

# GANPAT UNIVERSITY

## FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Civil Engineering
Semester	IV	Version	2.0.0.0
Effective from Academic Year	2024-25	Effective for the Batch admitted in	July 2022
Course Code	2CI4110	Course Name	Geotechnical Engineering
Teaching Scheme		Examination Scheme (Marks)	
(Per week)	Lecture (DT)	Practical (Lab.)	Total
	L TU	P TW	
Credit	03 00	01 00	04
Hours	03 00	02 00	05
		CE	SEE
			Total

### Pre-requisites

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### Course Outcomes

On successful completion of the course, the students will be able to:

CO1	Remember and analyse the index and engineering properties of the soil.
CO2	Understand the theory of slopes and types of earth pressure occurred in the Civil Engineering Structures.
CO3	Apply the fundamentals of Compaction and Consolidation in the real field application.
CO4	Analyse the various types of soil and characterize them.
CO5	Evaluate the stresses in the soil mass and computation of shear strength.

### Theory Syllabus

Unit	Content	Hrs.
1	<b>Introduction:</b> Introduction of soil, basic soil properties, Mineralogy of Structures, Soil Mechanics, Origin and formation of soils, Field identification of soils, Atterberg's limits & soil classification, grain size analysis.	4
2	<b>Permeability of Soils:</b> Permeability of soils, Darcy's law, Lab tests of permeability, Factors affecting permeability, Field permeability tests, Confined and unconfined aquifers, Permeability of stratified soils.	5
3	<b>Stress Distribution in Soil:</b> Boussinesq's theory for distribution of pressure on a vertical plane and a horizontal plane below ground surface due to vertical point load on the ground surface, isobar, assumptions, comparison and limitations of Boussinesq's theory & Westergaard theory. Stress caused by loaded areas of different shapes, equivalent point load method, stresses due to trapezoidal loads. New mark's influence chart.	6
4	<b>Shear Strength of Soil:</b> Mohr's strength theory, Mohr- coulomb's strength theory, Modified Mohr-coulomb's theory, direct shear test, unconfined compression test, vane shear test, triaxial compression test, shear tests based on drainage conditions.	6
5	<b>Compaction:</b> Definition, theory of compaction, factors affecting compaction, laboratory compaction tests, effect of compaction on soil properties, placement water content, placement layer thickness, field control of compaction, Proctor's needle, methods of compaction used in the field.	6
6	<b>Consolidation of Soils :</b> Compressibility of soils, definitions and mechanism of consolidation, spring analogy, void ratio and effective stress relation, related indices, assumptions of Terzaghi's one dimensional consolidation theory, time factor, one dimensional consolidation tests, laboratory and theoretical time curves, determination of preconsolidation pressure, estimation of consolidation settlement and rate of settlement for uniform pressure increment in a clay layer.	6
7	<b>Earth Pressure:</b>	6

	Active and passive earth pressures due to level and uniform surcharged backfill for cohesion less and cohesive soils using Rankine's theory, earth pressure at rest, introduction to Coulomb's theory, limitations and differences of Rankine's and Coulomb's theory	
8	<b>Stability of Slopes:</b> Idealized condition used in the analysis, types of slope failures, infinite and finite slopes, factor of safety, stability of infinite slopes, Fundamentals of conventional methods, Swedish circle method, friction circle method, Taylor stability numbers, stability charts, effects of seepage and non-homogeneity on the stability of slopes, factor of safety and soil parameters for special cases such as end of construction, rapid (instantaneous) draw down, steady seepage, Tension cracks.	6

#### Practical Content

Practical, assignments and tutorials are based on above syllabus and along with that software such as Plaxis 3D, GEO STUDIO etc. should be given to the students for practice in the laboratory sessions.

#### Text Books

1	Arora K.R.; Soil Mechanics & Foundation Engineering, Standard Publisher.
2	B. Punamia.; Soil Mechanics & Foundation Engineering, Laxmi Publication.

#### Reference Books

1	Murthy V.N.S.; Soil Mechanics & Foundation Engg Vol-.I, Geotechnical Engineering Series (GES).
2	Taylor D.W.; Fundamentals of Soil Mechanics Wiley, New York, 1948.

#### ICT/MOOCs Reference

1	<a href="https://nptel.ac.in/courses/105101201">https://nptel.ac.in/courses/105101201</a>
2	<a href="https://archive.nptel.ac.in/courses/105/105/105105185/">https://archive.nptel.ac.in/courses/105/105/105105185/</a>
3	<a href="https://nptel.ac.in/courses/105105185">https://nptel.ac.in/courses/105105185</a>

#### Mapping of CO with PO and PSO:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	0	0	0	0	1	0	2	1	0	1	0	1	1
CO2	3	1	1	1	0	1	0	0	1	1	1	2	1	0	1
CO3	2	2	1	1	1	0	0	0	2	1	1	1	0	1	1
CO4	1	0	0	1	1	1	0	0	1	1	0	0	0	1	0
CO5	2	3	2	1	1	1	0	1	2	1	1	1	2	1	1