

BANGLADESH SWEDEN POLYTECHNIC INSTITUTE
SEMESTER PLAN
OF
4TH SEMESTER CONSTRUCTION TECHNOLOGY (88)

SUBJECT : GEOTECHNICAL AND FOUNDATION ENGINEERING (8843)

CLASS TEACHER : MD. ABDUL KADER

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3		3		4
T.C	T.F	P.C	P.F	Total
30	120	25	25	200

THEORY

Week	Chapter	Lecture	Content	Description	Quiz Test	Class Test
01	<u>1.INTRODUCTION OF GEOTECHNIC</u> Understand the basic concept of geotechnical.	01	1.1 1.2 1.3	Define soil and soil engineering. Describe origin and formation of soil. Explain limitation of soil engineering.		
		02	1.4 1.5 1.6 1.7	Mention the soil classification system. State textural, AASHO and unified ASTM system. State field identification test such as: dilatancy, toughness, dry strength test. List general properties of soil.		
	03	2.1 2.2 2.3	Define the following terms: void ratio, porosity, degree of saturation, percentage of air voids, air content, water content, bulk unit wt, dry unit wt, saturated unit wt, submerged unit wt, unit wt, unit wt of solids, specific gravity of solids, density index. Explain three-phase diagram in terms of void ratio. Explain three-phase diagram in terms of porosity.			
02		01	2.4	Solve problems on soil properties.		
		02	2.5 2.6	Explain over drying method of water content determination. Explain specific gravity determination by pycnometer method.		
	03	3.1 3.2 3.3	Define index properties of soil. State mechanical analysis of soil. Describe sieve analysis.			
03	<u>4. PLASTICITY CHARACTERISTICS OF SOIL.</u> Understand the plasticity characteristics of soil.	01	3.4 3.5	Mention & Drive stokes law. Describe particle size analysis by Hydrometer.		
		02	4.1	Define: plasticity of soil, Atterberg limit, liquid limit, plastic limit, shrinkage limit, plasticity index, liquidity index, consistency index, flow index and toughness index.		
		03	4.2 4.3 4.4	State the method of measurement of consistency. Define the terms: sensitivity and thixotropy. List the uses of consistency (Atterberg) limits.		
04	<u>5.HYDRAULIC PROPERTIES OF SOIL</u> Understand the hydraulic properties of soil.	01	5.1 5.2	Define the following: permeability of soil, hydraulic head, piezometric head, position head and d Darcy's law. State the meaning of constant head and variable head permeability test for determination of co-efficient of permeability.		
		02	5.3 5.4 5.5 5.6	Describe the pumping out tests for determination of coefficient of permeability. Compute effective pressure and pore water pressure. List the factors affecting permeability of soil. Define seepage velocity, equipotential line and flow net.		
	03	6.1 6.2	Define consolidation and initial, primary and secondary consolidation. State behavior of saturated soil under pressure.			
05		01	6.3 6.4 6.5	Draw consolidation characteristics of preloaded deposits. Identify triaxial compression test apparatus. Interpret the results of triaxial tests.		
		02	6.6 6.7 6.8	Explain unconfined and confined compression test. Differentiate between consolidation and compaction. State standard proctor test compaction and standard proctor moisture density curve for material.		
		03		Review Class & Quiz Test	01	
06	<u>7.SUBSURFACE INVESTIGATION</u> Understand the purpose of subsurface investigation.	01	7.1 7.2 7.3	State the meaning of subsurface investigation of soil. Mention the stages in subsurface explorations. Mention the purposes of subsurface investigation of soil.		
		02	7.4 7.5 7.6 7.7	Compute the depth and lateral extent of explorations. Describe the open excavation methods of explorations. Describe auger boring, wash boring, rotary drilling, percussion drilling and core boring. Identify various types of soil samples.		
		03	7.8 7.9 7.10	Identify split barrel sampler, spring core catches. Scraper bucket, piston sampler for collecting samples. Describe the method of standard penetration test. State the procedure of writing subsoil investigation report.		

07	8. <u>LATERAL EARTH PRESSURE</u> Understand the aspect of lateral earth pressure.	01	8.1 8.2	State the meaning of at-rest pressure, active earth pressure and passive earth pressure. Explain active and passive earth pressure of Rankine's theory with non-surcharge.	01
		02	8.3 8.4 8.5	State the formula of active earth pressure of Rankine's theory with surcharge. State the fundamental assumption of coulomb's wedge theory. 8.5 State the formula of active earth pressure of Coulomb's theory with surcharge.	
		03			
08	9. Understand the foundation and foundation engineering.	01	9.1 9.2 9.3 9.4	State the meaning of foundation and foundation engineering. Mention the requirements of a satisfactory foundation. Mention the classification of foundation. Mention the factors governing the depth of foundation.	02
	10. Understand the soil stabilization.	02	10.1 10.2 10.3 10.4 10.5 10.6	State the meaning of soil stabilization. Mention the various methods of soil stabilization. Describe the process of addition and removal of soil particles for soil stabilization. Describe the soil stabilization by drainage. Describe the process of sand piling. Describe the process of soil cement stabilization.	
	11. Understand the bearing capacity of soil.	03	11.1 11.2 11.3	Define the bearing capacity of soil. Explain the ultimate bearing capacity of soil. Mention the Tarzaghi's bearing capacity factors.	
09		01	11.4 11.5 11.6 11.7	Express the equations for determination of ultimate bearing capacity of soil for square and circular footing. Calculate the ultimate bearing capacity of sandy soil. Explain the allowable bearing capacity of clay. Explain the allowable bearing capacity of sand.	02
		02	11.8 11.9 11.10	Describe the method of plate bearing test. Calculate the allowable bearing capacity of soil. Explain the method for improving bearing capacity of soil.	
		03		Review Class & Quiz Test	
10	12. Understand the pile and anchor.	01	12.1 12.2 12.3 12.4	Define pile. Classify pile. Differentiate pre-cast & cast in situ pile. Describe methods of cast in situ pile.	
		02	12.5 12.6 12.7	Describe methods of pre-cast pile. Explain the bearing capacity of pile. Describe the negative skin friction.	
		03	12.8 12.9 12.10 12.11	State the meaning of end bearing pile. Define the ground anchors. Describe the anchor in sand. Describe the anchor in stiff clay.	
11	13. Understand the foundation on sand and non-plastic silt.	01	13.1 13.2 13.3	Mention the characteristics of sand and silt deposits. Explain footing on sand. Explain raft on sand.	02
		02	13.4 13.5 13.6	Describe the process of excavation in sand. Explain piles in sand. Explain piers on sand.	
		03			
12	14. Understand the foundation on clay and plastic silt.	01	14.1 14.2 14.3 14.4 14.5 14.6	Mention the characteristics of clay and plastic silt deposits. Explain footing on clay. Explain raft on clay. Describe the process of excavation in clay. Explain piers on clay. Explain settlement of foundations underlying by clay.	
	15. Understand the foundation on non-uniform soils.	02	15.1 15.2 15.3 15.4	Define the non-uniform soils. Describe the characteristics of soft or loose strata overlaying firm deposit. Explain the dense or stiff layer overlaying soft deposit as foundation material. Describe the characteristics of irregular soft and stiff layers.	
		03	15.5 15.6 15.7	Describe the characteristics of irregular deposit. Describe the excavation in non-uniform soils. Describe the stability of slope in non-uniform soils.	

REFERENCE BOOKS:

- Soil Mechanics and Foundation Engineering
- Dr. K R Arora.
- Soil Mechanics and Foundation
- Dr. B C Punmia.
- Foundation Engineering
- Ralph B Peck, Walter, E Hanson

AIMS

- To enable to understand of the origin, composition, classification and properties of soil.
- To assist in understand the plasticity characteristics and hydraulic properties of soil.
- To assist in understand the consolidation characteristics of soil.
- To understand lateral earth pressure of soil.
- To provide understand of the site investigation and method of sample collection.
- Toa be able to understand the foundation and foundation engineering.
- Toa be able to understand the soil stabilization.
- Toa be able to understand the bearing capacity of soil.
- Toa be able to understand the foundation on sand and non-plastic soil, plastic soil, non-uniform soil.

SHORT DESCRIPTION

Introduction to geotechnical; Preliminary definition and simple tests; particle size of soil; plasticity characteristics of soil; Hydraulic properties of soil; consolidation characteristics of soil; Subsurface investigation; Lateral earth pressure. Foundation and foundation engineering; Soil stabilization; Bearing capacity of soil' Foundation on sand and non-plastic silt; Foundation on clay and plastic silt; Foundation on non-uniform soil.