



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Subject Code : ME03033011

Subject Name : Ground Improvement

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

Prerequisite:	Knowledge of Geotechnical Engineering and Advanced Soil Mechanics
Rationale:	The subject is introduced with a view that it will provide students insight into identifying various engineering problems associated with soft and compressible soil deposits and selection of appropriate ground improvement technique based on the soil type and application. The course would impart knowledge about design and implementation of various soil improvement techniques. It would introduce the students to decide suitability of mechanical and chemical modification of soil, grouting and application of Geosynthetics for solving engineering problem more cost effectively.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Explain various engineering problems associated with soft and compressible soil deposits.	R
02	Understand knowledge about design and implementation of various soil improvement techniques.	B
03	Analyze soil improvement technique based on the soil type and application.	B, T
04	Judge various application of Geosynthetic, related issues and its behavior.	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



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Subject Code : ME03033011

Subject Name : Ground Improvement

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction: Engineering properties of soft, weak and compressible deposits and potential problems associated with these deposits, Need of Ground Improvement, Classification of Ground Improvement methods and its selection.	08	15
2.	Mechanical modification: In-situ deep dynamic compaction of cohesionless soil, pre-compression, stone columns; injection grouting, thermal, admixture and reinforcement its concept and application, dewatering systems, preloading and vertical drains, rapid compaction, vibro-compaction, design step and procedure.	12	30
3.	Chemical modification and Stabilization: Modification by admixtures (lime, cement, lime-fly ash, hydroxides, carbonates etc., inorganic stabilizers), stabilization using industrial Wastes, Lime columns, bituminous stabilization.	6	15
4.	Grouting: Objective, Classification, Grout materials, suitability of grouting methods for different types of soil, Grout characteristics, physical and chemical properties of grout, types of grouting and its application. Allowable grout pressure, Rheological aspects of coarse and fine grouts, performance aspect of coarse and fine grouts,	8	20
5.	Geosynthetic in ground improvement: Type of soil reinforcement, selection of stabilization/improvement of ground using Geotextiles, Geogrid, Geofoam, Geomembranes, Geocells, function of Geosynthetics, shallow foundations on reinforced earth, analysis and design of shallow foundations using geosynthetic reinforcements, design of geosynthetic reinforced earth wall and its performance.	8	20
Total		45	100

Suggested Specification Table with Marks (Theory):

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:



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Subject Code : ME03033011

Subject Name : Ground Improvement

(a) Books:

1. Koerner R M, “Construction and Geotechnical Methods in Foundation Engineering”, McGraw Hill Publishing Co. Ltd., 1984
2. A. V. Shroff & D.L. Shah, Grouting technology for dam construction and tunneling, Oxford & IBH Publishers, 2nd addition, 1999
3. G.V. Rao, G.V.S. Suryanarayana (2011) “Advances in Geosynthetics”, Sai Master Geoenvironmental Services Private Ltd., Hyderabad
4. Hausmann M.R. „Engineering Principles of Ground Modification“ McGraw Hill Publishing Company, New York - 1990.
5. R.H. Karol, Chemical Grouting, Applied Science Publishers-1986.

(b) Open source software and website:

1. NPTEL lecture series
