study about failure of slope and stability of slope.
- To analyze the stress distribution and earth pressure theoretically and graphically.
- To understand the types of foundations, methods of exploration for subsurface investigations and different soil penetration tests.
- To provide basic knowledge to carry out field investigations.
- To study about Types, Bearing Capacity and settlement of Shallow Foundation & Pile Foundation.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weightage (%)
1	<u>Stability of Slopes:</u> Infinite and finite slopes, factor of safety, type of slope failure, stability of infinite slopes, finite slopes forms of slip surfaces, limit equilibrium method and critical stage instability analysis, effects of tension crack and submergence, C-analysis-method of slices, Taylor's stability no., use of Bishop's method.	06	15
2	<u>Earth Pressure</u> Types of lateral earth pressure, Rankine's and Coulomb's earth pressure, theory and their application for determination of lateral earth pressure under different conditions, Rebhann's and Culmann's Graphical methods of determination of lateral earth pressures.	06	18
3	<u>Stress Distribution of Soils</u> Causes of stress in soil, geostatic stress, Boussinesque's equation, stress distribution diagrams, Newmark's influence chart Westergaard's equation, contact pressure, stresses due to triangular and other loadings.	06	12
4	<u>Basics of foundation</u> Types of foundation, Factors affecting the selection of type of foundations, steps in choosing types of foundation.	02	05

5	<u>Subsurface Investigation</u> Objectives of exploration, planning of exploration program, soil samples and soil samplers, field penetration tests: SPT, SCPT, DCPT. Introduction to geophysical methods, Bore log and report writing.	05	12
6	<u>Bearing Capacity of Shallow Foundation</u> Introduction, significant depth, design criteria, modes of shear failures. Detail study of bearing capacity theories (Prandtl, Rankine, Terzaghi, Skempton), bearing capacity determination using IS Code, Presumptive bearing capacity. Settlement, components of settlement & its estimation, permissible settlement, Proportioning of footing for equal settlement, allowable bearing pressure. Bearing capacity by use of penetration test data and by plate load test. Bearing capacity of raft. Factors affecting bearing capacity including Water-Table. Contact pressure under rigid and flexible footings. Floating foundation. Types of pavements & its design.	09	20
7	<u>Pile foundations</u> Introduction, load transfer mechanism, types of piles according to their composition, their method of installation and their load carrying characteristics, piles subjected to vertical loads- pile load carrying capacity from static formula, dynamic formulae (ENR and Hiley), penetration test data & Pile load test. Pile group: carrying capacity, efficiency and settlement. Negative skin friction. Under-reamed pile foundation-its concept, design & field installation.	08	18

Course Outcome:

After learning the course the students should be able to:

1. The course covers various topics like earth pressure, stress distribution which gives insight to students to analyze soil parameters based on application and need of project site.
2. The course also discusses details of foundations, its selection procedures as per soil conditions and various modifications available for various degrees of loads.
3. Select appropriate soil investigation/testing technique/method and get true sub soil parameters used for selection of type of foundation as per codal guidelines.
4. 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.
5. Design deep foundation satisfying bearing capacity and settlement requirements.

List of Text and Reference Books:

1. Soil Mechanics & Foundation Engineering –B.C. Punamia, Laxmi Pub. Pvt. Ltd., Delhi.
2. Soil Mechanics & Foundation Engineering –K.R. Arora, Standard Pub., Delhi.
3. Soil Mechanics & Foundation Engineering – Alam singh, CBS Publishers & Distributors, Delhi.
4. Soil Mechanics & Foundation Engineering – V. N. S. Murthy, CRS Press, Taylor & Francis Group, New York.
5. Basic and applied soil mechanics – Gopal Ranjan, A.S.R. Rao, New age int. (p) ltd.
6. Principles of Geotechnical Engineering – Braja M Das, Thomson Asia Pvt. Ltd.
7. Soil Mechanics and Foundation Engineering – P. Purushothama Raj, Pearson Education.

List of Experiments:

1. Auger Boring/Sampling
2. Standard / Dynamic Cone Penetration Test
3. Static Cone Penetration Test
4. Free swell and Swell Potential Test
5. Swelling Pressure Test
6. Analyze Bore Log Data and Report Writing

E-Resources:

1. <http://nptel.ac.in/>
2. <http://ocw.mit.edu/courses/civil-and-environmental-engineering/>