2/4 B.Tech. FOURTH SEMESTER

CE4T2 GEOTECHNICAL ENGINEERING – I Credits: 4

Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Objectives:

- To study the soil structure, consistency limits and IS Classification of soils.
- To conduct laboratory tests on soils.
- To know the permeability, flow nets, seepage, Bousssinesq and Westergaard's analysis.
- To understand the compaction, Liquefaction, Consolidation and shear strength of soils.

Learning outcomes:

At the end of course the student will be able to:

- Determine basic soil properties and classify the soil for engineering application.
- Apply concepts of soil mechanics for structural stability.
- Apply the engineering properties of the soil such as Shear Strength, Compressibility and permeability to the engineering problems.
- Use the principle of compaction to the field problems such as construction of roads, dams, bunds, earth filling etc.

UNIT – I
INTRODUCTION:
Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship – Relative density.

UNIT – II
INDEX PROPERTIES OF SOILS:
Grain size analysis – Sieve and Hydrometer methods – consistency limits and Indices – I.S. Classification of soils

UNIT –III
PERMEABILITY:
Soil water – capillary rise – flow of water through soils – Darcy's law- Permeability – Factors affecting – laboratory determination of coefficient of permeability – Permeability of layered systems.

UNIT -IV
SEEPAGE THROUGH SOILS:
Total, neutral and effective stresses –quick sand condition – Seepage through soils – Flow nets, Characteristics and Uses.

UNIT – V
STRESS DISTRIBUTION IN SOILS:
Boussinesq's and Wester gaard's theories for point loads and areas of different shapes – Newmark's influence chart.

UNIT – VI
COMPACTION:
Mechanism of compaction – factors affecting – effects of compaction on soil properties – Field compaction Equipment - compaction control.

UNIT – VII
CONSOLIDATION:
Stress history of clay, e-p and e-log p curves – magnitude and rate of 1-D consolidation – Terzaghi's Theory.

UNIT - VIII
SHEAR STRENGTH OF SOILS:
Mohr – Coulomb Failure theories – Types of laboratory strength tests – strength tests based on drainage conditions – Shear strength of sands – Critical Void Ratio – Liquefaction- shear strength of clays.

Learning resources

Text books:

1. Basic and Applied Soil Mechanics, (2nd edition) by Gopal Ranjan and Rao, A.S., New Age International Pvt . Ltd, New Delhi, 2010.
2. Soil Mechanics and Foundation Engg, (7th edition) by Dr.Arora, K.R., Standard Publishers and Distributors, Delhi, 2010.
3. Soil Mechanics and Foundation, (16th edition) Punmia, B.C., Laxmi Publications Pvt. Ltd., New Delhi, 2005.

Reference books:

1. Geotechnical Engineering, (3rd edition) by Venkataramiah, C., New Age International Pvt . Ltd, 2010.
2. Soil Mechanics by Lambe and Whitman, T.W., Indian Wiley, 2009.
3. Geotechnical Engineering by Purushotham Raj., McGraw-Hill, New Delhi, 2000.
4. Geotechnical Engineering by Manoj Dutta and Gulati, S.K., Tata McGraw-Hill, New Delhi, 2005.