

## **NWFP University of Engineering & Technology Peshawar**

Document Type: **Course Outline**

Department: **Civil Engineering**

Course No.: **CE-209**

Serial No.: \_\_\_\_\_

Course Title: **Soil Mechanics-I**

Type: **Theory**

Credit Hours: **03**

Approved Under Reference: \_\_\_\_\_

Verified By: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Effective From: \_\_\_\_\_

Effective For Session: \_\_\_\_\_

Effective To: \_\_\_\_\_

### **Soil Formation**

Soil and its constituents, weathering of rocks and types of soils. Description and Identification of soil (Visual-Manual Procedure), Mineralogy of soil solids.

### **Physical Properties**

Water content, void ratio, porosity, degree of saturation, specific gravity, unit Weight and their determination, Atterberg limits, sieve analysis, hydrometer and Pipette analysis, Stoke's law, grain size distribution.

**Soil Classification**, Grain size classification, Bureau of soils, M.I.T., Unified, AASHTO and ASTM Classification systems. Textural Classification by triangular chart, united soil classification system, AASHTO soil classifications.

### **Permeability and Seepage**

Definition, Hydraulic gradient, Darcy's Law, Factors affecting permeability, Permeability of stratified soils, Laboratory and field determination of coefficient of permeability. Seepage force, quick sand condition, flow nets, boundary conditions, graphical method of flow net construction, determination of quantity of seepage, two dimensional flow, Laplace Equation, seepage through earth dams, design of filters

### **Compaction**

Definition, Compaction fundamentals, Moisture density relationships, Standard Proctor test and modified AASHO test for compaction, Factors affecting compaction, Compaction equipment, properties and structure of compacted soils, Specifications, field control and measurement of in-situ density, CBR test.

### **Vertical stresses in soils**

Definition, stresses caused by self weight of soil, Geostatic stresses, stresses caused by point loads and uniformly distributed loads: Boussinesq and Westergaard theories, Pressure bulb, stress distribution diagram on horizontal and vertical planes; stress at a point outside loaded area, Newmark's charts and 2:1 Method

### **Soil Exploration**

Importance of soil exploration, soil exploration methods; probing, test trenches and pits, auger boring, wash boring, rotary drilling, Percussion drilling and geophysical methods, soil samples, Disturbed and undisturbed samples, In-situ tests (SPT, CPT and PLT)

### **Introduction of related Software**

#### **Books Recommended**

- An Introduction to Mechanics of Soils and Foundation by "John Atkinson"
- Soil Mechanics by R.F.Craig
- Principles of Geotechnical Engineering by Braja M. Das.

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Course Title: **Soil Mechanics-I**

Type: **Lab**

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- Identification of Soil (Visual Manual Procedure)
  - Determination of Moisture content of soil
  - Determination of specific gravity of soil
  - Determination of liquid limit of soil
  - Grain-size analysis of soil (including both mechanical and hydrometer analysis)
  - Determination of Plastic limit and Plasticity Index of soil
  - Determination of shrinkage limit of soil
  - Classification of soil according to AASHTO and USCS
  - Modified/Proctor Compaction Test
  - Constant Head Permeability test (Granular Soil)
  - Falling Head Permeability (Granular and Fine grained soils)