

Course Code	Course Title	L	T	P	C
17CE016	GROUND IMPROVEMENT TECHNIQUES	3	0	0	3

Course Objectives:

1. To understand the engineering properties of soil and problems associated with weak deposit.
2. To understand the need for ground improvements.
3. To study the concept of soil stabilization.
4. To familiarize students in recent ground improvement techniques.
5. To get exposure to soil reinforcement techniques and geo-synthetics.

Course Outcomes:

At the end of the course student will be able

1. To understand the engineering properties of soil and problems associated with weak deposit.
2. Identify ground conditions and suggest method of improvement
3. Design and assess the degree of improvement
4. Understand the principles of soil reinforcement and confinement in engineering constructions
5. Design reinforced soil structures

Activities:

1. Design and make a model of a Reinforced Earth Wall
2. A model of stone columns in a clayey strata and observation of ground water depletion
3. Design a stone column and determine its load carrying capacity and settlements
4. Case studies on usage of different geo synthetics in soils
5. Test and compare the strength of the soil with different additives and justify the difference observed

Skills:

1. Able to suggest a suitable ground improvement technique
2. Able to design stone columns, reinforced earth walls
3. Able to diagnose problems associated with problematic soils
4. Able to design mix for various cement, lime and bitumen stabilization techniques
5. Able to suggest various grouting techniques for different problems and their design

UNIT-I: Ground Improvement in Cohesion less Soil:

Need for Ground Improvement, Different types of problematic soils, Emerging trends in ground Improvement. Shallow and deep compaction requirements, Principles and methods of soil compaction, Shallow compaction and methods. Properties of compacted soil and compaction control, Deep compaction and Vibratory methods Dynamic compaction.

UNIT-II: Ground Improvement in Cohesive Soil:

Drainage and Dewatering-Drainage techniques - Well points - Vacuum and electro osmotic methods. Preloading with and without vertical drains. Compressibility, vertical and radial consolidation, preloading methods. Types of Drains, Design of vertical Drains, Construction techniques. Stone Column: Function Design principles, load carrying capacity, construction techniques, settlement of stone column foundation.

UNIT-III: Reinforced Earth:

Principles, components of reinforced earth, governing design of reinforced earth walls, design principles of reinforced earth walls. Geotextiles-Introduction, types of Geotextiles, functions and their applications, tests for Geotextiles, Geogrids and their functions.

UNIT-IV: Mechanical Stabilization:

Soil aggregate mixtures, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control. In situ soil treatment methods-Soil nailing, rock anchoring, micro-piles, construction techniques.

UNIT-V: Chemical Stabilization:

Cement Stabilization-Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques. Lime and Bituminous Stabilization-Type of admixtures, mechanism, factors affecting, design of mixtures, construction methods-Grouting Techniques-Types of grouts - Grouting equipment and machinery - Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals - Stabilization of expansive soils.

TEXT BOOKS:

1. Purushothama Raj. P, “Ground Improvement Techniques”, 2nd ed., Laxmi Publications (p) Ltd., New Delhi, 1998.
2. Craig, R.F., “Soil Mechanics”, 3rd ed., Van Nostrand Reinhold Co.,New York, 1993.
3. Koerner R.M., “Construction and Geotechnical Methods in Foundation Engineering”, 3rd ed., McGraw Hill, 1994.

REFERENCES:

1. Moseley M.P., “Ground Improvement Blockie Academic and Professional”, 2nd ed., Chapman and Hall, Glasgow, 1993.
2. Jones J.E.P., “Earth Reinforcement and Soil Structure”, 3rd ed., Butterworths, 1995.