GEOTECHNICAL ENGINEERING

VI Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ACEB19	**CORE**	2	1	-	3	30	70	100
Contact Classes: 30	**Tutorial Classes: 15**	**Practical Classes: Nil**				**Total Classes: 45**		

I. COURSE OVERVIEW:

Geotechnical engineering is the systematic application of techniques which allows construction with soil androck. This course features soil basics, including their derivation, identification and classifica- tion andemphasizes Principles of water flow in soils, settlement, heave, and shear strength of soils. The course alsodeals with materials, soil and rock that, by their very nature, exhibit varied and uncertain behavior due to theimprecise physical processes associated with the formation of these materials. Fur- ther, The course is usefulfor designing and development of different forms of foundations in industrial and residential constructions.

II. OBJECTIVES:

The course should enable the students to:

  I The fundamental knowledge on soils, importance in the design and constructionprocess of massive structures.

  II The laboratory, field tests conducted on soils to identify the better ground toconstruction.

  III The methods employed for soil properties prediction, soil layers and its applications

  IV The role of shear strength in load carrying capacity of soils, restored and durablestructures.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**List out** the procedure of soil formation, soil structure, clay mineralogyand index proportion for classifying the soil types.	Understand
CO 2	**Demonstrate** the concepts of permeability and seepage flow net for estimating seepage losses from earthen dams.	Understand
CO 3	**Summarize** stress distribution in soils at different loading conditions based on various theories for estimating intensity of pressure on soil. forestimating intensity of pressure on soil.	Understand
CO 4	**Relate** the effect of compaction and consolidation pressures forestimating the total settlement, time rate of settlement	Remember
CO 5	**Recognize** different stages of consolidation for predicting stress historyon clays.	Remember
CO 6	**Compare** Mohrs- columbs failure theories and lab tests for determining shear strength of soils at various drainage conditions.	Apply

IV. SYLLABUS:

MODULE - I	INTRODUCTION AND INDEX PROPERTIES OF SOILS	Classes: 08

Soil formation, clay mineralogy and soil structure, moisture content, weight-volume relationships, relative density. Grain size analysis, sieve analysis, principle of hydrometer method, consistency limits and indices, I.S. classification of soils.

MODULE - II	PERMEABILITY, EFFECTIVE STRESS AND SEEPAGE THROUGH SOILS	Classes: 10

Capillary rise, flow of water through soils, Darcy's Law, permeability, factors affecting permeability, laboratory & field tests for determination of coefficient of permeability, permeability of layered soils; Total, neutral and effective stress, upward and downward seepage through soils, quick sand condition, flow nets: characteristics and uses.

MODULE - III	STRESS DISTRIBUTION IN SOILS AND COMPACTION	Classes: 09

Boussinesq's and Westergard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along vertical and horizontal plane, Newmark's influence chart for irregular areas.

Mechanism of compaction, factors affecting compaction, effects of compaction on soil properties, field compaction equipment and compaction quality control.

MODULE - IV	CONSOLIDATION	Classes: 10

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 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.

MODULE - V	SHEAR STRENGTH OF SOILS	Classes: 08

Importance of shear strength, Mohr and 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, liquefaction, shear strength of clays.

Text Books:

1. Braja M. Das, "Principles of geotechnical engineering" Cengage learning publishers, 2002.
2. VNS Murthy, "Soil mechanics and foundation engineering", CBS publishers and distributors, 2003.
3. Gopal Ranjan and ASR Rao, "Basic and Applied Soil Mechanics", New age international Pvt. Ltd, New Delhi, 2000.

Reference Books:

1. C. Venkataramiah, "Geotechnical engineering", New Age International Pvt. Ltd, 2002.
2. Manoj dutta and Gulati, "Geotechnical engineering", Tata Mc Graw hill publishers New Delhi, 2005.
3. K.R .Arora, "Soil mechanics and foundation engineering", standard publishers and distributors, New Delhi, 2005.
4. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Soil mechanics and foundation", Laxmi publications Pvt. Ltd, New Delhi, 2005.

Web References:

1. http://nptel.ac.in/courses/105107120/1#
2. http://www.nptel.ac.in/courses/105105105/
3. http://www.nptel.ac.in/courses/105105104