

16CE307**GEO TECHNICAL
ENGINEERING - II**

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	-	30	13	45	5	15	2	-

**Course Description and Objectives:**

This course offers about soil investigation and sampling, lateral earth pressure and retaining wall, stability of slopes, foundation etc. The primary objective of this course is to equip the student with the knowledge of how to explore the soil, estimate the bearing capacity of soil, design the foundations for different conditions and check the stability of structures.

Course Outcomes:

The Students will be able to:

- understand the earth pressures on foundations and retaining structures.
- analyse shallow and deep foundations.
- calculate the bearing capacity of soils and foundation settlements.
- understand soil exploration methods.

SKILLS:

- ✓ *Explore and examine a site.*
- ✓ *Suggest suitable exploration techniques for a particular type of soil.*
- ✓ *Analyze lateral soil pressures acting on to a wall.*
- ✓ *Determine bearing capacity of a soil using different theories at different conditions.*
- ✓ *Analyze slopes for their stability.*

ACTIVITIES:

- *Analyse active and passive earth pressures acting on to a retaining wall with the properties of the soil given, using any theory, using some soft wares.*
- *Determining the actual active pressure and the actual failure plane for a retaining wall backfill using Culmann's Graphical Method.*
- *Analyze a slope for its stability with the given properties of soils using different theories at different conditions, using soft wares (e.g. Geo5 etc.,)*
- *Suggest a suitable foundation for the given soil and load conditions and justify it.*
- *Few case studies on well foundations.*

UNIT - 1**L-9**

SUB-SOIL INVESTIGATION AND SAMPLING: Introduction, Methods of exploration, Methods of Boring, Soil samples, Soil samples and sampling, Number and disposition of trial pits and borings, Depth of exploration, Ground water observations, Field tests visa-vis Laboratory tests, Plate load test, Penetrometer tests, Geophysical methods, Borehole logs, Site investigation report.

UNIT - 2**L-9**

LATERAL EARTH PRESSURE & RETAINING WALLS: Introduction, Effect of wall movement on earth pressure, Earth pressure at rest, Rankine's theory of earth pressure, Coulomb's theory of earth pressure, Culmann's graphical method for active earth pressure, Design considerations for retaining walls.

UNIT - 3**L-9**

STABILITY OF SLOPES: Introduction, Infinite slopes and translational slides, Definitions of factor of safety, Finite slopes, Forms of slip surface, Total stress and effective stress methods of analysis, Cu-0 analysis (Total Stress Analysis), C- analysis, Method of slices, Location of most critical circle, Stability of earth dam slopes friction circle method, Taylor's stability number.

UNIT - 4**L-9**

SHALLOW FOUNDATIONS: Concept of foundations, Types of foundations and their applicability, General requirements of foundations, Location and depth of foundation.

BEARING CAPACITY OF SHALLOW FOUNDATION: Terminology relating to bearing capacity, Bearing capacity of shallow foundations, Terzaghi's bearing capacity theory, Skempton's bearing capacity analysis for clay soils, IS code recommendations for bearing capacity, Influence of water table on bearing capacity.

SETTLEMENT ANALYSIS: Settlement of shallow foundation, Types, Methods to reduce differential settlements, Allowable bearing pressure, Immediate settlement, Terzaghi's Method, Allowable bearing pressure of granular soils based on standard penetration test value, Terzaghi and IS methods.

UNIT - 5**L-9**

PILE FOUNDATIONS: Introduction, Uses of piles, Types of piles, Cast in-situ pile construction, Selection of pile type, Pile driving, Pile load carrying capacity in compression, Static pile load formula, Load tests, Dynamic pile formulae, Correlations with penetration test data, Group action of piles – load carrying capacity and settlement, Negative skin friction.

WELL FOUNDATIONS: Types of wells, Components of well foundation, Shapes of wells, Forces acting on well foundation, Construction and sinking of wells.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

Total hours: 30

1. Unconfined Compression Test.
2. Direct Shear Test.
3. Vane Shear Test.
4. Consolidation Test.
5. Triaxial Test
 - a) Unconsolidated Undrained.
 - b) Consolidated Undrained.
 - c) Consolidated Drained.

TEXT BOOKS:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Soil Mechanics and Foundation", 16th edition, Laxmi Publications Pvt. Ltd., New Delhi, 2005.
2. K. R. Arora, "Soil Mechanics and Foundation Engineering", 7th edition, Standard Publishers and Distributors, Delhi, 2009.

REFERENCE BOOKS:

1. B. M. Das , "Principles of Foundation Engineering", 7th edition, Cengage Learning India, 2013.
2. J. E. Bowles , "Foundation Analysis and Design", 5th edition, Tata McGraw-Hill Education India Pvt. Ltd., New Delhi, 2000.
3. P. Purushothama Raj, "A Text book of Soil Mechanics and Foundation Engineering", 1st edition, Pearson Education, 2004.
4. Gopal Ranjan and A. S. R. Rao , "Basic and Applied Soil Mechanics", 4th edition, New Age International Pvt. Ltd., New Delhi, 2004.