

Year & Sem	Course Code: CE3606	Course Name: Advanced Geo-Technical Engineering	No. of Credits: 4	L	T&PS	P
				2	2	0

Unit-I: Soil composition and soil structure:

- Soil formation; Types of soils and their characteristics; Particle sizes and shapes; their impact on engineering properties;
- Soil structure; Clay mineralogy; Soil-air-water interaction; Consistency; Soil compaction; Concept of effective stress.

Unit-II: Permeability and Seepage:

- Permeability; Seepage force and effective stress during seepage.
- Laplace equations of fluid flow for 1-D, 2-D and 3D seepage, Flow nets, Anisotropic and non-homogeneous medium, Confined and Unconfined seepage

Unit-III: Compressibility and Consolidation:

- Stresses in soil from surface loads; Terzaghi's 1-D consolidation theory; Application in different boundary conditions; Ramp loading.
- Determination of Coefficient of consolidation c_v ; Normally and Overconsolidated soils; Compression curves; Secondary consolidation.
- Radial consolidation; Settlement of compressible soil layers and Methods for accelerating consolidation settlements

Unit-IV: Stress-strain relationship and Shear strength of soils:

- Stress state, Mohr's circle analysis and Pole, Principal stress space, Stress paths in p-q space;
- Mohr-coulomb failure criteria and its limitations, correlation with p-q space;
- Stress-strain behaviour: Isotropic compression and pressure dependency, confined compression, large stress compression, Definition of failure, Interlocking concept and its interpretations, Drainage conditions;
- Triaxial behaviour, stress state and analysis of UC, UU, CU, CD, and other special tests, Stress paths in triaxial and octahedral plane; Elastic modulus from triaxial tests

Unit-V: Stability of Slopes:

- Stability analysis of a slope and finding critical slip surface; Sudden Draw down condition, effective stress and total stress analysis;
- Seismic displacements in marginally stable slopes;
- Reliability based design of slopes, Methods for enhancing stability of unstable slopes

Unit-VI: Buried Structures:

- Load on Pipes, Marston's load theory for rigid and flexible pipes, Trench and Projection

conditions, minimum cover, Pipe floatation and Liquefaction

Unit-VII: Geotechnical Physical Modeling:

- Physical modeling methods; Application of centrifuge modeling and its relevance to geotechnical engineering;
- Centrifuge modeling of geotechnical structures

References/Text Books:

1. Das, B.M. (2008). Advanced Soil Mechanics. Taylor and Francis Group, London, Second edition.
2. Helwany, S. (2007). Applied Soil Mechanics with ABAQUS Applications, John Wiley & Sons, INC, New Jersey, USA.
3. Wood, D.W. (2004). Geotechnical Modelling. Spon Press, Taylor and Francis Group, London, First edition.
4. Powrie, W. (2002). Soil Mechanics concepts and applications. Spon Press, Taylor and Francis Group, London, Second edition.
5. Terzaghi, K., Peck, R.B. and Mesri, G. (1996). Soil Mechanics in Engineering Practice.

Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.

Year & Sem: E4S1	Course Code: CE4135	Course Name: Advanced Foundation Engineering	No. of Credits: 4	L	T&PS	P
				2	2	0

UNIT –I :Soil exploration:

Analysis and interpretation of soil exploration data, estimation of soil parameters for foundation design.

UNIT –II:Shallow Foundations:

Methods for bearing capacity estimation, total and differential settlements of footing and raft, code provisions. Design of individual footings, strip footing, combined footing, rigid and flexible mat, buoyancy raft, basement raft, underpinning.

UNIT –III: Pile Foundations:

Estimation load carrying capacity of single and pile group under various loading conditions. Pile load testing (static, dynamic methods and data interpretation), settlement of pile foundation, code provisions, design of single pile and pile groups, and pile caps. Well Foundations: Types, components, construction methods, design methods (Terzaghi, IS and IRC approaches), check for stability, base pressure, side pressure and deflection.

UNIT –IV:Retaining Walls:

Types (types of flexible and rigid earth retention systems: counter fort, gravity, diaphragm walls,