

## **CE8001 GROUND IMPROVEMENT TECHNIQUES**

### DETAILED SYLLABUS

#### **OBJECTIVE:**

- Students will be exposed to various problems associated with soil deposits and methods to evaluate them. The different techniques will be taught to them to improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods.

#### **UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES**

Role of ground improvement in foundation engineering – Methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

#### **UNIT II DEWATERING**

Dewatering Techniques - Well points – Vacuum and electroosmotic methods – Seepage analysis for two-dimensional flow for fully and partially penetrated slots in homogeneous deposits – Design for simple cases.

#### **UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS**

Insitu densification of cohesionless soils – Shallow as deep compaction – Dynamic compaction – Vibro flotation, Sand compaction piles and deep compaction. Consolidation of cohesionless soils - Preloading with sand drains, and fabric drains, Stabilization of soft clay ground using stone columns and Lime piles-Installation techniques – Simple design - Relative merits of above methods and their limitations.

#### **UNIT IV EARTH REINFORCEMENT**

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – Simple design - Applications of reinforced earth; Functions of Geotextiles in filtration, drainage, separation, road works and containment applications.

#### **UNIT V GROUTING TECHNIQUES**

Types of grouts – Grouting equipments and machinery – Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals – Stabilization of expansive soil.

#### **TEXTBOOKS:**

1. Purushothama Raj. P, “Ground Improvement Techniques”, Lakshmi Publications, 2nd Edition, 2016.
2. Koerner, R.M. “Construction and Geotechnical Methods in Foundation Engineering”, McGraw Hill, 1994.
3. Nihar Ranjan Patra, “Ground Improvement Techniques”, Vikas Publishing House, First Edition, 2012.

4. Mittal. S, "An Introduction to Ground Improvement Engineering", Medtech Publisher, First Edition, 2013.

**REFERENCES:**

1. Moseley, M.P., "Ground Improvement" Blockie Academic and Professional, 1992.
2. Moseley, M.P and Kirsch. K., 'Ground Improvement", Spon Press, Taylor and Francis Group, London, 2nd Edition, 2004.
3. Jones C.J.F.P. "Earth Reinforcement and Soil Structure", Thomas Telford Publishing, 1996.
4. Winterkorn, H.F. and Fang, H.Y. "Foundation Engineering Hand Book". Van Nostrand Reinhold, 1994.
5. Das, B.M., "Principles of Foundation Engineering" (seventh edition), Cengage learning, 2010.
6. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt. Ltd. New Delhi, 2011.
7. Koerner, R.M., "Designing with Geosynthetics" (Sixth Edition), Xlibris Corporation, U.S.A, 2012.
8. IS Code 9759: 1981 (Reaffirmed 1998) "Guidelines for Dewatering During Construction", Bureau of Indian Standards, New Delhi.
9. IS Code 15284 (Part 1): 2003 "Design and Construction for Ground Improvement – Guidelines" (Stone Column), Bureau of Indian Standards, New Delhi.