SUBJECT TITLE : GROUND IMPROVEMENT TECHNIQUES

SUBJECT CATEGORY: E

SUBJECT CODE : 5011

PERIODS / WEEK :4

PERIODS /SEMESTER :72

CREDIT : 4

Time schedule

Module	TOPIC	PERIODS
I	Introduction to ground improvement techniques Drainage and dewatering	18
II	Soil stabilizations Grouting	18
III	Reinforced earth and Geosynthetics	18
IV	Shear strength consolidation	18
	TOTAL	**72**

Rationale:

Ground improvement refer to the improvement or modification to the engineering properties of a soil that are carried out at a site where the soil in its natural state

does not possess properties that are acceptable to us for the proposed Civil engineering activity. Therefore knowledge this course is useful in field activities.

Objectives

Upon completing the subject, the students should be able to

1.1.0 Understand introduction to ground improvement techniques

1.1.1 Explain the purpose of ground improvement techniques

1.1.0 Explain dewatering

1.1.3 Understand the well point system, shallow & deep well system, vacuum method, electro osmosis methods of lowering water table

2.1.0 Methods of stabilization

2.1.1 Explain mechanical stabilization

2.1.2 Explain cement and its influencing factors

2.1.3 Explain method of cement stabilization

2.1.4 Explain lime stabilization

2.1.5 Explain various types of bitumen stabilizations

2.1.6 Explain chemical stabilization by calcium chloride and sodium chloride method

2.2.0 understand grouting in soils

2.2.1 Explain the uses of grouting

2.2.2 Explain basic functions of grouting

2.2.3 Explain the classifications of grouts

2.2.4 Understand groutability ratio

2.1.6 Explain various properties of grouts

3.1.0 Understand the reinforced soil

3.1.1 Understand the mechanism of reinforced earth

3.1.2 Explain the types of reinforcing elements

3.1.3 Describe the mechanism of reinforcement-soil interaction

3.1.4 Explain the applications of soil reinforcement

3.1.5 Explain the construction of reinforced earth wall

3.2.0 Understand the basic concepts of geosynthetics

3.2.1 Explain the types geosynthetics

3.2.2 Explain the functions of geosythetics: separation, filtration, drainage, reinforcement, hydraulic barriers, surface erosion control, encapsulation, and protection.

3.2.3 Explain the properties of geosynthetics

4.1.0 Understand the basic concept of consolidation

4.1.1 Describe the spring analogy model

4.1.2 Explain the procedure of laboratory consolidation test

4.1.3 Explain the consolidation of laterally confined soil

4.1.4 Understand the e-log p curve

4.1.5 Determine coefficient of consolidation c_v by square root time fitting method and log of time fitting method

4.1.6 Differentiate between compaction and consolidation

4.2.0 Understand the basic concepts of shear strength of the soil

4.2.1 Explain Mohr's circle

4.2.2 Plot the Mohr's circle and identify the features

4.2.3 Explain principle planes and principle stresses

4.2.4 Explain the Mohr-Coulomb failure theory

4.2.5 Plot the failure envelop

4.2.6 Explain the procedure of direct shear test

4.2.7 Describe the advantages and disadvantages of direct shear test

4.2.8 Calculate the shear strength parameters

COURSE CONTENT

Module - I

Introduction to Ground improvement techniques – Purpose.

Drainage and dewatering: well point system, shallow & deep well system, vacuum method, electro osmosis method.

Module - II

Methods of stabilizations – Mechanical – Cement - Lime - Bituminous - Chemical.

Grouting – basic functions- classification of grouts- groutability ratio- properties of grouts: viscosity, stability, fluidity, rigidity, thixotropy, permeance

Grouting applications: seepage control in soil and rock under dams- seepage control in soil for cut off walls – stabilization grouting for underpinning.

Module - III

Reinforced earth- mechanism- types of reinforcing elements- reinforcement-soil inter action – applications- reinforced soil structures with vertical faces

Geosynthetics – types – functions of geosynthetics – properties of geosythetics.

Module - IV

Consolidation: definition- laboratory consolidation test- e-log p curve - coefficient of consolidation.

Shear strength: definition – theoretical considerations: Mohr's stress circle, principal plane, principal stresses – Mohr-coulomb failure theory – the effective stress principle - measurement of shear strength - Direct shear test – advantages and disadvantages – triaxial compression test – unconfined compression test - vane shear test .

EFERENCE BOOKS

1. Ground Improvement Technique –P. Purushothama Raj, Laxmi Publications (P) Ltd
2. Geotechnical Engineering - P. Purushothama Raj, Tata McGraw –Hill publishing company Ltd
3. Geotechnical Engineering – Shashi K Gulhati & Manoj Datta, Tata McGraw –Hill publishing company Ltd
4. Soil Mechanics and Foundation Engineereing – Dr.B.C. PUnmia, A.Saurabh&Co (P) Ltd
5. Soil Mechanics and Foundation Engineering – Dr.Arora.K.R; Standard publishers distributers.
6. Basic and applied soil mechanics – Gopal Ranjan & A.S.R.Rao.
7. Soil Mechanics & foundation Engineering –P. Purushothama Raj, Pearson Education
8. Text book of Geotechnical Engineering – A.Khan, Prentice Hall of India

9. Construction and Foundation Engineering – Dr. J.Sha & S.K.sinha, Khanna Publishers Delhi.

10. Geotechnical Engineering . T.N.Ramamurthy & T.G.Sitaraman., S.chand Publishers.