

## 19CE3403 - GEOTECHNICAL ENGINEERING

Course Category:	Program Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial- Practical:	3-0-0
Prerequisites:	19CE3301- Engineering Mechanics	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

### Course Outcomes

Upon successful completion of the course, the student will be able to:

<b>CO1</b>	Understand formation of soil and classification of soils by formation and transporting agent, Indian regional soil deposits	K2
<b>CO2</b>	Determine index properties of soil, coefficient of permeability and classify the soil as per IS soil classification	K3
<b>CO3</b>	Evaluate the effective stress and vertical stress distribution	K5
<b>CO4</b>	Determine compaction characteristics of soil and consolidation	K3
<b>CO5</b>	Determine shear strength analytically and from laboratory data and choose the relevant laboratory or field-testing method to evaluate shear strength.	K3

### Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	3	3	2									1	3	2
<b>CO2</b>	3	3	2									1	3	2
<b>CO3</b>	3	3	2									1	3	2
<b>CO4</b>	3	3	2									1	3	2
<b>CO5</b>	3	3	2									1	3	2
<b>Avg.</b>	3	3	2									1	3	2

1- Low

2-Medium

3-High

## Course Content

<b>UNIT-1</b>	<p><b>Soil Properties:</b> Origin and formation of soils, General types of soils, residual and transported soils, three phase representation of soil mass, physical properties of soil – void ratio, porosity, degree of saturation, water content, module weights, specific gravity – their functional relationships, relative density.</p> <p><b>Consistency Limits:</b> Determination and various indices – plasticity index, consistency index, liquidity index – uses and applications of consistency limits in soil engineering, activity ratio.</p>	<b>CO1</b>
<b>UNIT-2</b>	<p><b>Classification:</b> – I.S and MIT grainsize classification, Indian standard classification for fine grained and coarse grained soils for general engineering purposes</p> <p><b>Soil Hydraulics:</b> Types of soil water, Darcy’s law and its limitations, determination of coefficient of permeability, laboratory methods-constant head and variable head permeameter tests, factors influencing coefficient of permeability, permeability of stratified soils, stress principle for saturated soils-total, neutral and effective stresses, no flow, downward flow and upward flow conditions, quick sand conditions, critical hydraulic gradient, piping failures in dams founded on permeable formations</p>	<b>CO2</b>
<b>UNIT-3</b>	<p><b>Stress Distribution:</b> Boussinesq theory for the determination of vertical stresses due to point loads, assumptions and validity, extension to circular loaded areas, equivalent point load method, 2 : 1 approximate method, Westergaard’s theory &amp; equation, Newmark’s influence chart - construction and use, contact pressure distribution beneath rigid footings</p>	<b>CO3</b>
<b>UNIT-4</b>	<p><b>Consolidation:</b> Oedometer Tests, e-p and e-log p curves – compression index, coefficient of compressibility and coefficient of volume change, Terzaghi’s assumptions for one dimensional consolidation, equation and application,</p>	<b>CO4</b>

	coefficient of consolidation, degree of consolidation vs time, initial compression, primary compression and secondary compression, normally consolidated, over consolidated and under consolidated clayey deposits, <b>Compaction:</b> Mechanism of compaction, factors affecting compaction, effect of compaction on engineering properties of soils, field compaction equipment and quality control.	
<b>UNIT-5</b>	<b>Shear Strength of Soils:</b> Stress at a point, Mohr circle of stress, Mohr-coulomb's failure theory, shear tests – direct shear box, unconfined compression, tri-axial compression, and field vane shear tests, shear parameters, types of shear tests in the laboratory based on drainage conditions, shear strength of sands, critical void ratio, thixotropy and dilatancy of sands.	<b>CO5</b>

### Learning Resources

<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. B.C. Punmia, Soil Mechanics and Foundations, (SI Modules), 16/e Laxmi Publications, Sixteenth edition (2017).</li> <li>2. Gopala Ranjan and A.S.R, Rao, Basic and Applied Soil Mechanics, 2/e, New Age International Publishers, Third edition 2016.</li> <li>3. Dr. K. R Arora, Soil Mechanics and Foundation Engineering, Standard Publisher Dist, 2009.</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. C. Venkataramaiah, Geotechnical Engineering, New Age International, 2006.</li> <li>2. M. Braja Das, Principles of Geotechnical Engineering, Cengage Learning, 2013.</li> <li>3. P. Donald, Coduto, Geotechnical Engineering, Prentice-Hall India, 2010.</li> </ol>
<b>e-Resources &amp; other digital material</b>	<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/105/101/105101201/">https://nptel.ac.in/courses/105/101/105101201/</a></li> <li>2. <a href="http://jntuk-coeerd.in/">http://jntuk-coeerd.in/</a></li> </ol>