



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Subject Code : ME03033021

Subject Name : Geosynthetic Reinforced Soil Structure

w. e. f. Academic Year:	2024-25
Semester:	3
Category of the Course:	MOPEC

Prerequisite:	Geotechnical Engineering, Foundation Engineering, Advanced Soil Mechanics
Rationale:	To introduce the students to the different types of Geosynthetic, their manufacturing technique, testing methods and their applications in different types of Civil Engineering projects. They will be exposed to various slope stability methods and their analysis.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Explain the different types of Geosynthetics, their manufacturing technique and testing methods for various civil engineering structures	R
02	Understand and able to design reinforced earth soil.	B
03	Analyze reinforced soil slope and reinforced foundation.	B, T
04	Judge various application of Geosynthetic and related issues about mechanics on soil as a material and its behavior before failure.	T

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial / Practical	
			ESE (E)		PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	0	3	70	30	0	0	100



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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Historical background of reinforced soil, Introduction to Geosynthetic, Types of Geosynthetics, their applications and manufacturing methods. Strength of reinforced soils. Testing of Geosynthetics: Various properties of Geosynthetics, physical, mechanical, hydraulic and endurance properties. Different Types of Soil Retaining Structures. Construction Aspects of Geosynthetic Reinforced Soil Retaining Walls like wrap-around walls, full-height panel walls and discrete-facing panel walls, modular block walls Design Codes and methods for Reinforced Soil Retaining Walls	08	15
2.	Slope stability analysis: Planar wedge method and bilinear wedge analysis, External Stability Analysis of Reinforced Soil Retaining Walls, Internal Stability Analysis of Reinforced Soil Walls, Testing Requirements for Reinforced Soil Retaining Walls, Design of Reinforced soil Retaining walls - simple geometry, Design of reinforced soil retaining walls supporting sloped backfill soil, Design of reinforced soil retaining walls supporting a bridge abutment. Stability analysis of soil slopes- Infinite slopes, Stability analysis of reinforced soil slopes resting on soft and strong foundation soil	12	30
3.	Applications of Geosynthetics: Reinforced soil for supporting shallow foundations. Biquet and Lee's approach for analysis of foundations with reinforcement layers, Accelerated consolidation of soft clays using Geosynthetics, Analysis and Design methods for encased stone columns, Drainage and filtration: Different filtration requirements, filtration in different types of soils and criteria for selection of geotextiles.	10	25
4.	Erosion control using Geosynthetics, Natural Geosynthetics and their applications, Geosynthetics for construction of municipal and hazardous waste landfill. Landfills application: Different components of modern landfills, collection techniques for Leachate. Application of different Geosynthetics for drainage in landfills, use of geomembranes and Geosynthetic, Clay Liner (GCL) as barriers.	12	30
	Total	45	100

Suggested Specification Table with Marks (Theory):



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Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
15	15	20	25	15	10

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Koerner, R.M. (2012)"Designing with Geosynthetics", 6 th edition, Vol-1 and 2, Xlibris corp.ion.
2. S. Kumar Shukla (2002) "Geosynthetics and Their Applications", Thomas Telford Ltd.
3. G.V. Rao, G.V.S.Suryanarayana (2011) "Advances in Geosynthetics", Sai Master Geoenvironmental Services Private Ltd., Hyderabad
4. Hoe I. Ling, Dov Leshchinsky Fumio (2003)- "Reinforced Soil Engineering: Advances in Research and Practice" Tatsuoaka. R. W.
5. Sarsby "Geosynthetics in Civil Engineering" edited by, CRC press G. V Rao & G. K. Pothal "Geosynthetics Testing, Laboratory Manual" SAGES Pvt. Ltd.

(b) Open source software and website:

1. NPTEL lecture series
