

# PCCE4206 Geotechnical Engineering

## **Module 1:**

Origin of Soil and Grain Size: Rock Cycle and the origin of soil, soil particle size, clay minerals, mechanical analysis of soil, grain size distribution curve, particle shape, weight volume relationships, specific gravity, unit weight, void ratio, moisture content, and relationships, relative density, Consistency of soil: Atterberg limits - liquid limit, plastic limit, shrinkage limit. Liquidity index and consistency index, activity, soil structure. Engineering classification of soil: IS, USCS, HRB and ASTM. (8 Hours)

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, 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. (6 Hours)

## **Module II:**

Soil Compaction: mechanism and principles, Standard and Modified Proctor Test, factors affecting compaction, effect of compaction on soil properties, field compaction techniques. (4 Hours)

Consolidation of soils: Consolidation and compaction, primary and secondary consolidation, Terzhaghi's theory of one dimensional consolidation, consolidation test, determination of coefficient of consolidation. (4 Hours)

Stresses in Soil: 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. (6 Hours)

## **Module III**

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. (7 Hours)

Stability of Slopes: Terminology, stability of finite and infinite slopes, Swedish slip circle method and friction circle method of analysis of slopes, Taylor stability Number and stability curves, Bishops Method. (7 Hours)

## **Text Books:**

- (1) Principles of Geotechnical Engineering by Braja M. Das, Thomson/ Brooks Cole
- (2) Geotechnical Engineering by T.N. Ramamurthy & T.G. Sitharam, S. Chand & Co.

## **Reference Books:**

- (3) Geotechnical Engineering by Donald P. Coduto, Pearson Education, Prentice Hall
- (4) Soil Mechanics and Foundation Engineering by B. C Punmia et al., Laxmi Publications Pvt Ltd