



SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and
Technology
Bachelor of Technology
Civil Engineering



B.Tech. IV Semester – VII

Subject Name : Advanced Soil Improvement Techniques **Subject Code:** BTCL14702

Type of course : PEC – IV

Prerequisite (if any) : Fundamental of Soil Mechanics (BTCL13402) & Applied Soil Mechanics (BTCL13501)

Rationale: To give updated information to the students about treatment of poor soil conditions for development activities and tell them about state of art in this area by case studies. Acquaint students with problematic soil and selection of suitable techniques.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
3	0	0	3	60	25	15	—	—	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Content	Total Hrs	Module Weightage
1.	Introduction -- Types of Soil Structure – Clay Minerals – Characteristics and Construction of mineral groups – soil water - Typical situations where ground improvement becomes necessary, historical review of methods adopted in practice, current status and the scope in the Indian context- Weak Deposits- Identification-Problems associated with weak deposits- Mitchel chart of applicability of treatment methods	10	20 %
2.	Ground Improvement Techniques -- Methods of ground improvement, mechanical compaction, dynamic compaction, impact loading, compaction by blasting, vibro-compaction; pre-compression, dynamic consolidation, design aspects of stone columns, use of admixtures, injection of grouts, design guidelines and quality control, design examples on preloading with sand drains, road designs with geosynthetic – Soil Electrosmosis	12	25 %

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3.	Geotextiles and Earth Reinforcement -- Reinforced earth, basic mechanism, constituent materials and their selection; engineering applications – shallow foundations on reinforced earth, design of reinforced earth retaining walls, reinforced earth embankments structures, wall with reinforced backfill, analysis and design of shallow foundations on reinforced earth geotextiles, selection and engineering applications, design examples, stabilization/improvement of ground using geomembranes, geocells, geonets, geosynthetic walls	10	25 %
4.	Techniques for Underground Structure and Slope Stability -- Soil nailing, construction of underground structures, landslide controls, deep vertical cuts, contiguous piles Ground Water Control – Methods – Diaphragm techniques – well point system	7	15 %
5.	Problematic soils and its Improvement -- Problematic soils, use of ply soils, improvement of saline soils, improvement of black cotton soils	6	15 %

Suggested Specification table with Marks (Theory):

% Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	20	20	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom’s Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Principles of Ground Modification	Hausmann, H.R	McGraw-Hill Book Company US. ISBN-10 : 0070272794	1990	3 rd
2.	Ground Improvement	Moseley, M. P. and Krisch K	Taylor and Francis. ISBN9780429095917	2004	2 nd

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3.	Ground Improvement Case Histories: Compaction, Grouting and Geosynthetics	Buddhima Indraratna, Jian Chu and Cholachat Rujikiatkamjorn	Elsevier Ltd., Canada ISBN 978-0-08-100698-6	2015	3 rd
4.	Earth Reinforcement and Soil Structure	Colin J.F.P. Jones	Thomas Telford Ltd ISBN 10: 0727725254 ISBN 13: 9780727725257	1996	2 nd
5.	Fundamentals of Geosynthetic Engineering	Sanjay Kumar Shukla, Jian-Hua Yin	CRC Press Taylor & Francis Group ISBN 9780415394444	2006	1 st
6.	An Introduction to Ground Improvement Engineering	Satyendra, Mittal	Medtech ISBN-10 9381714363 ISBN-13 978-9381714362	2013	1 st
7.	Ground Improvement Techniques	P. Purushothama Raj	Laxmi Publications ISBN-10 9788131805947 ISBN-13 : 978-8131805947	2016	2 nd
8.	Foundation Design Manual	Dr. N.V.Nayak	I. DhanpatRai Publications ISBN-10 9383182903	2018	7 th

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Interpret the basic concept of different types of problematic soil and introduce engineering properties of soft, weak and compressible deposits. (R,U,A-Cognitive level)	20
CO-2	Develop the fundamental principles of different types of mechanical stabilization use in soil improvement techniques with its suitability. (R,U,A-Cognitive level)	35
CO-3	Assess the applications of geotextiles in various civil engineering projects. The basic knowledge of earth reinforcement - their application. (R,U,A,N,C-Cognitive level)	20

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CO-4	Identify the basic facts of soil behavior under hydraulic modification with ground water control. (R,U,A-Cognitive level)	10
CO-5	Comprehend the behavior of soft, weak compressible deposits and black cotton soils (A,N,C-Cognitive level)	15

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	1	1	1	-	2	1	-	-	-	-	1	1	-	1
CO-2	3	2	2	1	2	1	1	1	2	1	1	1	-	2	-
CO-3	3	2	2	2	3	1	2	1	1	-	2	1	2	-	1
CO-4	3	2	2	1	2	2	2	1	2	-	-	1	-	-	1
CO-5	3	2	2	-	1	1	1	-	1	-	1	-	2	1	-
Rational e*	15	09	09	05	08	07	07	03	06	01	04	04	05	03	03

Rationale*: Subject satisfying majority of programme outcomes and at the end of programme, the specific objectives are also satisfy. Subject gives updated information to the students about treatment of poor soil conditions for development activities and tell them about state of art in this area by case studies.

List of Open learning website:

- APSEd Website: <https://learn.apsed.in/Clay Mineral and Soil Structures> | Soil Mechanics youtube.com
- Module 1
- https://nptel.ac.in/content/syllabus_pdf/105108075.pdf , NPTEL <http://nptel.iitm.ac.in> Ground Improvement Techniques - Video course
- Module 2
- <https://nptel.ac.in/courses/105/106/105106052/Geosynthetic and Reinforced Soil Structures Prof. K Rajagopal Department of Civil Engineering IIT Madras>
- Module 3
- <https://nptel.ac.in/content/storage2/courses/105108075/module8/Lecture24.pdf>
- Module 4
- <https://nptel.ac.in/content/storage2/courses/105108075/module3/Lecture09.pdf>
- Module 5
- <https://nptel.ac.in/content/storage2/courses/105108075/module1/Lecture02.pdf>

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