Semester – IV

Subject Name: Soil Mechanics

Subject Code: 09CI1403

Diploma Branches in which this subject is offered: Civil Engineering

Objective: Objectives of introducing this subject at second year level in civil engineering are:

- Understand the Importance of geological investigations for engineering projects
- To acquire knowledge of soil formation and its index properties
- Ability to classify soils and to evaluate soil parameters such as soil consistency, permeability, etc. experimentally.
- To understand the mechanism of compaction and seepage and evaluate the shear strength of soil.
- To understand the basics of foundation engineering.

Credits Earned : 4

Students Learning Outcomes:

After studying this subject students will be able to:

- Selection of the best project site based on geological investigation for given project.
- Identify soil formation, types of soils, types of soils found in various parts of India.
- Evaluate the index properties of soil and interrelationships between various soil parameters.
- Classify the different types of soils as per IS code.
- Compute compaction characteristics OMC and MDD of soil.
- Understand concept of permeability & its implications with respect to use of soil.
- Understand different terms related to shear strength and evaluate shear strength parameters and conduct direct shear test.
- Understand different terms of bearing capacity and different test on foundation.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term work	
3	0	2	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact hours	Weightage (%)
1	**Introduction**	**03**	**05**
	1.1 history, scope of soil mechanism in civil engineering	1	
	1.2 soil formation, Geological cycle	1	
	1.3 General characteristics of different types of soils and overview of different types of soils in Gujarat / India.	1	
2	**Soil Index Properties**	**06**	**15**
	2.1 Different phase diagram of soil	1	
	2.2 Volume and weight relationships and basics definitions and interrelationships	2	
	2.3 Introduction of soil index properties and their determination, water content, specific gravity, density	3	
3	**Soil Classification**	**08**	**18**
	3.1 Objectives, Sieve analysis, Particle size distribution curve and its uses, Introduction of sedimentation analysis.	2	
	3.2 Plasticity characteristics: consistency limits (liquid, plastic and shrinkage limits and various indices) Activity, Sensitivity & Thixotropy of soil.	3	
	3.3 Brief of Textural and Unified soil classification. IS classification method,	2	
	3.4 Field identification and General characteristics of the soil.	1	
4	**Compaction**	**05**	**15**
	4.1 Introduction to Compaction and its Application	1	
	4.2 Standard and modified proctor test	1	
	4.3 Determination of OMC, MDD and compaction curve	1	
	4.4 Effects of compaction on different soil properties	1	
	4.5 Methods of compaction in field and various Equipment for compaction	1	

5	**Permeability of soil**	**04**	
	5.1 Concept of permeability and Darcy's law	1	**10**
	5.2 Determination of coefficient of permeability by Constant Head Method and Falling Head Method	2	
	5.3 The factors affecting permeability of soil	1	
6	**Shear Strength**	**05**	
	6.1 Introduction and important terms	1	
	6.2 Coulomb theory and Mohr- Coulomb equation	1	**17**
	6.3 Introduction to different test and direct shear test	2	
	6.4 Types of C-soil, φ-soil, C-φ soil. Failure envelope by Mohr's circle using direct shear test data	3	
7	**Introduction to foundation engineering**	**05**	
	7.1 Types of foundation, Various Shallow and deep foundations	2	
	7.2 Different bearing capacities of soil	1	**15**
	7.3 Introduction to standard penetration test	1	
	7.4 Introduction to Pile Foundation	1	
8	**Soil Investigation & Exploration**	**02**	
	8.1 Purposes & planning of exploration program	1	**05**
	8.2 Different type of soil sample, soil samplers and its collection methods	1	

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
30%	20%	15%	15%	20%	0%

Suggested List of Experiments:

Sr. No.	Name	Hours
1	Determine moisture content of soil by oven drying method	2
2	Determine bulk density and dry density of soil by core cutter method	2
3	Determine specific gravity of soil by pycnometer method	2
4	Sieve Analysis of soil	2
5	Liquid and Plastic Limit Test	2
6	Determine OMC and MDD by Proctor Test and modified proctor test	2
7	CBR test	2
8	Determine shear parameters of soil by box shear test	2
9	UCS with demonstration of Triaxial shear test	2
10	Demonstration of SPT	2

Instructional Method and Pedagogy

1. At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
2. Lectures will be also conducted with the aid of multi-media projector, black board, OHP etc.
3. Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.
4. Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
5. Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weight age of 5%.
6. Surprise tests will be conducted which carries 5% of the overall evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
8. Minimum 9 experiments shall be there in the laboratory related to course contents.

Recommended Study Material

Text Books:

1. Punmia B. C., Soil Mechanics & Foundations, Laxmi Publications.

Reference Books:

1. Das Braja M; Principles of Geotechnical Engineering; Thomson Asia Pvt. Ltd.
2. Arora K. R., Soil Mechanics & Foundation Engineering, Standard Publications.
3. Alamsingh; Soil Mechanics & Foundation Engineering; CBS Publishers & Distributors, Delhi