

Course Code	Course Name	L-T-P-Credits	Year of Introduction
CE208	GEOTECHNICAL ENGINEERING - I	3-0-0 -3	2016

Prerequisite : CE 205 Engineering Geology

Course objectives:

1. To impart to the students, the fundamentals of Soil Mechanics principles;
2. To enable the students to acquire proper knowledge about the basic, index and engineering properties of soils.

Syllabus:

Major soil deposits of India, Basic soil properties, Relationship between basic soil properties, Index properties-Sieve analysis, Hydrometer analysis, Atterberg Limits and Relative density, Soil classification, Permeability of soils, Principle of effective stress, Quick sand condition, Critical hydraulic gradient, Shear strength of soils, Mohr-Coulomb failure criterion, Different types of shear tests, Liquefaction of soils, Compressibility and Consolidation, Void ratio versus pressure relationship, Normally consolidated, under consolidated and over consolidated states, Estimation of magnitude of settlement, Terzaghi's theory of one-dimensional consolidation, Coefficient of consolidation, Stability of finite slopes, Swedish Circle Method- Friction circle method, use of Stability, Compaction of soils, light and heavy compaction tests, Control of compaction

Course Outcomes:

1. The students will be able to understand the basic principles governing soil behavior.
2. The students will be able to understand the procedure, applicability and limitations of various soil testing methods.

Text Books:

1. Ranjan G. and A. S. R. Rao, Basic and Applied Soil Mechanics, New Age International, 2002.
2. Das B. M., Principles of Geotechnical Engineering, Cengage India Pvt. Ltd., 2010.

References:

1. Taylor D.W., Fundamentals of Soil Mechanics, Asia Publishing House, 1948.
2. Arora K. R., Geotechnical Engineering, Standard Publishers, 2006.
3. Venkatramaiah, Geotechnical Engg, Universities Press, 2000.
4. Terzaghi K. and R. B. Peck, Soil Mechanics in Engineering Practice, John Wiley, 1967.
5. Purushothamaraj P., Soil Mechanics and Foundation Engineering, Dorling Kindersley(India) Pvt. Ltd., 2013
6. A V Narasimha Rao and C Venkatramaiah, Numerical Problems, Examples and Objective questions in Geotechnical Engineering, Universities Press (India) Ltd., 2000

COURSE PLAN			
Module	Contents	Hours	Sem.Exam Marks %
I	<p>Introduction to soil mechanics -Major soil deposits of India</p> <p>Basic soil properties - Void ratio, porosity, degree of saturation, air content, percentage air voids, moisture content, specific gravity, unit weight - Relationship between basic soil properties - Sensitivity – Thixotropy - numerical problems</p>	6	15%
II	<p>Index properties - Sieve analysis – Well graded, poorly graded and gap graded soils - Stoke's law - Hydrometer analysis(no derivation required for percentage finer and diameter) - numerical problems- – Relative density</p> <p>Consistency-Atterberg Limits - Practical Applications - numerical problems</p> <p>I.S. classification of soils.</p>	7	15%
FIRST INTERNAL EXAMINATION			
III	<p>Permeability of soils - Darcy's law – Factors affecting permeability - Practical Applications - Constant head and falling head permeability tests - Average permeability of stratified deposits (no derivation required) - numerical problems.</p> <p>Principle of effective stress - Total , neutral and effective stress variation diagrams - Quick sand condition - Critical hydraulic gradient - - numerical problems– Definition of phreatic line and exit gradient.</p>	6	15%
IV	<p>Shear strength of soils- Practical Applications - Mohr-Coulomb failure criterion – Mohr circle method for determination of principal planes and stresses- numerical problems – relationship between shear parameters and principal stresses[no derivation required]</p> <p>Brief discussion of direct shear test, tri-axial compression test, vane shear test and unconfined compression test – Applicability - numerical problems -UU and CD tests [Brief discussion only]</p> <p>- Liquefaction</p>	7	15%

SECOND INTERNAL EXAMINATION			
V	<p>Compressibility and Consolidation - Void ratio versus pressure relationship - Coefficient of compressibility and volume compressibility - Compression index Practical Applications -</p> <p>Change in void ratio method - Height of solids method - Normally consolidated, under consolidated and over consolidated states - Estimation of pre consolidation pressure - Practical Applications - Estimation of magnitude of settlement of normally consolidated clays - Numerical problems</p> <p>Terzaghi's theory of one-dimensional consolidation(no derivation required) - average degree of consolidation - Time factor - Coefficient of consolidation - Practical Applications -Square root of time and logarithm of time fitting methods - Numerical problems</p>	8	20%
VI	<p>Stability of finite slopes - Toe failure, base failure, slip failure - Swedish Circle Method- Friction circle method- Factor of safety with respect to cohesion and angle of internal friction - Stability number - Stability charts - Methods to improve slope stability.</p> <p>Compaction of soils - Standard Proctor, Modified Proctor, I.S. light & Heavy Compaction Tests – OMC - Zero Air voids line - Control of compaction - numerical problems</p>	8	20%
END SEMESTER EXAMINATION			

QUESTION PAPER PATTERN (End semester exam) :

Maximum Marks :100

Exam Duration: 3 Hrs

The question paper shall have three parts.

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

Note : 1.Each part should uniformly cover the two modules in that part.

2. Each question can have a maximum of 4 subdivisions (a,b,c,d), if needed