Foundation Engineering

Year: III **Semester: II**

Teaching Schedule Hours/week				Examination Scheme						Total Marks
				Final				Internal Assessments		
				Theory		Practical		Theory	Practical	
Cr.	L	T	P	Duration	Marks	Duration	Marks			
3	3	3	-	3	60	-	-	40	-	100

Course objective:

The objective of this course is to provide the basic knowledge, concept and introduction of tools that can be used to determine soil structure interaction. This course includes a review of principles of soil mechanics and deal with a variety of foundations and retaining walls.

Course Contents:

1.0 Introduction **(1 hrs)**

1.1 Foundation Engineering, Importance and Purpose.
1.2 Soil/foundation interaction
1.3 Function of foundation and its types
1.4 Factors influencing the choice of a foundation

2.0 Site Investigation **(5 hrs)**

2.1 Objectives, stages and methods of site investigation
2.2 Sampling of soils, samplers, sample area
2.3 Field measurement of consistency and relative density
2.4 Plate loads test, Penetration Test (SPT,DCPT, SCPT), In-situ permeability test
2.5 Ground water observation
2.6 Bore Hole logs
2.7 Preservation, transportation and storage of samples
2.8 Laboratory tests on soils
2.9 Preparation of site investigation reports

3.0 Earth pressure and Retaining Structures **(9 hrs)**

3.1 Definition and Types of earth pressure
3.2 Steady state equilibrium and earth pressure at elastic and plastic equilibrium
3.3 Active and passive conditions
3.4 Modified failure envelope of line
3.5 Rankine state of plastic equilibrium
3.6 Strains associated with Rankine's states
3.7 Local state of plastic equilibrium, deformation and boundary conditions
3.8 Rankine's earth pressure theory
3.9 Active earth pressure on cohesion less backfill
3.10 Active and passive earth pressure on backfill
3.11 Active thrust by trial wedges and limitations of the method
3.12 Influence of wall friction
3.13 Coulomb's earth pressure theory and its graphical solution
3.14 Limitations of Coulomb's wedge theory
3.15 Selection of soil parameters for earth pressure computations
3.16 Stability analysis of an earth retaining structure

4.0 Arching in Soils and Braced Cuts (3hrs)

4.1 Arching in Soils and practical application
4.2 Braced Excavation
4.3 Earth pressure against Bracings in Cuts
4.4 Strut Loads

5.0 Bearing capacity and Settlement of Shallow Foundations (7 hrs)

5.1 Types of failures
5.2 Types of bearing capacity, and influencing factors
5.3 Pauker, Rankine, Bells theories, Prandlt's theory
5.4 Modes of foundation failure
5.5 Terzaghi's general bearing capacity theory
5.6 Effects of water table on bearing capacity
5.7 Extension of Terzaghi's theory (Meyerhof, Hanson and Vesic Theory)
5.8 Introduction to recent bearing capacity theories
5.9 Ultimate bearing capacity of cohesion less and cohesive soils
5.10 Types of settlement and their relationship
5.11 Calculation of bearing capacity based on settlement
5.12 Limitations of the methods for predicting settlement
5.13 Bearing capacity from In-situ tests (Plate Load Test)
5.14 Allowable settlement and Allowable bearing Pressure
5.15 Steps involved in the Proportioning of Footings for uniform settlement
5.16 Ultimate bearing capacity on layered soil
    5.16.1 Foundation on layered sand (dense sand over loose sand)
    5.16.2 Foundation on dense sand overlying soft clay

6.0 Mat Foundations (3 hrs)

6.1 Types of mat foundation and their uses
6.2 Bearing capacity and settlement of mat foundation
6.3 Design of mat foundation in sand and clay
6.4 Compensated Foundation
6.5 Analysis of Mat Foundation
6.6 Construction of mat foundations

7.0 Pile Foundation (6 hrs)

7.1 Classification of piles, advantages and disadvantages
7.2 Factors affecting Pile selection
7.3 Soil-pile interaction
7.4 Load Carrying capacity of piles in clay and sand
7.5 Pile driving formulae
7.6 Group action of pile
7.7 Bearing capacity and settlement of pile group
7.8 Negative skin friction
7.9 Piles resisting uplift
7.10 Piles resistance under the action of inclined loading
7.11 Pile load test
7.12 Construction of pile foundation
7.13 Damage, alignment and effect of pile driving

8.0 Pier Foundations (2 hrs)

8.1 Function of piers and their types
8.2 Bearing capacity and settlement of piers
8.3 Skin friction on pier shafts
8.4 Design of piers in sand and clay
8.5 Construction of pier foundations

9.0 Well or caisson Foundation (2 hrs)

9.1 Use of caisson foundation and their types
9.2 Bearing capacity of caissons in sand and clay
9.3 Design of caissons
9.4 Sinking of caissons

10.0 Sheet piles and coffers Dams (5 hrs)

10.1 Common types of sheet piles and their uses
10.2 Classification of sheet piled walls
10.3 Design of Cantilever and Anchored sheet piled walls
10.4 Construction of sheet piled walls
10.5 Common types of coffer dams and their uses
10.6 Design of braced coffer dams
10.7 Construction of braced coffer dams

11.0 Geo-technical processes (2 hrs)

11.1 Ground water in excavation and methods of its control
11.2 Foundation Soil stabilization (mechanical compaction, dynamic compaction, preloading, sand compaction piles and stone column, soil stabilization by use of admixtures, soil stabilization by use of grouts
11.3 Underpinning
11.4 Machine Foundation

Field Visit:

One day local site visit based on site investigation project and each student to prepare a brief report on the basis of prescribed data-format.

References:

1. "Soil Mechanics and Foundation Engineering", K.R. Arora, CBS Publishers and Distributors, New Delhi, 1988.
2. "A Text Book of Soil Mechanics and Foundation Engineering in SI Units", V.N.S. Murthy, UBS Publishers Distributors Ltd.
3. "A Text Book of Foundation Engineering", Dr.R.K.Poudel and R.Neupane.
4. "Soil Mechanics in Engineering practice", Terzaghi, K and Peck, R.B. John Wiley, 2nd Edition, New York, 1967.
5. "Foundation Engineering" B.M. Das.
6. "Foundation Analysis and Design" Joseph E.Bowels, McGraw-hill International Editions.
7. "Principles of Foundation Engineering", Braja M.Das, Thomson/Brookscole.
8. "Basic and Applier Soil Mechanics", G.Ranjan & ASR Rao. New Age International Publishers.