

Branch Name:	Civil engineering
Program Code:	ET401
Course Name:	2ET4010405
Course Code:	Geotechnical Engineering
Pre-requisite Course:	---

COURSE OBJECTIVE:

Following are the objectives of this course:

- To understand and determine physical and index properties and classification of soil
- To estimate permeability and shear strength of soil
- To know the load bearing capacity of soil
- To learn various soil stabilization and compaction methods

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous assessment
03	-	02	04	60	40	20	30

DETAILS OF COURSE CONTENTS:

Sr. No.	TOPIC	Total Hrs.	WEIGHTAGE
1	Introduction of Geotechnical Engineering 1.1 Historical development of soil mechanics 1.2 Importance of soil in Civil engineering structures and foundation 1.3 State the types of failures due to soil 1.4 General characteristics of different types of soils 1.5 Preview of Geotechnical problems in civil Engineering and infrastructure Development	02	04%
	Physical and Index Properties of Soil 2.1 Three phase diagram 2.2 Properties of soil like Density, Field density, Dry density, Saturated density, Void ratio, Porosity, Specific Gravity, Degree of saturation, Moisture content, Density Index 2.3 Derive the following relations for a soil sample from fundamentals 2.3.1 $e = n/n-1$, $n = e/1+e$ 2.3.2 $w \times G = e \times s_r$ 2.3.3 $\gamma_d = \gamma_b/1+w$ 2.3.4 $\gamma_b = (G+e.s_r)\gamma_w/(1+e)$ 2.3.5 $\gamma_{sat} = (G+e)\gamma_w/(1+e)$		

	2.4 Classification of soil (Grain size) as per Indian Standard 2.5 Sieves designation as per I.S. code 2.6 Grading Curves and different coefficients i.e. CU and CC 2.7 Atterberg's limits of consistency.	14	30%
3	Compaction & soil exploration 3.1 Compaction and its Application 3.2 Effects of compaction on different soil properties 3.3 Maximum dry density and O.M.C. 3.4 Proctor test (Light compaction, Heavy compaction test) 3.5 Factors affecting compaction like water content, nature of soil Grading of soil, compaction energy, thickness of layer. 3.6 Compaction and Consolidation 3.7 Methods of Field Compaction & various Equipment for compaction 3.8 Introduction to geophysical methods for soil exploration. 3.9 Purposes of exploration of soil 3.10 Planning of exploration program and sample collection.	12	28%
4	Permeability & Shear strength of soil. 4.1 Permeability & Factors affecting the permeability 4.2 Methods to find Coefficient of Permeability 4.3 Quick sand condition. 4.4 Flow net, its characteristics and application. 4.5 Shear strength of soil 4.6 Different shear tests used to determine shear strength of soil in laboratory 4.7 Types of soil C-soil, ϕ -soil, C- ϕ soil	08	18%
5	Bearing Capacity of soil 5.1 Different Bearing capacity of soil 5.2 Methods – Plate Load Test, Penetration Test & using C – Φ parameters for determining bearing capacity of soil and to improve bearing capacity of soil 5.3 Foundation on soils of various bearing Capacity 5.4 Liquefaction & Effects of Liquefaction Remedial for Liquefaction	06	20%

LIST OF PRACTICAL:

Sr. No	Experiment / Exercises
1	Determine water content of given soil sample by oven drying method.

2	Determine specific gravity of soil by pycnometer method.
3	Determine dry unit weight of soil in field by core cutter method.
4	Determine dry unit weight of soil in field by sand replacement method
5	Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample
6	Determine grain size distribution of given soil sample by mechanical sieve analysis.
7	Determine coefficient of permeability by constant head test and falling head test.
8	Determine shear strength of soil by direct shear test.
9	Determine MDD and OMC by standard proctor test of given soil sample.

LIST OF REFERENCES:

Sr. No.	Title	Author
1	Soil Mechanics and Foundation Engineering	B.C. Punmia
2	Soil Mechanics and Foundation Engineering	K R Arora
3	Geotechnical Engineering	Kasamalkar, B. J.
4	Soil Mechanics and Foundation Engineering	Murthy, V.N.S
5	Soil Mechanics and Foundation Engineering	Raj, P. Purushothama
6	Geotechnical Engineering	Ramamurthy, T.N. &Sitharam,T.G

LIST OF OPEN SOURCE SOFTWARE/LEARNING WEBSITE:

- 1) www.academia.edu
- 2) www.nptel.iitm.ac.in
- 3) "https://en.wikipedia.org/w/index.php?title=Dumbwaiter_(elevator)&oldid=621761813"
- 4) www.bis.org.in/sf/nbc.htm
- 5) cpwd.gov.in/Units/handbook.pdf

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	To understand and determine physical and index properties and classification of soil.	2 Understanding
CLO2	To estimate permeability and shear strength of soil.	3 Applying
CLO3	To know the load bearing capacity of soil.	1 Understanding 3 Applying
CLO4	To learn various soil stabilization and compaction methods.	2 Understanding
CLO5	Interpret the soil bearing capacity results.	5 Evaluate, 4 Analyze
CLO6	Compute optimum moisture content values for maximum	2 Understanding

	dry density of soil through various tests	5 Evaluate,
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Course Learning Outcomes	Program Outcomes(Po's)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CLO1	H						L					
CLO2	M		H									
CLO3	L	M										
CLO4	L										M	
CLO5	M	M			M							
CLO6	H										M	

H: High, M: Medium, L: Low