

GROUND IMPROVEMENT TECHNIQUES (Professional Elective- IV)

Course Code: 20CE1164

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Pre-requisites: Building Materials and Concrete Technology, Geotechnical Engineering-I, Geotechnical Engineering-II

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Describe dewatering techniques according to field conditions.

CO2: Identify different grout materials and apply various grouting methods

CO3: Explain various in situ densification methods for granular and cohesive soils.

CO4: Demonstrate basic knowledge about design principles of reinforced soil walls.

CO5: Describe applications of geo-synthetics and methods of soil stabilization.

UNIT-I

(10 Lectures)

DEWATERING:

Methods of dewatering- Sumps and Interceptor Ditches- Single, Multistage well points - Vacuum well points- Horizontal wells- Foundation drains-Blanket drains- Criteria for selection of fill material around drains, Electro-osmosis.

Learning outcomes:

1. Explain about the dewatering (L2)
2. Explain methods of dewatering (L2)
3. Discuss the merits and demerits of methods of dewatering (L2)

UNIT-II

(10 Lectures)

GROUTING:

Objectives of grouting- Grouts and their properties- Grouting methods-Ascending, Descending and Stage Grouting- Hydraulic fracturing in soils and rocks- Post grout test.

Learning outcomes:

1. Explain about grouting (L2)
2. Explain about grouts properties (L2)
3. Discuss the merits and demerits of various methods of grouting (L2)

UNIT-III

(10 Lectures)

IN SITU DENSIFICATION METHODS:

GRANULAR SOILS: Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth.

COHESIVE SOILS: Preloading or dewatering, Vertical drains – Sand Drains, Sand wick drains, synthetic drains – Stone and Lime columns – Thermal methods.

Learning outcomes:

1. Explain about vibration and impact (L2)
2. Explain in situ densification methods of granular and cohesive soils (L2)

3. Discuss the merits and demerits of various in-situ densification methods (L2)

UNIT-IV

(10 Lectures)

REINFORCED SOIL AND GEOSYNTHETICS:

Reinforced earth: - mechanism- types of reinforcing elements- reinforcement-soil interaction – applications– types of geosynthetics – functions of geosynthetics – properties of geosynthetics. – Geo grids and Geomembranes – Functions and Applications.

Learning outcomes:

1. Explain about reinforced soil (L2)
2. Explain importance of reinforcement (L2)
3. Explain about applications of geosynthetics (L2)

UNIT-V

(10 Lectures)

SOIL STABILIZATION:

Cement Stabilization Mechanism, Factors affecting and Properties, Use of Additives, Design of soil cement mixtures, Construction techniques. Lime Stabilization - Type of Admixtures, Mechanism, Factors affecting, design of mixtures, construction. Stabilization using bitumen emulsions, Stabilization using industrial wastes Construction techniques and applications.

Learning outcomes:

1. Explains stabilization importance(L2)
2. Explains stabilization - type of admixtures, mechanism (L2)
3. Discuss the merits and demerits of various methods of stabilization(L2)

TEXT BOOKS:

1. Hausmann M.R., “Engineering Principles of Ground Modification”, 3rd Edition, McGraw-Hill International Edition, 2002.
2. Purushotham Raj, “Ground Improvement Techniques”, 4th Edition, Laxmi Publications, New Delhi, 2006.

REFERENCES:

1. Moseley M.P., “Ground Improvement”, 2nd Edition, Blackie Academic and Professional, 2007.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A., “Ground Control and Improvement”, 5th Edition, John Wiley and Sons, 2000.
3. Robert M. Koerner, “Designing with Geo-synthetics”, 2nd Edition, Prentice Hall of India, 2000.