

B.E. (Civil) Semester: V
Subject Name: GEOTECHNICAL ENGINEERING-I (CV503)

A. Course Objective:

- To provide a coherent development to the students for the courses in sector of Engineering like Geotechnical Engineering & Soil Improvement Techniques etc.
- To present the foundations of many basic Engineering tools and concepts related Geotechnical Engineering.
- To give an experience in the implementation of Engineering concepts which are applied in field of Geotechnical Engineering
- To involve the application of scientific and technological principles of planning, analysis, design of foundation .

B. Teaching /Examination Scheme

Teaching scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract/ Tut.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
03	00	02	05	04	03	70	30	20	30	150

C. Detailed Syllabus:

1. Introduction:

Definition, Brief history, Scope and limitations of Geotechnics.

2.Origin and Nature of Soil:

Geological cycle, Physical and chemical agencies for soil, Formation - residual, transported, cumuloase, alluvial, marine and lacustrine, loess and colluvial soil. General soils in Gujarat / India. characteristics of different types of soils. Overview of different types of soils in Gujarat /India.

3.Index Properties, Relationships and Tests:

Phase diagram, Basic terms and definitions, Functional relationships, Determination of index properties, Relative density for granular soil.

4.Particle Size Analysis:

Size and nomenclature of soil particles as per BIS, Sieve analysis, Sedimentation analysis, Particle size distribution curve and its uses.

5. Soil Structure:

Shape of the particles, Texture and structure of the soil. Types of the structure, properties, Conditions for the formation of different structures.

6. Soil Consistency:

Consistency limits and its determination, Different indices, Field moisture equivalent, Activity, Sensitivity & Thixotropy of soil.

7. Soil Classification:

Objectives, Basis, Textural, Unified soil classification, IS classification method, group index. Field identification and General characteristics of the soil.

8. Soil Water: Free water and held water, Structural water and absorbed water, Capillary water, Total stress, Neutral stress and Effective stress.

9. Permeability and Seepage:

Darcy's law and its validity, Factors affecting permeability, Laboratory permeability tests, Introduction to field permeability test, Permeability of stratified soil masses, Laplace equation (2-D), Seepage pressure, Quick condition, Flow net, its characteristics and application.

10. Compaction:

Definition, Theory of compaction, Factors affecting compaction, Laboratory compaction tests, Effect of compaction on soil properties, Placement water content, Placement layer thickness, Field control of compaction, Proctor's needle, Methods of compaction used in field.

11. Shear Strength of Soil :

Mohr's strength theory, Mohr- coulomb's strength theory, Modified Mohr coulomb's theory, Direct shear test, Unconfined compression test, lab. Vane shear test, Introduction to triaxial compression test, Shear tests based on drainage conditions.

12. Consolidation of Soils :

Compressibility of soils, Definitions and mechanism of consolidation, Spring analogy, Void ratio and effective stress relation, Related indices, Assumptions of Terzaghi's one dimensional consolidation theory, Time factor, One dimensional consolidation tests, Laboratory and theoretical time curves, Determination of pre-consolidation pressure, Estimation of consolidation settlement and rate of settlement for uniform pressure increment in a clay layer.

D. Lesson Planning

Sr. No.	Title of the Unit	Minimum Hours	Weightage%
1.	Introduction	1	3
2.	Origin and Nature of Soil	3	3
3.	Index Properties, Relationships and Tests	5	7
4.	Particle Size Analysis	3	7
5.	Soil Structure	3	5
6.	Soil Consistency	3	5
7.	Soil Classification	3	5
8	Soil Water	3	5
9	Permeability and Seepage	4	10
10	Compaction	5	10
11	Shear Strength of Soil	6	20
12	Consolidation of Soils	6	20
TOTAL		45	100

E. List of Experiments:

Term work shall consist of laboratory work (Minimum 09 Experiments from listed below) and tutorials (minimum 25 problems) based on above course. Practical examinations shall consist of oral based on term work and above course.

Experiment No.	Name of Experiment
1	Visual identification and specific gravity
2	Sieve Analysis
3	Hydrometer Analysis
4	Liquid Limit Test
5	Plastic Limit Test
6	Shrinkage limit Test
7	Proctor Compaction Test
8	In site Density by Sand Replacement method
9	Permeability Test: Constant Head

10	Permeability Test: Variable Head
11	CBR Test
12	Consolidation /Odometer test
13	Direct Shear Test
14	Unconfined Compression Test
15	Tri axial test

F. Instructional method and pedagogy (Continuous Internal Assessment Scheme) (CIA)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and practical which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms Carries Marks
- Internal exam of 30 marks will be conducted as a part of Mid semester evaluation.
- Experiments shall be performed in the field related to course contents.
- The course includes a practical, where students have an opportunity to build an appreciation for the concept being taught in lectures.

G. Students Learning Outcomes:

- The students will gain an experience in the implementation of Geotechnical Engineering on engineering concepts which are applied in field Geotechnical Engineering.
- The students will get a diverse knowledge of geotechnical engineering practices applied to real life problems of designing of structures.
- The students will learn to understand the theoretical and practical aspects of geotechnical engineering along with the design and management applications.

H. Recommended Study Materials

A. Reference Books:

1. P. Purushothama Raj; Soil Mechanics and Foundation Engineering; Pearson Education.
2. B.C. Punamia; Soil Mechanics & Foundation Engineering; Laxmi Pub. Pvt. Ltd., Delhi.
3. Alamsingh; Soil Mechanics & Foundation Engineering; CBS Publishers & Distributors, Delhi

4. Taylor D.W.; Fundamentals of Soil Mechanics; Asia Publishing House, Mumbai
5. V. N. S. Murthy; Soil Mechanics & Foundation Engineering; Sai Kripa Technical Consultants, Bangalore
6. Gopal Ranjan, Rao A.S.R.; Basic and applied soil mechanics; New age int. (p) ltd.
7. Arora K.R.; Soil Mechanics & Foundation Engineering; Standard Pub., Delhi
8. Das Braja M; Principles of Geotechnical Engineering; Thomson Asia Pvt. Ltd.

B. Web Materials:

1. <http://edudel.nic.in>
2. <http://bis.org.in/other/quake.htm>
3. <http://www.thepeninsulaneighborhood.com/ThePlan.html>
4. http://www.historytution.com/indus_valley_civilization/town_planning.html