

Name of teacher		Sudip Banerjee	
Discipline	:	Civil Engg.	
Semester	:	4TH SEMESTER	
Subject	:	SOIL & FOUNDATION ENGG	
Lesson Plan Duration : 15 weeks			
Week	Theory		Practical
	Lecture Day	Topic (including assignment / test)	Practical Day
			1.
1.	1.	1. Introduction: 1.1 Importance of soil studies in Civil Engineering, Scope of Soil Mechanics in Civil Engg.	1. To determine the Moisture content of a given sample of soil.
	2.	1.2 Geological origin of soils, soil profiles in India: residual and transported soil, alluvial deposits, lake deposits, local soil found in J&K, dunes and loess, glacial deposits, black cotton soils, conditions in which above deposits are formed.	
	3.	1.3 Names of organizations dealing with soil engineering work in India, soil map of India, classification of Soil as per major deposits in India.	
	4.	2. Physical Properties of Soils: 2.1 Constituents of soil and phase diagram	2.
2.	1.	2.2 Definitions of void ratio, porosity, water content, degree of saturation, specific gravity, unit weight, bulk density/bulk unit weight, dry unit weight,	2. Auger Boring and Standard Penetration Test a) Identifying the equipment and accessories b) Conducting boring and SPT at a given location c) Collecting soil samples and their identification d) Preparation of boring log and SPT graphs e) Interpretation of test results
	2.	saturated unit weight and submerged unit weight of soil grains and correlation between them	
	3.	2.3 Simple numerical problems on phase diagrams	

	4	3. Classification and Identification of Soils 3.1. Particle size, shape and their effect on engineering properties of soil, particle size classification of soils 3.2 Gradation and its influence on engineering properties	3.	
3.	1.	3.3 Relative density and its use in describing cohesionless soils 3.4 Behaviour of cohesive soils with change in water content, Atterberg's limit - definitions, use and practical significance	4.	3. Extraction of Disturbed and Undisturbed Samples a) Extracting a block sample b) Extracting a tube sample c) Extracting a disturbed samples for mechanical analysis. d) Field identification of samples
	2.	3.5 Field identification tests for soils 3.6 Soil classification system as per BIS 1498; basis, symbols, major divisions and sub divisions, groups, plasticity chart; procedure for classification of a given soil		
	3.	4. Flow of Water Through Soils: (04 hrs) 4.1 Concept of permeability and its importance 4.2 Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability		
	4.	4.3 Comparison of permeability of different soils as per BIS		
4.	1.	4.4 Measurement of permeability in the laboratory	5.	4. Field Density Measurement (Sand Replacement and Core Cutter Method) a) Calibration of sand b) Conducting field density test at a given location c) Determination of water content d) Computation and interpretation of results
	2.	5. Effective Stress: (Concept only) Stresses in subsoil Definition and meaning of total stress, effective stress and neutral stress and their interrelationships.		
	3.	5.3 Principle of effective stress.	5.	
	4.	5.4 Importance of effective stress in engineering problems		

5.	1.	REVISION	6.	5. Liquid Limit and Plastic Limit Determination: a) Identifying various grooving tools b) Preparation of sample c) Conducting the test d) Observing soil behaviour during tests e) Computation, plotting and interpretation of results
	2.	FIRST SESSIONAL		
	3.	6. Deformation of Soils Meaning, conditions/situations of occurrence with emphasis on practical significance of: a) Consolidation and settlement b) Creep c) Plastic flow		
	4	d) Heaving e) Lateral movement f) Freeze and thaw of soil		
6.	1.	Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation. Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects	7.	6. Mechanical Analysis a) Preparation of sample b) Conducting sieve analysis c) Computation of results d) Plotting the grain size distribution curve e) Interpretation of the curve
	2.	Settlement due to construction operations and lowering of water table Tolerable settlement for different structures as per BIS		
	3.	7. Shear Strength Characteristics of Soils: Concept and Significance of shear strength		
	4	DO		
7.	1.	DO	8.	7. Laboratory
	2.	7.2 Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law and application in soil mechanics.		
	3.	7.3 Examples of shear failure in soils		
	4	DO		
8.	1.	DO		

	2.	8. Compaction: Concept and necessity of compaction and consolidation.		Compaction Tests (Standard Proctor Test) a) Preparation of sample b) Conducting the test c) Observing soil behaviour during test d) Computation of results and plotting e) Determination of optimum moisture content and maximum dry density
	3.	8.2 Laboratory compaction test (standard and modified proctor test as per BIS) definition and importance of optimum water content, maximum dry density; moisture dry density relationship for typical soils with different compactive efforts		
	4	8.3. Compaction control; Density control, measurement of field density by core cutter method and sand replacement method, moisture control, Proctor's needle and its use, thickness control, jobs of an embankment supervisor in relation to compaction	9.	
9.	1.	9. Soil Exploration:		8. Demonstration of Unconfined
		9.1 Purpose and necessity of soil exploration		Compression Test a) Specimen preparation b) Conducting the test c) Plotting the graph d) Interpretation of results and finding/bearing capacity
	2.	DO		
	3.	9.2 Reconnaissance, methods of soil exploration, Trial pits, borings (auger, wash, rotary, percussion to be briefly dealt)		
	4	DO	10.	
10.	1.	9.3 Sampling; undisturbed, disturbed and representative samples; selection of type of sample; thin wall and piston samples; area ratio,		REVISION
	2.	recovery ratio of samples and their significance, number and quantity of samples, resetting, Sealing and preservation of samples.		
	3.	9.4 Presentation of soil investigation results		

	4.	REVISION	11.	
11.	1.	SECOND SESSIONAL	12.	9. Demonstration of: a) Direct Shear and Vane Shear Test on sandy soil samples b) Permeability test apparatus
	2.	10 Bearing Capacity of soil Concept of bearing capacity		
	3.	10.2 Definition and significance of ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure		
	4.	10.3 Guidelines of BIS (IS 6403) for estimation of bearing capacity of soil		
12.	1.	10.4 Factors affecting bearing capacity	13.	REVISION
	2.	10.5 Concept of vertical stress distribution in soils due to foundation loads, pressure bulb		
	3.	10.6 Applications of SPT, unconfined compression test and direct shear test in estimation of bearing capacity		
	4.	10.7 Plate load test and its limitations		
13.	1.	10.8 Improvement of bearing capacity by sand drain method, compaction, use of geo-synthetics.	14.	REVISION
	2.	11. Foundation Engineering: Concept of shallow and deep foundation;		
	3.	types of shallow foundations:		
	4.	Isolated, combined, strip, mat, and their suitability.		
14.	1.	Factors affecting the depth of shallow foundations, deep foundations, type of piles and their suitability;	15.	REVISION
	2.	Pile classification on the basis of material, pile group and pile cap.		
	3.	REVISION		
	4.	THIRD SESSIONAL		
15.	1.	PREPARATION FOR FINAL EXAM		REVISION
	2.	DO		
	3.	DO		
	4.	DO		