**17CE42E4 – GEOSYNTHETICS AND REINFORCED SOIL STRUCTURES**

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| **Course Category**  | Core Elective | **Credits**  | 3 |
| **Course Type**  | Theory | **Lecture - Tutorial - Practical**  | 3 - 0 - 0 |
| **Prerequisite**  | Soil Mechanics, Foundation Engineering & RCC Structural Design-II | **Sessional Evaluation**  | 40 |
| **Semester End Exam Evaluation**  | 60 |
| **Total Marks**  | 100 |

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| **Course Objectives** | 1. To explain the various types of geosynthetics and their manufacturing methods and to demonstrate the various testing methods for geosynthetics.
2. To understand design and construction methods of different types of reinforced soil retaining walls.
3. To analyse slope stability of reinforced soil slopes using different methods.
4. To understand the applications of geosynthetics in foundations and selection of geotextiles based on flow characters of soils and geotextiles.
5. To study the use of geosynthetics in the construction of pavements.
6. To study the use of geosynthetics in the construction of landfills.
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| **Course** **Outcomes** | CO1 | Demonstrate types of geosynthetics and various testing methods. |
| CO2 | Perform the design of reinforced soil retaining wall. |
| CO3 | Analyse the slope stability of reinforced soil slopes using different methods. |
| CO4 | Analyse drainage and filter applications of geosynthetics. |
| CO5 | Demonstrate the use of geosynthetics in the construction of pavements. |
| CO6 | Identify the geosynthetics in the construction of landfills. |
| **Course****Content** | **UNIT – I****INTRODUCTION:** Historical background of reinforced soil – Principles of reinforced soil through Mohr circle analysis – Types of geosynthetics like geotextiles, geogrids, geonets, geocells, geo-composites and their manufacturing methods.**TESTING METHODS FOR GEOSYNTHETICS:** Techniques for testing of different index properties – strength properties – Apparent Opening Size – In-plane and cross-plane permeability tests – Assessment of construction induced damage and extrapolation of long term strength properties from short term tests.**UNIT – II****REINFORCED SOIL RETAINING WALLS:** Different types of walls like wrap-around walls – Full-height panel walls and discrete-facing panel walls – Modular block walls – Design methods as per BS-8006 and FHWA methods – Construction methods for reinforced soil retaining walls.**UNIT – III****REINFORCED SOIL SLOPES:** Basal reinforcement for construction on soft clay soils – Construction of steep slopes with reinforcement layers on competent soils – Different slope stability analysis methods like planar wedge method – Bi-linear wedge method and circular slip methods – Erosion control on slopes using geosynthetics.**UNIT – IV****APPLICATIONS IN FOUNDATIONS:** Binquet and Lee's approach for analysis of foundations with reinforcement layers.**DRAINAGE AND FILTRATION APPLICATIONS OF GEOSYNTHETICS:** Different filtration requirements – Filtration in different types of soils and criteria for selection of geotextiles – Estimation of flow of water in retaining walls – Pavements and selection of geosynthetics.**UNIT – V****PAVEMENT APPLICATION:** Geosynthetics for separation and reinforcement in flexible pavements – Design by Giroud-Noiray approach – Reflection cracking and control using geosynthetics – Use of geosynthetics for construction of heavy container yards and railway lines.**UNIT – VI****CONSTRUCTION OF LANDFILLS USING GEOSYNTHETICS:** Different components of modern landfills – Collection techniques for leachate – Application of different geosynthetics like geonets – Geotextiles for drainage in landfills – Use of geomembranes and Geosynthetics Clay Liner (GCL) as barriers. |

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| **Textbooks****and References** | **TEXTBOOKS:** 1. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.
2. Soil Mechanics and Foundation Engineering by K.R.Arora.
3. Geotechnical Engineering by C. Venkatramaiah.

**REFERENCES:**1. Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 4th edition, 1999.
2. Jewell, R.A., "Soil Reinforcement with Geotextiles", Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.
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