

**III Year I Semester**  
**Code: 17CE505**

**L T P C**  
**3 1 0 3**

## **GEOTECHNICAL ENGINEERING I**

### **Course Objectives:**

1. To enable the student to find out the index properties of the soil and classify it.
2. To impart the concept of seepage of water through soils and determine the seepage discharge.
3. To enable the students to differentiate between compaction and consolidation of soils and to determine the magnitude and the rate of consolidation settlement.
4. To enable the student to understand the concept of shear strength of soils, assessment of the shear parameters of sands and clays and the areas of their application.

### **Course Outcomes:**

1. The student understands about the Soil formation, soil structure, clay mineralogy
2. The student understands the various parameters related to soil mechanics and establish their inter-relationships.
3. The student should be able to determine the permeability
4. The student should be able to know the stress distribution and various theories.
5. The student understands the concept of consolidation.
6. The student should be able to determine the shear strength of the soil.

## **SYLLABUS**

### **UNIT – I**

**Introduction:** Soil formation – Soil structure and Clay Mineralogy – Adsorbed water – Mass-volume relationship –Relative density , Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.

### **UNIT – II**

**Index Properties Of Soils:** Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

### **UNIT –III**

**Permeability:** Soil water – Capillary rise – One dimensioned flow of water through soils – Darcy's law- Permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems. Total, neutral and effective stresses –quick sand condition – 2-D flow and Laplace's equation - Seepage through soils – Flow nets: Characteristics and Uses.

### **UNIT – IV**

**Stress Distribution In Soils:** Stresses induced by applied loads - Boussinesq's and Westergaard's theories for point loads and areas of different shapes– Newmark's influence chart – 2:1 stress distribution method.

## UNIT – V

**Consolidation:** Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (cv) - Over consolidated and normally consolidated clays.

## UNIT – VI

**Shear Strength of Soils:** Basic mechanism of shear strength - Mohr – Coulomb Failure theories – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination- various drainage conditions.

### Text Books:

1. Basic and Applied Soil Mechanics, GopalRanjan and A. S. R. Rao, New Age International Publishers.
2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS publishers

### References:

1. Fundamentals of Soil Mechanics, D. W. Taylor, Wiley.
2. An introduction to Geotechnical Engineering, Holtz and Kovacs; Prentice Hall.
3. Fundamentals of Geotechnical Engineering, B M Das, Cengage Learning, New Delhi.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	1	3	2	2	3	1	1	1	1	3	3	3	3
<b>CO2</b>	3	3	3	3	1	3	3	1	2	1	1	3	3	3	3
<b>CO3</b>	3	3	3	3	2	3	3	1	1	1	1	3	2	3	3
<b>CO4</b>	3	3	2	3	3	3	3	1	1	2	1	3	3	3	3
<b>CO5</b>	3	3	2	3	3	3	3	1	1	2	1	3	3	1	3
<b>CO6</b>	3	3	3	3	3	3	3	1	1	2	1	3	3	1	3