

**NIRMA UNIVERSITY**

<b>Institute:</b>	<b>Institute of Technology, School of Engineering</b>
<b>Name of Programme:</b>	<b>B. Tech. in Civil Engineering</b>
<b>Course Code:</b>	2CL401
<b>Course Title:</b>	<b>Geotechnical Engineering</b>
<b>Course Type:</b>	Core
<b>Year of Introduction:</b>	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 –

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

**Syllabus:**

**Total Teaching hours: 30**

Unit	Content	Teaching hours
Unit-I	<b>Introduction to Soil Mechanics:</b> Definition, formation of soil; Soil as three phase system & derived properties, index properties, consistency limits; classification of soils; Soil Investigations: methods, stages, planning, sampling, field tests, report.	08
Unit-II	<b>Engineering Properties of Soil:</b> Permeability: definition, factors affecting, measurements; Compaction: definition, compaction tests, field compaction method; Shear strength: definition, shear parameters & theory, tests; Consolidation: one-dimensional theory, test.	10
Unit-III	<b>Retaining Structures and Foundations</b> Lateral earth pressures: Introduction, analysis: dry & wet 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; Ground improvement techniques.	12

**Self Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.



Suggested Readings/  
References:

- Das, B. M. & Shobhan, K. *Principles of Geotechnical Engineering*, Cengage Learning India.
- 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. *Principles of Foundation Engineering*, C.B.S Publishers
- Bowles, J. E. *Foundation Analysis and Design*, McGraw Hill.
- Codes: IS 1892, IS 2720, IS 6403, IS 2911.

Suggested List of  
Experiments/exercises:  
Suggested Case List:

Laboratory work will be based on above syllabus with minimum  
07 experiments/exercises to be incorporated.

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Suggested List of Experiments/Exercises:

Sr. No.	Name of Experiment/Exercise	Hours
1	Collection of Soil Samples & 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