

**Course Name:**  
Soil Mechanics

**Course Number:**  
20411

**Credit:**  
3

**Prerequisite:**  
Engineering Geology; Solid Mechanics I; Fluid Mechanics

**Course Description:**

The objective of this course is familiarizing the students with soil behavior based on the physical and mechanical properties of different soil types. The application of soil mechanics in engineering problems is of special concern in this course.

**Course Content (outline):**

- Soils Formation and Structure, Weight-Volume parameters and their relationships.
- Classification of Soils: classification criteria and common methods for soil classification (USCS, AASHTO, B.S., ...) and their application in engineering projects.
- Soil Compaction: compaction mechanisms in soils, compaction tests in laboratory, theoretical compaction curve and the effect of compaction energy, field compaction, compaction control in field works.
- Stress in porous media: Geostatic stresses, principal stresses and Mohr's circle, stress paths, stress distribution at depth based on elastic theory, stress distribution beneath different type of foundations, stress contours, Newmark diagrams.
- Water in soil: Seepage in soils, Darcy's law, Permeability coefficient and methods for its measurement, Mathematical equation for flow of water in soils, Flow Nets, calculating seepage volume beneath walls and dams.
- Total and effective stresses in saturated soils, elevation/pressure/velocity heads in saturated soils, buoyancy force, seepage force, liquefaction state
- Soil Consolidation: Cylinder-Spring analogy for soil consolidation and settlement, Terzaghi 1-dimensional consolidation equation and its solution, Effect of time and time-rate of consolidation, secondary compaction in soft soils, consolidation test and method of determining consolidation coefficient for settlement calculations.
- Shear strength of soils: Mohr-Coulomb Failure criterion, determination of shear strength parameters, description of direct shear, unconfined compression, and tri-axial tests for different drainage conditions, total and effective stress paths for laboratory tests.

Stability of Slopes: instability problem for excavations and embankments, stability of saturated clay slopes, stability of sandy slopes (dry and saturated), different methods for stability analysis and calculating the factor of safety for dry/saturated slopes, and slopes under seepage condition.

**References:**

- Soil Mechanics, R. F. Craig, 5<sup>th</sup> Edition, Chapman & Hall.
- Principles of Geotechnical Engineering, B. M. Das, 2<sup>nd</sup> Edition, PWS-KENT publishing.
- Geotechnical Engineering: Principles and Practices, D. P. Coduto, Prentice-Hall.
- An Introduction to Geotechnical Engineering, R. D. Holtz and W. D. Kovacs, Prentice Hall.