

GEOTECHNICAL ENGINEERING – II

Lectures : 4 Periods/Week

Sessional marks : 40

Semester End Exam. : 3 Hours

Semester End Exam. marks : 60

Credits : 4

Course Objectives:

- To introduce the soil exploration, field testing of soil to know soil strata, strength and water table location.
- The civil engineering structures like retaining wall which are to resist lateral stresses are also introduced.
- To introduce concepts of stability of slopes, bearing capacity, pile capacity and its determination.

Course Outcomes:

- Equip the student with knowledge of how to explore the soil, design the foundations for different conditions and check the stability of structures.

UNIT – I

Sub–Soil Investigation And Sampling

Introduction; Methods of exploration; Methods of Boring; Soil Samples; Soil samplers and Sampling; Number and disposition of trial pits and borings; Depth of exploration; Ground water observations; Plate load test; Penetration tests- SPT,CPT(static and dynamic), Geophysical methods- Electrical resistivity and seismic refraction methods; Bore logs; Site investigation report.

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 - II

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; $\phi_u=0$ Analysis (Total Stress Analysis) ; $c-\phi$ Analysis- Method of slices; Location of most Critical Circle; Stability of Earth Dam Slopes; Friction Circle Method; Taylor's Stability Number.

Shallow Foundations

Concept of foundations; Types of foundations and their applicability; General requirements of foundations; Location and Depth of foundation.

UNIT -III

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 – IV**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-static and cyclic pile 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.

Foundations in Expansive Soils

Clay minerals ,Clay water relations, Identification of expansive soil; Field conditions that favour swelling; consequences of swelling; Laboratory methods for determination of swell pressure, Different alternative foundation practices in swelling soils; Construction practice of UR piles in swelling soils.

NOTE

Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

1. Basic and Applied Soil Mechanics – Gopal Ranjan and A.S.R.Rao, New Age International Publishers, 2011.

REFERENCES

1. Foundation Engineering by B. J. Kasmalkar; Pune Vidyarthi Griha Prakashan, Pune
2. Foundation Analysis & Design by Bowles, J.E., McGraw- Hill, 1995.
3. Foundations on Expansive Soils, F.H. Chen. Elsevier Publications,1988.
4. Geotechnical Engineering by SK Gulati & Manoj Datta, Tata McGraw-Hill,2010.
5. Principles of Foundation Engineering by B.M. Das., PWS Publishing Company, 4th edition, 1999.
6. Geotechnical Engineering by Codutu, 2nd Edition, PHI, 2010.

WEB REFERENCES:

www.iitm.ac.in