RCI5C001 - Geotechnical Engineering

Module-I (8 classes)
Origin of Soil: Rock Cycle and the origin of soil, clay mineralogy, mechanical analysis of soil, grain size distribution curve, particle shape and size, weight volume relationships, specific gravity, unit weight, void ratio, moisture content, and relationships, relative density.
Consistency of soil: Atterberg limits - Liquidity index and consistency index, activity, soil structure.
Engineering classification of soil: Types of Soil classification, IS, USCS, HRB and ASTM.

Module-II (8 classes)
Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships.
Permeability - Bernaulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, Factors affecting hydraulic conductivity, equivalent hydraulic conductivity in stratified soil.
Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.

Module-III (6 classes)
Soil Compaction: mechanism and principles, Laboratory compaction, factors affecting compaction, effect of compaction on soil properties, field compaction techniques.

Module-IV (12 classes)
Stress Distribution: Normal and shear stresses on a plane, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.
Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination: direct and tri-axial shear test, unconfined compression test, vane shear test.
Other methods of determining the un-drained shear strength of soil, sensitivity and thixotropy of clay.

Module-V (6 classes)
Consolidation of soils: Consolidation and compaction, primary and secondary consolidation, Terzhaghi's theory of one dimensional consolidation, consolidation test, coefficient of consolidation.
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Books:
1. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning
2. Soil Mechanics and Foundation Engineering, by K.R. Arora, Stanard Publishers
3. Soil Mechanics and Foundation Engineering by B.N.D. NarasingaRao, Wiley India Pvt.Ltd.
4. Basic and applied soil mechanics, by Gopal Ranjan, A S R Rao New Age International Publishers
Digital Learning Resources

Course Name GEOTECHNICAL ENGINEERING- 1
Course Link (https://nptel.ac.in/courses/105/101/105101201
Course Instructor Prof. Devendra Narain Singh, IIT Bombay 12 week