RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Civil Engineering, VII-Semester

CE701- Geotechnical Engg

UNIT-I

INTRODUCTION, INDEX PROPERTIES AND CLASSIFICATION OF SOILS: Definition and scope of soil mechanics, Origin of soil, formation of soil, clay minerals, Soil structure. 3-phase soil system, Basic terminology, and their relations, index properties of soil - Water content, Field density, Specific gravity, Grain size distribution by sieve and hydrometer analysis, Relative density, Atterberg limits and their determination, Various indices -Flow-Index, Plasticity Index, Toughness Index, Liquidity Index, Activity Ratio.

Different Systems of Soil Classification - Particle Size, Textural, Unified, HRB and IS classification. Field identification of soils

UNIT –II

PERMEABILITY, EFFECTIVE STRESS AND SEEPAGE THROUGH SOILS : Types of soil water, Capillarity in soils, Flow of water through soils, Darcy's Law, permeability, Factors affecting permeability, Laboratory & field tests for determination of coefficient of permeability, Permeability of layered soils.

Seepage pressure, total, Neutral and effective stress, Upward and downward seepage through soils, , Flow nets: characteristics, Methods of construction of flow net, Application of flow net, Quick condition, Laplace Equation for two –dimensional flow, Seepage through anisotropic soil and non-homogenous soil, Seepage through earth dam.

UNIT-III

STRESS DISTRIBUTION IN SOILS AND COMPACTION: Boussinesq's and Westergard's theories for point load, Uniformly loaded circular and rectangular areas, Pressure bulb, Variation of vertical stress under point load along vertical and horizontal plane, Newmark's influence chart for irregular areas. Contact pressure distribution in sands and clays.

Mechanism importance of compaction, Standard Proctor compaction test, Modified compaction test Factors affecting compaction, Effects of compaction on soil properties, Field compaction equipment and compaction quality control.

UNIT-IV

CONSOLIDATION : Types of compressibility, Spring analogy, Immediate settlement, Primary consolidation and secondary consolidation, Stress history of clay, e-p and e-log p curves, Normally consolidated soil, Over consolidated soil and under consolidated soil, Pre-consolidation pressure and its determination, Consolidation test, Terzaghi's 1-D consolidation theory, Coefficient of consolidation, Square root time and Logarithm of time fitting methods, Computation of total settlement.

UNIT-V

SHEAR STRENGTH & STABILIZATION OF SOILS:

SHEAR STRENGTH: Definition and importance of shear strength, Mohr and coulomb failure theories, Mohr's Stress Circles, Measurement of shear strength-Different types of Shear Test namely, Direct Shear Test, Unconfined Compression Test, Tri Axial Compression Test & Vane Shear Test for strength parameters, Strength tests based on drainage conditions, Measurement of pore pressure, Pore pressure parameters, Strength envelops, shear strength of sands, Critical void ratio, Liquefaction, Shear strength of clays. Factors affecting shear strength of granular soils and cohesive soils.

STABILIZATION OF SOIL: Introduction, Mechanical stabilization, Cement stabilization, Lime stabilization, Bituminous stabilization, Chemical stabilization, Thermal stabilization, Electrical stabilization, Stabilization by grouting, Use of geo-synthetic materials, Types, Functions and applications of geo-synthetics, Reinforced earth structures-components and construction.

LIST OF EXPERIMENTS:

1. Determination of water content by Oven drying method.
2. Determination of water content by Pycnometer
3. Determination of soil field density by core cutter method
4. Determination of soil field density by sand replacement method
5. Determination of Specific Gravity By Pycnometer.
6. Determination of Consistency Limits (i) Liquid Limit (ii) Plastic Limit (iii) Shrinkage Limit
7. Determination of liquid limit of soil by cone penetrometer.
8. Grain size analysis by sieve shaking method
9. Grain size analysis of fine grained soil by sedimentation using (i)pipette (ii) hydrometer.
10. Determination of coefficient of permeability of soil by- (a) constant head method (b) variable head method.
11. Determination of compaction parameters by- (a) light compaction, (b) heavy compaction.
12. Direct Shear test
13. Triaxial Test
14. Unconfined Compression Strength Test

Books and References

1. Punamia B.C., Soil Mechanics & Foundations., Firewall Media, 2017 (16th edition)

2. Alam Singh, Modern Geotechnical Engineering., CBS Publishers & Distributors, 2012 (3rd edition)

3. Gopal Ranjan & ASR Rao, Basic & Applied Soil Mechanics. New Age International, 2016 (3rd edition)

4. S.K Grag, Geotechnical Engineering., Khanna Publishers, 2016 (10th edition)