NIRMA UNIVERSITY

Institute:	**Institute of Technology**
Name of Programme:	**B. Tech. in Civil Engineering**
Course Code:	2CL401
Course Title:	**Geotechnical Engineering**
Course Type:	(☑Core/□Value Added Course/□Departmental Elective/ □Institute Elective/□University Elective/(□Open Elective Any other)
Year of Introduction:	2023-24

L	T	Practical Component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLO):

At the end of the course, the student will be able to –

1. classify soils and derive physical properties of soil (BL2)
2. evaluate the engineering properties of soil (BL5)
3. analyse retaining structures and shallow foundation (BL4)
4. estimate capacity of deep foundation. (BL5)

Syllabus: **Total Teaching hours: 30**

Unit	Syllabus	Teaching hours
Unit-I	**Introduction to Soil Mechanics:** Definition, formation of soil; Soil as three phase system and derived properties, index properties, consistency limits; classification of soils; Soil investigations: methods, stages, planning, sampling, field tests, report.	08
Unit-II	**Engineering Properties of Soil:** Permeability: definition, factors affecting, measurements; Compaction: definition, compaction tests, field compaction method; Shear strength: definition, shear parameters and theory, tests; Consolidation: one-dimensional theory, test.	10
Unit-III	**Retaining Structures and Foundations** Lateral Earth Pressures: Introduction, analysis: dry, wet, submerged soils; pressure calculations for retaining walls; Introduction to slope stability analysis; Shallow Foundations: Bearing capacity analysis, settlement analysis, criteria for selection of shallow foundation; Deep Foundation: Classification, load carrying capacity of piles, pile groups, pile load test.	12

Self Study:	The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents.
Suggested Readings/ References:	• Arora, K. R. *Soil Mechanics and Foundation Engineering*, Standard Publication. • Ranjan, G., & Rao, A.S.R. *Basic and Applied Soil Mechanics*, New Age International Publication. • Gulhati, S., & Datta, M. *Geotechnical Engineering*, Tata McGraw-Hill. • Terzaghi, K. V., Peck, R. B. & Mesri, G. *Soil Mechanics in Engineering Practice*, John Wiley. • Knappett, J. A., & Craig, R. F. *Craig's Soil Mechanics*, CRC Press. • Das, B. M. & Shobhan, K. *Principles of Geotechnical Engineering*, Cengage Learning India. • Das, B. M. *Principles of Foundation Engineering*, C.B.S Publishers • Bowles, J. E. *Foundation Analysis and Design*, McGraw Hill.
Suggested List of Experiments:	Laboratory work will be based on above syllabus with minimum 07 experiments/exercises to be incorporated.

Sr. No.	Name of Experiments/Exercises	Hours
1.	Collection of Soil Samples and Standard Penetration Test: Collection of disturbed and undisturbed samples, Standard Penetration Test	04
2.	Determination of Index Properties of Soil: Relative density test, Specific gravity test, Liquid limit test, Plastic limit test	06
3.	Grain Size Analysis: Sieve analysis, Sedimentation analysis	04
4.	Determination of Compressibility of Soil: Standard proctor test, Consolidation test	04
5.	Determination of Permeability of Soil: Constant head permeability test, Falling head permeability test	02
6.	Determination of Shear Strength of Soil: Unconfined compressive strength test, Direct shear test, Vane shear test, Triaxial compression test	08
7.	Computer Application in Geotechnical Engineering	02