#### **GEOTECHNICAL ENGINEERING**

VI Semester: CE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACEC24	Core	L	T	P	C	CIA	SEE	Total
		3	1	0	4	30	70	100
Contact Classes: 45	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				Total Classes: 60		

## **Prerequisite:** Engineering Geology

#### I. COURSE OVERVIEW:

Geotechnical engineering is the systematic application of techniques which allows construction with soil and rock. This course features soil basics, including their derivation, identification and classification and emphasizes Principles of water flow in soils, settlement, heave, and shear strength of soils. The course also deals with materials, soil and rock that, by their very nature, exhibit varied and uncertain behavior due to the imprecise physical processes associated with the formation of these materials. Further, The course is useful for designing and development of different forms of foundations in industrial and residential constructions.

### **II. COURSE OBJECTIVES:**

## The students will try to learn:

- The fundamental knowledge on soils, importance in the design and construction process of massive structures.
- II. The laboratory, field tests conducted on soils to identify the better ground to construction.
- 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 durable structures.

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

# IV. COURSE SYLLABUS:

# MODULE -I: INTRODUCTION AND INDEX PROPERTIES OF SOILS (8)

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 (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 & downward seepage through soils, quick sand condition, flow nets: characteristics and uses.

# MODULE -III: STRESS DISTRIBUTION IN SOILS AND COMPACTION (9)

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 & downward seepage through soils, quick sand condition, flow nets: characteristics and uses.

## MODULE -IV: CONSOLIDATION (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, preconsolidation 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 (8)**

Importance of shear strength, Mohr's-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.

# V. 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.

#### VI. REFERENCE BOOKS:

- 1. C. Venkataramiah, "Geotechnical engineering", New Age International Pvt. Ltd, 2002.
- 2. Manojdutta and Gulati, "Geotechnical Engineering", Tata McGraw 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.

## VII. 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

## VIII. E-TEXT BOOKS:

 $1. \quad https://onlinelibrary.wiley.com/doi/book/10.1002/9781118686195$