III Year-I Semester
(20CE5640) Advanced Foundation Engineering

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre- Requisites: Fundamentals of Geotechnical Engineering

Course Objectives:
The objectives of this course are:

- To enable the student to appreciate how Meyerhof's general bearing capacity equations are important
- To teach the student special methods of computation of settlements and the corrections to be applied to settlements.
- To enable the student to understand the advanced concepts of design of pile foundations.
- To teach the student the problems posed by expansive soils and the foundation practices appropriate to expansive soils.
- To enable the student to learn the difference between isolated and combined footings, the determination of bearing capacity of mats and proportioning of footings.

UNIT-I:
Bearing capacity of Foundations using general bearing capacity equation – Meyerhof's, Brinch Hansen's and Vesic's methods.

UNIT-II:
Settlement analysis: Immediate settlement of footings resting on granular soils – Schmertmann& Hartman method – De Beer and Martens method – Immediate settlement in clays – Janbu's method – correction for consolidation settlement using Skempton and Bjerrum's method – Correction for construction period.

UNIT-III:
Mat foundations – Purpose and types of isolated and combined footings – Mats/ Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in clays and granular soils – compensated rafts.

UNIT-IV:
Earth-retaining structures – cantilever sheet piles – anchored bulkheads – fixed and free earth support methods – design of anchors – braced excavations – function of different components – forces in ties – stability against bottom heave.

UNIT-V:
Pile foundations – single pile versus group of piles – load-carrying capacity of pile groups – negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock method – laterally loaded piles in cohesive soils – Davisson and Gill method – Broms' analysis.

Course Outcomes:

S.No	Course Outcomes	BTL
1	Compute the safe bearing capacity of footings subjected to vertical and inclined loads.	L4
2	Understand the advanced methods of settlement computations and proportion foundation footings.	L2
3	Appreciate the methods of computing the pull-out capacity and negative skin friction of piles and compute the settlements of pile groups in clays.	L5
4	Appreciate the problems posed by expansive soils and the different foundation practices devised.	L5
5	Appreciate the difference between isolated footings and combined footings and mat foundations	L5

Text Books:

1. 'Basic and applied soil mechanics' by GopalRanjan and ASR Rao, New Age Publishers.
2. 'Soil Mechanics and Foundation Engineering' by VNS Murthy, CBS Publishers.
3. 'Principles of Foundation Engineering' by BM Das, Thomson Brooks/Cole.

Reference Books:

1. 'Foundation Analysis and Design' by JE Bowles, John Wiley.
2. 'Foundation Design' by WC Teng, Prentice Hall Publishers.