

GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Diploma Engineering	Branch	Civil Engineering						
Semester	IV	Version	1.0.0.0						
Effective from Academic Year		2019-20	Effective for the batch Admitted in		June 2019				
Subject code	1CI2405	Subject Name	Geotech Engineering						
Teaching scheme			Examination scheme (Marks)						
(Per week)	Lecture(DT)	Practical(Lab.)	Total	CE	SEE	Total			
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

The students have to know about basics of Geology and properties of fluids.

Course Learning Outcomes:

The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:

- CO1. Understand the fundamentals of geology, Structural features of rocks & various geological investigations.
 - CO2. Explain essential features and requirements of site investigation with respect to soil.
 - CO3. Acquire knowledge of basics of soil mechanics and soil properties.
 - CO4. Conduct different laboratory tests for determining engineering properties /parameters of a soil.
 - CO5. Ability to classify soils and to evaluate soil parameters such as permeability, compaction, shear strength etc. experimentally.
- The practical should be carried out in such a manner that students are able to acquire different learning outcomes from covered course.

Course Content

Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hr
UNIT – 1 INTRODUCTION	1.1 History 1.2 List structures where soil is used as construction material. 1.3 Soil-formation in Geological cycle. 1.4 Name the types of failure due to soil in civil engineering structure. 1.5 Foundation as branch of civil engineering. 1.6 Selection of foundations and its failures.	1a Discuss soil formation cycle & general characteristics of soil. 1b List structures where soil is used as dam Construction material. 1c Describe soil-formation in Geological cycle. 1d State the types of failures due to soil in Civil Engineering structure.	02	02
UNIT – 2 INDEX PROPERTIES AND RELATIONS	2.1 Constituents of Soils, Phase Diagram. 2.2 Definitions of void ratio, porosity, degree of saturation, moisture content, specific gravity, unit weight, density index, air content. 2.3 Derivations of Functional relationships. 2.4 Numerical.	2a Explain phase diagram of Soil. 2b Discuss various index properties of soil for the purpose of their classification & Use 2c Describe interrelationship between different index properties.	10	08

<p align="center">UNIT – 3 CLASSIFICATION OF SOIL AND IDENTIFICATION</p>	<p>3.1 Classification of soil (Grain size) as per Indian Standard. 3.2 Mechanical Analysis of soils. 3.3 Grading Curves and different coefficients i.e. CU and CC. 3.4 Difference between clay, silt, sand and gravel. 3.5 Define the following Atterberg's Limits (Liquid, Plastic and Shrinkage Limits). 3.6 Field identification test for coarse grained and fine grained soils.</p>	<p>3a Discuss methods of Classification. 3b Describe method of I.S. Classification of Soil. 3c Classify Soil based on Consistency Limits</p>	<p align="center">10</p>	<p align="center">08</p>
<p align="center">UNIT – 4 PERMEABILITY</p>	<p>4.1 Permeable and Impermeable soils 4.2 Darcy's Law. 4.3 Factors affecting the permeability. 4.4 Coefficient of permeability. 4.5 Laboratory determination of Permeability of Soil & Relative Numerical.</p>	<p>4a Explain concept of permeability & its implications with respect to use of soil. 4b Determine 'permeability' of given soil. 4c Comprehend the concept of Seepage Analysis in relation to 'quicksand condition' with examples.</p>	<p align="center">08</p>	<p align="center">05</p>
<p align="center">UNIT – 5 COMPACTION</p>	<p>5.1 Definition and scope 5.2 Maximum dry density and O.M.C 5.3 Proctor test (a) Light compaction (b) Heavy compaction test 5.4 Factors affecting compaction 5.5 Difference between compaction and consolidation 5.6 Role of O.M.C in the field 5.7 Methods of compaction 5.8 List the Equipment for compaction & Relative Numerical.</p>	<p>5a Comprehend the principle and methods of compaction of soil. 5b Differentiate between compaction and consolidation with examples. 5c Determine MDD & OMC of soil by conducting appropriate test.</p>	<p align="center">10</p>	<p align="center">06</p>
<p align="center">UNIT – 6 SHEAR STRENGTH</p>	<p>6.1 Importance of determination of shear Strength. 6.2 Definition of: Cohesion, Angle of Internal Friction, Angle of Repose. 6.3 Types of soil C-soil, ϕ-soil, C-ϕ soil. 6.4 Coulomb's Equation. 6.5 Shear stress of soil & Relative 6.6 Numerical.</p>	<p>6a Explain different terms used in the context of 'shear strength' of soil. 6b Evaluate shear parameters of various types of soil, with their practical significance.</p>	<p align="center">05</p>	<p align="center">05</p>
<p align="center">UNIT – 7 BEARING CAPACITY</p>	<p>7.1 Concept of Ultimate Bearing Capacity, Safe Bearing Capacity, Allowable Bearing Capacity, Factors affecting Bearing Capacity. 7.2 Bearing capacity of various soils. 7.3 Methods of improving bearing capacity of soils. 7.4 Methods for determining bearing capacity of soils 7.5 Foundation on soils of various bearing capacity 7.6 Liquefaction</p>	<p>7a Explain concept of bearing capacity of soil. 7b Describe various methods to determine bearing capacity of soil. 7c Explain the concept & occurrence mechanism & effect of 'Liquefaction' of soil.</p>	<p align="center">10</p>	<p align="center">07</p>

	7.7 Earth Pressure: Active and passive earth pressure & Relative Numerical.			
UNIT – 8 SOIL INVESTIGATION & EXPLORATION	8.1 Purposes of exploration of soil. 8.2 Planning of exploration program, Soil samples and collection. 8.3 Field penetration Test: SPT 8.4 Introduction to geophysical methods.	8a Discuss various methods & appropriate use for investigation & exploration of soil.	05	04
		Total	60	45

List of Practical		
No.	Unit	Name of Practical
1	II	Determine field moisture content of soil
2	II	Determine bulk density and dry density of soil by core cutter method
3	II	Determine specific gravity of sand by pycnometer.
4	II	Determine bulk density and dry density of soil by sand replacement method.
5	III	Conduct Sieve analysis of given soil for its classification.
6	III	Determine consistency Limits i.e. Liquid limit, Plastic limit, Shrinkage limit
7	IV	Determine permeability of soil by constant head method
8	IV	Determine permeability of soil by falling head method
9	VI	Determine shear parameters of soil by box shear test
10	V	Determine OMC and MDD by Proctor Test

List of Instruments / Equipment / Trainer Board	
1	Core Cutter
2	Hot Air Oven
3	Sand Pouring Cylinder
4	Pycnometer Bottle
5	Permeability Apparatus
6	Set of IS Sieves
7	Casagrande Apparatus.
8	Direct Shear Apparatus
9	Electronic Weighing Balance
10	Heavy & Light Proctor Test Apparatus

List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Soil Mechanics & Foundation	Dr. B C Punamia	Standard Book House
2	Soil Mechanics & Foundation	Dr. K.R.Arora	Standard Publishers

Link of Learning Web Resource	
1	www.issnge.org
2	www.springer.com
3	www.britannica.com
4	www.trb.org

PO & CO Mapping

Sr.No.	Name of PO	Description	Co1	Co2	Co3	Co4	Co5
1	PO 1	Acquire fundamental knowledge of mathematics, science, and civil engineering.	Moderate	None	None	Slight	Slight
2	PO 2	Design and conduct experiments, as well as analyze and interpret data.	Slight	Slight	Slight	None	Moderate
3	PO 3	Use the techniques, skills, and modern engineering tools necessary for engineering practice	Slight	Slight	Slight	Slight	Substantial
4	PO 4	Function in multi-disciplinary teams and identify, formulate, and solve engineering problems.	None	None	Slight	None	Slight
5	PO 5	Clear understanding of his duties and responsibilities as a civil engineer.	None	None	None	None	Slight
6	PO 6	Develop effective communication skill and provide leadership for professional development.	Slight	None	None	None	None
7	PO 7	Engage in life-long learning in civil engineering field and comprehend issues related to environment and sustainable development.	Moderate	Moderate	Slight	Slight	Slight
8	PO 8	Graduate will demonstrate knowledge of professional and ethical responsibilities.	Moderate	None	None	None	None
9	PO 9	Incorporate economics and business practice including project and risk management.	None	None	None	None	None
10	PO 10	Graduated are able to share their knowledge to the industries as well as society.	Moderate	None	None	None	None
11	PO 11	Graduated will be able to apply their skill and knowledge for the sustainable development of nation.	None	None	Moderate	None	None
12	PO 12	Graduated are able to learn to work with with the team and also with the inter discipliners.	Slight	Slight	None	Slight	Slight