

Geosynthetics and its Application
01GT0204 (PC)

Objective of the Course: Objectives of introducing this subject at first year level in Masters of civil engineering are:

- To understand the emerging trends of Geosynthetic in Geotechnical Engineering
- To evaluate the different properties of including different tests
- To analyze the functions of geosynthetic and its suitability
- To design different structures using geosynthetics according to various applications

Credits Earned: 5

Students learning outcomes:

After successful completion of the course it is expected that student will be able to..

1. Identify the type of geosynthetics and their relevance in geotechnical field
2. Understand the mechanism of formation of different geosynthetics
3. Analyse and compute different properties of geosynthetics
4. Apply the knowledge for designing the structures using Geosynthetic materials.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (M)	Internal (I)	Viva (V)	Term Work (TW)	
4	0	2	5	50	20	30	25	25	150

Detailed Syllabus

Sr No.	Title of the unit	Number of hours
1	An Overview of Geosynthetic in Geotechnical Engineering	8
	Historical development	2
	Types of geosynthetics : geotextiles , geogrids, geonets , geomembranes , geocomposites	4
	Recent use in India	2
2	Manufacturing : Materials and Process	8
	Raw materials : polyamide , polyester , polyethylene , polypropylene , poly vinyl chloride	2
	Different type of geosynthetics based on manufacturing woven , monofilament , multifilament , slit filament , non-woven	4
	Different bonding process : Mechanically bonded, Chemically bonded ,Thermally bonded	2
3	Properties of Geosynthetics	10
	PHYSICAL Properties: Mass per unit area , Thickness , Specific gravity	2
	Hydraulic properties: Apparent open size, Permittivity, Transmissivity	2
	Mechanical Properties : Uniaxial Tensile Strength , Burst and Puncture Strength , Soil Geosynthetic friction tests	4
	Durability : Abrasion resistance ,Ultraviolet resistance	2
4	Functions of Geosynthetics	9
	Reinforcement,	2
	Separation	2
	Filtration,	1
	Drainage	2
	Barrier Functions	1
	Confinement	1
5	Applications of Geosynthetics	9
	Use of geosynthetics in roads	1
	Use of reinforced soil in Retaining walls	2
	Improvement of bearing capacity	2
	Geosynthetics in environmental control and land fills	2
	Ground Improvement by geodrains	1
	Use of Geosynthetics in lining of canals	1

Suggested list of the experiments:

1. Tensile strength of geotextile/geogrid/geonet
2. Puncture resistance of geomembrane
3. In-plane and cross-plane permeability of the Geotextiles

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	15%	15%	25%	20%	20%

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through ppt and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

F. Recommended Study Material:**Reference Book:**

1. Engineering with Geosynthetics by G.VenkatappaRao and G.V.S SuryanarayanaRaju – Tata McGraw Hill, New Delhi, 1990.
2. Construction and Geotechnical Methods in Foundation Engineering by Robert M. Koerner – McGraw Hill, New York, 1985.
3. Designing with Geosynthetics by Robert M. Koerner, Prentice Hall, New Jersey, UAS,1989.
4. Fundamentals of Geosynthetic Engineering by Sanjay Kumar Shukla, Jian-Hua Yin, CRC Press
5. Handbook on Geosynthetics and their applications, Sanjay Kumar Shukla, Thomas Telford, 2002

Web Resources

1. <http://nptel.ac.in/courses/105106052> *Geosynthetics and Reinforced Soil Structures (Video): (NPTEL Course)*
2. <http://nptel.ac.in/courses/105101143>