4012 - SOIL MECHANICS

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)			
					Theory		Practical Ex.	Total
Lectures	Practical	Credits						
3	2	5	25	25	3Hrs.	100	0	150

Pre-requisite	Source
Nil	CVL

Semester	Theory	Test	Total	TW	PR	Gr Total
	75	25	100	25	–	125

RATIONALE: - A sound understanding of the fundamental principles of soil mechanics is needed to predict the behaviour and performance of soil as a construction material and /or as a supporting medium of engineering structures. The course content has been designed to acquaint the students with the behaviour of different types of soils and their properties to enable him to make use of this information in the design and construction of foundations to various structures, pavements, earth retaining structures, embankments, earth dams, etc.

COURSE CONTENTS

	Hrs	Mks
1. INTRODUCTION Soil as an engineering material, importance of soil mechanics. Use of soil as a construction material and foundation bed and fields of application.	2	4
2. PHYSICAL PROPERTIES OF SOIL Soil mass, three-phase system. Properties like void ratio, porosity, water content, degree of saturation, bulk density, dry density, saturated density, submerged density, unit weight, specific- gravity. Interrelation between the properties.	8	12
3. CLASSIFICATION OF SOILS Mechanical analysis- Particle size distribution; sieve analysis, sedimentation analysis, pipette analysis. Consistency of soil, Atterbergs limits and their determination, plasticity index, liquidity Index and consistency index. Field identification of soil.	4	12

I. S. classification of soils- Plasticity chart and A-line diagram.

4. PERMEABILITY OF SOIL	6	12
Definition, Darcy's law, factors affecting permeability, permeability tests by constant head and falling head parameters. Concept of flow lines, equi-potential lines, seepage pressure, pore pressure and quick condition.		
5. STRENGTH OF SOIL	6	12
Shearing strength and bearing capacity of soil- Coulomb's law, Mohr's stress circle, failure envelope, tests to determine shearing strength, direct shear test, tri-axial shear test, drained and un-drained conditions, suitability of these tests. Ultimate, safe allowable bearing capacity of soil, Terzhaghi's analysis, effect of water table, plate load test, and its limitations, typical values of bearing capacity of different soils from codes.		
6. COMPACTION	4	10
Concepts of compaction, standard compaction tests, light and heavy compaction, OMC, field application and methods of compaction. Measurement of field density, core cutter method and sand replacement method. Concepts of consolidation, spring analogy, difference between compaction and consolidation, laboratory consolidation tests.		
7. LATERAL EARTH PRESSURE	4	8
Rankine's theory, Coulomb's theory of earth pressure.		
8. SOIL STABILIZATION	2	6
Definition, necessity, mechanical, lime, cement and bitumen stabilisation.		
9. SOIL EXPLORATION	6	12
Objectives and different methods of soil exploration, disturbed and undisturbed samples, bore hole logs, geophysical methods.		
10. GEOLOGY	6	12
Interior of earth, definition of weathering and weathering agents. Introduction to Igneous, Sedimentary, Metamorphic rocks, properties and uses of important rocks. Structural elements of rock. Unconformity- Angular un-confirmity, discontinuity, outcrop pattern. Faults- Introduction, Horst and Graben, vertical fault, hinge fault, reversed fault, parallel fault, radial fault. Folds- Introduction, parts of fold, anticlines, synclines, fan fold, overfold, isoclinal folding, recumbent folding. Joints- Introduction, sheet jointing, column jointing. Broad outline geology as applied to various Civil Engineering problems.		
Total	48	100

PRACTICALS

Journal containing the following tests (Minimum ten)

Determination of specific gravity of soil by Pycnometer. Determination of field-density of soil- Core cutter method and sand replacement method. Determination of Liquid Limit, Plastic Limit. Determination of Shrinkage Limit. Grain size distribution by Sieve analysis. Standard Proctor / I. S. Compaction (Light) test. Direct Shear Test. Unconfined Compression test. Triaxial-test- (Study experiment).O.C.B.R. test. Vane shear test (Demonstration). Consolidation test.

REFERENCE BOOKS

1. Soil Mechanics & Foundation Engineering by Bharat Singh
2. Soil Mechanics & Foundation Engineering by B.C. Purnima
3. Basic and Applied Soil Mechanics by Gopal Ranjan & A.S.R. Rao
4. Soil Engineering- Theory & Practicals by Alam Singh
5. Geo-Technical Engineering by C. Venkataramaiah.