

Indian Institute of Technology Mandi

Course Number:	CE 311
Course Name:	Geotechnical Engineering I
Credits:	3-0-0-3
Prerequisites:	NIL
Intended for:	UG students (B.Tech. 3 rd Year)
Distribution:	Discipline Core
Semester:	odd/even

Permeable: The basic course on Geotechnical Engineering introduces students to the fundamentals of the engineering behaviour of soil. The present course aims at familiarizing the basic about the soil formation, basic properties, testing procedures and thereby provides the required elementary knowledge for in-depth understanding about the soil for later studies.

Module for theory component:

1. **Introduction:** Origin, Formation, Importance of geotechnical engineering, Idealization of soil matrix, three phase diagram, Mass-weight-volume relationships, applications **(8 hours)**
2. **Properties of soil:** Particle size distribution, Index properties, Atterberg Limits, plasticity chart, Soil Classification **(4 hours)**
3. **Soil Compaction:** Soil density-water relationship, Proctor tests, field tests and applicability **(3 hours)**
4. **Permeability in soils:** One-dimensional flow, Darcy's Law, Laboratory and field method of determination of permeability, concept of seepage **(6 hours)**
5. **Stresses in soils:** Stresses in soil mass, capillarity phenomena, concept of effective stress, Stresses from elastic theory, Boussinesq and Westergaard's theory, pressure distribution diagram, pressure bulb, shapes of loading area **(7 hours)**
6. **Consolidation:** 1D laboratory test, preconsolidation pressure, concept of normally consolidated and over consolidated soil, One-dimensional equation and solution, determination of consolidation settlement **(5 hours)**

7. **Shear Strength of Soil:** Mohr circle, Mohr-coulomb failure criteria, shear strength of sand and clays, pore pressure, factors affecting shear strength, laboratory measurement of shear strength. **(8 hours)**

Text Books:

- (a) Robert D Holtz, William D. Kovacs and Thomas C. Sheahan, Introduction to Geotechnical Engineering, 2nd Edition, Pearson, 2021.
(b) V. N. S. Murty, 'Geotechnical Engineering', Book World Enterprises, 2005.

Reference Books:

- a) R.F. Craig, 'Soil Mechanics', ELBS and Van Nostrand Reinhold Co. Ltd., Berkshire, 2004.
b) Braja M. Das, 'Principles of Geotechnical Engineering', Cengage Learning, 7th edition and above.
c) G. Ranjan and A.S.R. Rao, 'Basic and Applied Soil Mechanics', New Age International Publishers, 2007.

Justification for new course proposal if cumulative similarity content is more than 30%:
Not applicable.

r. Mousumi.