Course Content for CE502PC: Geotechnical Engineering

B.Tech. III Year I Sem. L T P C

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Course Objectives:

- • Understand the formation of soil and classification of the soils.
- • Characterize the Index & Engineering Properties of Soils.
- • Determine the flow characteristics & stresses due to externally applied loads.
- • Estimate the consolidation properties of soils.
- • Determine the shear strength parameters.

Course Outcomes:

- • Characterize and classify the soils.
- • Estimate seepage, stresses under various loading conditions.
- • Understand laboratory and field compaction characteristics.
- • Analyze the compressibility of the soils.
- • Understand the strength of soils under various drainage conditions.

UNIT – I

- Introduction: Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity- Field density by core cutter and sand replacement methods-Relative density.
- Index Properties of Soils: Grain size analysis – consistency limits and indices – I.S. Classification of soils.

UNIT – II

- Permeability: Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils.
- Effective Stress & Seepage through Soils: Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

UNIT – III

- Stress Distribution in Soils: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.
- COMPACTION: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

UNIT – IV

- Consolidation: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil – pre-consolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

UNIT - V

- Shear Strength of Soils: Importance of shear strength – Mohr-Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio, Introduction to stress path method.

TEXT BOOKS:

- • Basic and Applied Soil Mechanics by Gopal Ranjan & A. S. R. Rao, 2nd Edition, New age International Publishers, 2006
- • Soil Mechanics and Foundation Engineering by V. N. S. Murthy, CBS Publishers & Distributors/Alkem Company (S), 2011
- • Principles of Geotechnical Engineering by Braja, M. Das, Cengage Learning Publishers, 10th Edition, 2020

REFERENCE BOOKS:

- • An Introduction to Geotechnical Engineering by R. D. Holtz, W. D. Kovacs, and Thomas Sheahan, Pearson, 2nd edition (2011).
- • Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).
- • Geotechnical Engineering Principles and Practices by Coduto and M. Y. Ronald, Pearson 2nd edition (2010).
- • Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers New Delhi (2017).

- • Foundation Engineering by P.C. Varghese, PHI (2005).