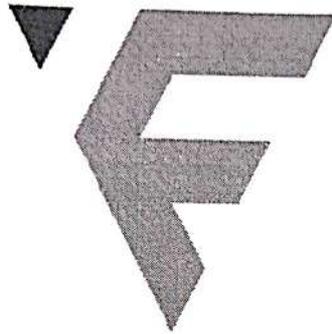


**FABTECH EDUCATION SOCIETY'S
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Affiliated to Dr. Babasaheb Ambedkar Technological University (BATU), Lonere



**In line with the
National Education Policy (NEP) 2020 Compliant
Curriculum
For**

DEPARTMENT OF CIVIL ENGINEERING

**Post Graduate Program
(Geotechnical Engineering)
First and Second Year M. Tech.
(Sem. I to Sem. IV)
(w.e.f. A.Y. 2025-26)**



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Curriculum for First Year M. Tech. with effect from A.Y. 2025-26

Semester I

Course Type	Course Code	Name of the Course	Engagement Hours			Credits	In Semester Evaluation Scheme		End Semester Evaluation Scheme		Total Marks
			L	T	P		MSE	ICA	ESE	OE/POE	
							M	M	M	M	
PCC	25PCE11171	Advanced Soil Mechanics	3	-	-	3	30	10	60	-	100
	25PCE11172	Ground Improvement Methods	3	-	-	3	30	10	60	-	100
	25PCE11173	Geotechnical Exploration and Instrumentation	3	-	-	3	30	10	60	-	100
	25PCE11174	Experimental Geotechnics Lab	-	-	2	1	-	50	-	-	50
PEC	25PCE11271	Professional Elective-1	3	1	-	4	30	10	60	-	100
	25PCE11272										
	25PCE11273	Professional Elective-2	3	1	-	4	30	10	60	-	100
	25PCE11274										
ELC	25PME11671	Research methodology and IPR	3	1	-	4	30	10	60	-	100
ELC	25PCE11672	Seminar	-	-	2	1	-	50	-	-	50
AEC	25PEE11471	Hands on Research and Analysis Tool	-	-	2	1	-	50	-	-	50
Total			18	03	06	24	180	210	360	-	750

Abbreviations: L= Lecture, T = Tutorial, P = Practical, M = Marks


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Professional Electives- I & II

Sr. No.	Professional Elective	Course	Course Code
1.	Professional Elective- I	Earth & Rockfill Dams	25PCE11271
		Marine Geotechniques	25PCE11272
2.	Professional Elective- II	Unsaturated soil mechanics	25PCE11273
		Computational Methods in Geotechnical Engineering	25PCE11274



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		Curriculum for First Year M. Tech. with effect from A.Y. 2025-26										
		Semester II										
		Course Type	Course Code	Name of the Course	Engagement Hours			Credits	In Semester Evaluation Scheme		End Semester Evaluation Scheme	
L	T				P	MSE	ICA		ESE	OE/POE		
						M	M		M	M		
PCC	25PCE12175	Advanced Foundation Engineering	3	-	-	3	30	10	60	-	100	
	25PCE12176	Soil Dynamics and Machine Foundations	3	-	-	3	30	10	60	-	100	
	25PCE12177	Geo-environmental Engineering	3	-	-	3	30	10	60	-	100	
	25PCE12178	Geotechnical Computational lab	-	-	2	1	-	50	-	-	50	
PEC	25PCE12275	Professional Elective- III	3	1	-	4	30	10	60	-	100	
	25PCE12276											
	25PCE12277	Professional Elective- IV	3	1	-	4	30	10	60	-	100	
	25PCE12278											
VSE	25PCE12172	Mini Project	-	-	2	1	-	50	-	-	50	
ELC	25PET12673	Research Publication and Ethics	-	-	4	2	-	50	-	-	50	
Total			15	2	8	21	150	200	300	-	650	
Abbreviations: L= Lecture, T = Tutorial, P = Practical, M = Marks												


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Professional Electives - III & IV

Sr. No.	Professional Elective	Course	Course Code
1.	Professional Elective- III	Soil Behaviour	25PCE12275
		Critical State Soil Mechanics	25PCE12276
2.	Professional Elective- IV	Earthquake Geotechnics	25PCE12277
		Geosynthetics Engineering	25PCE12278



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Curriculum for First Year M. Tech. with effect from A.Y. 2025-26

Semester III

Course Type	Course Code	Name of the Course	Engagement Hours			Credits	In Semester Evaluation Scheme		End Semester Evaluation Scheme		Total Marks
			L	T	P		MSE	ICA	ESE	OE/POE	
							M	M	M	M	
PCC	26PCE21179	Soil Structure Interaction	3	-	-	3	30	10	60	-	100
ELC	26PCE21674	MOOC's/NPTEL, Self Learning Courses/MKCL	2	-	-	2	-	50	-	-	50
OEC	26PCE21571	Open Elective Course	3	1	-	4	30	10	60	-	100
	26PCE21572										
	26PCE21573										
ELC	26PCC21675	Dissertation Phase - I	-	-	12	6	-	100	-	100	200
Total			8	1	12	15	60	170	120	100	450

Abbreviations: L= Lecture, T = Tutorial, P = Practical, M = Marks

Open Elective Course

Sr. No.	Course Code	Name of the Course
1.	25PCE21571	Business Analytics
2.	25PCE21572	Non-Conventional Energy
3.	25PCE21573	Organizational Behavior


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		Curriculum for First Year M. Tech. with effect from A.Y. 2025-26									
		Semester IV									
Course Type	Course Code	Name of the Course	Engagement Hours			Credits	In Semester Evaluation Scheme		End Semester Evaluation Scheme		Total Marks
			L	T	P		MSE	ICA	ESE	OE/POE	
							M	M	M	M	
ELC	26PCC22676	Dissertation Phase - II	-	-	24	12	-	200	-	200	400
Total			-	-	24	12	-	200	-	200	400
Abbreviations: L= Lecture, T = Tutorial, P = Practical, M = Marks											

Type of courses	Description
PCC	Programme Core Course
PEC	Programme Elective Course
MDM	Multidisciplinary Minor
OEC	Open Elective Course
REM	Research Methodology
VSE	Vocational and Skill Enhancement Course
ELC	Dissertation/Project/Internship
AEC	Ability Enhancement Courses


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Semester I



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First Year M. Tech.

Semester-I (w.e.f. A.Y. 2025-26)

Advanced Soil Mechanics (25PCE11171)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week	No. of Credits		
Lectures:	3	3	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	3	3	OE/POE :	-

Course Outcomes: At the end of this course, students shall be able to

BL Level

CO1	Characterization of soils and stress distribution in soils	BL-IV: Analyze
CO2	Analyze effective stresses in soils for different field conditions	BL-IV: Analyze
CO3	Apply three-dimensional consolidation theory for different geotechnical applications	BL-III: Applying
CO4	Find state of stresses at different stages of loading through stress paths	BL-I: Remember
CO5	Estimate pore pressure and Hvorslev shear strength parameters	BL-II: Understand

Unit	Course Contents	No. of Lectures (Hrs.)
Unit 1	Introduction: Introduction to soils, Deposition and Origin of natural soil, Complexity of soil nature, Soil Structure, Mineralogy and soil Water: Soil mineralogy and structure of clay minerals, classification of soils, Inter-particle forces in soils; Modes of occurrence of water in soils–Absorbed, Adsorbed, Double layer and Capillary water	07
Unit 2	Stress distribution: Types of stresses, Estimation of stresses in soils, Isobar and Pressure bulb, Variation of vertical stress under point load along the vertical and horizontal planes, Newmark's Influence Chart	06
Unit 3	Effective Stress: The principle and nature of effective stress, Inter-granular pressure, Pore pressure, effective stress under different conditions, Hydrostatics, Vertical & lateral effective stress, Effective stress for partially saturated soils, Quick sand phenomenon	09
Unit 4	Permeability: Flow through Soils: Darcy's law, Hydraulic conductivity of soils, Steady and Transient flows, seepage analysis, Flow nets, Critical hydraulic gradient	07
Unit 5	Consolidation: Principle of consolidation-compressibility, Difference between compaction and consolidation, Pressure void ratio relationships, Settlement and Time rate for consolidation, Terzaghi's one dimensional consolidation parameters, Pre-consolidation pressure, Estimation of total Settlement. Two-and three-dimensional consolidation, Secondary compression, methods for accelerating the consolidation settlements, Sand and Wick drains.	11

Text Books:

- 1) Das, BM, Advanced Soil Mechanics, CRC Press, London & New York, 2020, 5th Edition. 2. Murthy

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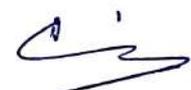
2)	V.N.S, Soil Mechanics and Foundation Engineering, CBS publications, New Delhi, 2018.
Reference Books:	
1)	Gopal Ranjan and Rao ASR Basic and applied soil mechanics, , New age Publications, Delhi, 2016, 3rd Edition.
2)	Richard L Handy, Foundation Engineering – Geotechnical Principles & Practical applications, Mc Graw Hill, New York, 2020.
3)	Karl Terzaghi, Ralph B Peck, and Gholamreza Mesri, Soil Mechanics in Engineering Practice, Wiley, 2009, 3rd Edition.
4)	William Lamb and Robert V Whitman, Soil Mechanics, Wiley, 2012.
5)	Shashi K Gulhati and Majoj Dutta, Geotechnical Engineering, Mc Graw Hill, New Delhi, 2017.
6)	D.M. Wood, Soil Behaviour and Critical State Soil Mechanics, Cambridge University Press, 1994..
In Semester Examination (MSE):	
MSE shall be based upon student's performance in three tests conducted and evaluated at institute level	

Mapping of Cos and POs:

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO↓												
CO1	1	2	2	2	-	-	-	1	1	1	1	1
CO2	1	2	1	1	-	-	1	1	2	2	1	-
CO3	1	1	1	1	-	-	1	1	1	2	1	-
CO4	1	2	2	2	-	-	-	1	1	1	1	1
CO5	1	2	2	2	-	-	-	1	1	1	1	1

Note: The strength of mapping is to be written as 1: low, 2: Medium, 3: High


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First Year M. Tech.

Semester-I (w.e.f. A.Y. 2025-26)

Ground Improvement Method (25PCE11172)

Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	3	3	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	3	3	OE/POE:	-

Course Outcomes: At the end of this course, students shall be able to		BL Level
CO1	Identify solutions for difficult ground conditions in engineering practice	BL-I: Remember
CO2	Comprehend different ground improvement techniques	BL-II: Understand
CO3	Propose site specific method of improvement and its design	BL-V: Evaluate
CO4	Promote wider use of techno-economical construction techniques such as soil nailing and confinement methods.	BL-III: Applying
CO5	Decide effective alternate techniques for soft soil problems	BL-II: Understand

Unit	Course Contents	No. of Lectures (Hrs.)
Unit 1	Introduction to Ground Modification: Need and objectives of Ground Improvement, Classification of, Ground Modification Techniques – suitability and feasibility, Emerging Trends in ground improvement	07
Unit 2	Mechanical Modification: Methods of compaction, Shallow compaction, Deep compaction techniques – Vibro-floatation, Blasting, Dynamic consolidation, pre-compression and compaction piles, Field compaction control and geomaterial replacement concept.	08
Unit 3	Hydraulic Modification: Methods of dewatering – open sumps and ditches, Well-point system, Electroosmosis, Vacuum dewatering wells; pre-loading without and with sand drains, strip drains and rope drains, vertical drains.	10
Unit 4	Admixture Stabilization: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen, Grouting: Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control	07
Unit 5	Reinforced Earth Technology: Concept of soil reinforcement, reinforcing materials, Backfill criteria, art of reinforced earth technology, Design and construction of reinforced earth structures, soil nailing	07

Text Books:

1)	Manfred R. Haussmann, Engineering principles of ground modification, Pearson Education Inc. New Delhi. 2008.
2)	Bell, F.G. E and FN Spon, Engineering Treatment of Soils, New York, 2006.

Reference Books:

1)	Jie Han, Principles and Practice of Ground Improvement, John Wiley & Sons, Inc., 2007.
2)	Anjan Patel, Geotechnical Investigations and Improvement of Ground Conditions, Woodhead Publishing Series in Civil and Structural Engineering, 2006, 1st Edition.


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3)	Purushothama Raj P, Ground Improvement Techniques, Laxmi Publications (P) Limited, 2006. 4.
4)	Klaus Kirsch and Alan Bell, Ground Improvement, 2004, 3rd Edition
In Semester Examination (MSE):	
MSE shall be based upon student's performance in three tests conducted and evaluated at institute level	

Mapping of Cos and POs:

PO → CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	-	-	-	2	1	2	1	1
CO2	1	2	2	1	-	1	1	2	1	2	1	1
CO3	2	2	2	1	-	1	1	2	1	2	1	1
CO4	1	2	2	1	1	1	1	2	1	2	1	1
CO5	2	2	2	1	-	1	1	2	1	2	1	1

Note: The strength of mapping is to be written as 1: low, 2: Medium, 3: High


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First Year M. Tech.

Semester-I (w.e.f. A.Y. 2025-26)

Geotechnical Exploration and Instrumentation (25PCE11173)

Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	3	3	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	3	3	OE/POE :	-

Course Outcomes: At the end of this course, students shall be able to		BL Level
CO1	Implement various exploration methods in soil and rock	BL-III: Applying
CO2	Prepare bore log for sub-soil strata	BL-III: Applying
CO3	Apply relevant instrumentation for Geotechnical Engineering works	BL-III: Applying
CO4	Interpret field and laboratory data and prepare soil investigation report	BL-III: Applying
CO5	Know about visual identification tests	BL-III: Understanding

Unit	Course Contents	No. of Lectures (Hrs.)
Unit 1	Introduction: Soil Formation, types of soils, physical and chemical weathering, soil transport, Deposition and stratification phenomena and Soil Classification.	07
Unit 2	Methods of Soil Exploration: Methods of Boring, Auguring and Drilling, Machinery used for drilling, types of augers and their usage for various projects.	07
Unit 3	Soil Sampling: Sampling methods, types of samples, storage of samples and their transport. Sample preparation, Sample sizes, types of sampler's specifications for testing.	07
Unit 4	Borehole Logging: Logging of Boreholes - logging methods - Groundwater observations - Water table fluctuations and Effects - Preparation of soil profiles and exploration report.	07
Unit 5	Filed Testing of Soils: Methods and specifications - visual identification tests, standard penetration test (SPT), plate load test (PLT), pressuremeter test (PMT) Dilatometer test (DMT) vane shear test (VST), Cone penetration test (CPT), Becker penetration test (BPT), analysis of test results. Geophysical methods of soil exploration- seismic refraction, electrical resistivity, cross hole test.	11

Text Books:

- 1) Clayton C. R., Matthews M. C and Simons N. E., Site Investigation, Blackwell Science. 2005
- 2) John Dunn cliff, Geotechnical Instrumentation for Monitoring Field Performance, WileyInterscience, 2008

Reference Books:

- 1) Muni Budha, Soil mechanics and Foundation Engineering, John Wiley and sons, 2010, 3rd Edition.


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2)	M. D. Desai, Ground Property Characterization from In-Situ Testing, IGS-Surat Chapter, 2005.
3)	A.S. Rao and Gopal Ranjan, Basic and Applied Soil Mechanics, New Age International.
4)	IS:1892-Code of Practice for subsurface investigation for foundation, 1979.
5)	IS:4453-Subsurface Exploration by Pits, Trenches, Drifts and Shafts - Code of Practice, 2009.
Mid Semester Examination (MSE):	
MSE shall be based upon student's performance in three tests conducted and evaluated at institute level	

Mapping of Cos and POs:

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	-	2	-	1	-	-	-	1
CO2	1	-	-	-	-	1	-	-	-	-	-	-
CO3	1	1	1	1	-	2	-	1	-	-	-	1
CO4	2	-	-	-	-	2	-	-	-	3	-	-
CO5	1	1	1	1	-	2	-	1	-	-	-	1

Note: The strength of mapping is to be written as 1: low, 2: Medium, 3: High


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	First Year B. Tech.
	Semester-I (w.e.f. A.Y. 2025-26)
	Experimental Geotechnics Lab (25PCE11174)

Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	-	-	MSE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:	02	01	ESE:	-
Total:	02	01	OE/POE/ICA:	-

Course Outcomes: At the end of this course, students shall be able to		BL Level
CO 1	Appraise the index and Engineering properties of soils	BL-IV: Analyze
CO 2	Determine shear strength parameters under different drainage conditions and find out the critical void ratio of sand	BL-III: Applying
CO 3	Assess the swell parameters of expansive clays	BL-IV: Evaluating
CO 4	Comprehend standard penetration test, plate and pile load tests	BL-II: Understand
CO 5	Perform the field tests on soils	BL-III: Applying

Ex.	Experiment Details	No. of Ex. Sessions (Hrs.)
Ex. 1	To find index properties of soils	6
Ex. 2	To determine engineering properties of soils	6
Ex. 3	To perform consolidation and swell tests on soils	4
Ex. 4	To perform shear strength tests on soils	4
Ex. 5	To perform field tests on soils	6

Internal Continuous Assessment (ICA):

ICA marks are calculated based on students' attendance during practical's and performance during laboratory sessions (at least six activities/ exercises should be performed from the list provided above).

The strength of mapping is to be written as 1: low, 2: Medium, 3: High.

PO → CO ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	1	-	-	-	1	-	1	-	1
CO2	1	1	-	1	-	-	-	1	-	1	-	1
CO3	1	2	-	-	2	1	1	2	1	1	-	1
CO4	1	2	-	-	2	1	1	2	1	1	-	1
CO5	1	-	-	-	2	1	1	1	-	1	-	1


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(An Autonomous Institute)

First Year M. Tech.

Semester-I (w.e.f. A.Y. 2025-26)

Earth & Rockfill Dams (25PCE11271)

Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	4	4	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	4	4	OE/POE:	-

Course Outcomes: At the end of this course, students shall be able to		BL Level
CO1	Design of the various earth and rock fill dam components like freeboard, top width etc.	BL-V: Evaluating
CO2	Analyses the seepage of the earth dams and design of the filters	BL-IV: Analyze
CO3	Interpret field and laboratory data and prepare soil investigation report	BL-III: Applying
CO4	Provide remedies for maintenance of the dams against various types of failures	BL-III: Applying
CO5	Determination of critical slip circle	BL-III: Applying

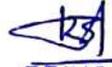
Unit	Course Contents	No. of Lectures (Hrs.)
Unit 1	Introduction: Classification of dams; Site selection; Preliminary section; Types of earth and rockfill dams.	08
Unit 2	Failures and Damages of Earth Dams: Nature of failures – hydraulic, seepage and structural failures; Piping; settlement; slides; earthquake & miscellaneous damages; case studies	08
Unit 3	Design and Construction of Earth Dam Components: Basic design requirements; Free board design; Top width design; Slope erosion protection; Construction of earth dams- soil types, methods, equipment	10
Unit 4	Seepage: Fundamentals of seepage flow- Darcy's law and Laplace's equation; Flow nets and its use; Phreatic line determination; Seepage control through dam section- impervious core, drains, filters; Design of filters; Seepage control through dam foundation- various impervious cut offs, upstream blanket, relief wells, drainage trenches, downstream loading berm; Sand boiling.	12
Unit 5	Slope Stability & Rock fill Dam: Fundamentals of slope failures; Types; Critical slip surfaces, Determination of critical slip circle; Factor of Safety; Strength parameters; Pore pressure consideration at slope; Taylor's stability charts; Ordinary method of slices; Bishop's method; Janbu's method; Morgenstern method. General characteristics and components; Rockfill materials; Construction; Design	12

Text Books:

- 1) B Singh, R S Varshney, Embankment Dam Engineering, Nem Chand & Bros, 2004


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2)	H D Sharma, Embankment Dams, Oxford & IBH Publishing Company, 1991
Reference Books:	
1)	S K Garg, Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 2003
2)	C Kutzner, Earth and Rockfill Dams: Principles for Design and Construction, Routledge, 1997
In Semester Examination (MSE):	
MSE shall be based upon student's performance in three tests conducted and evaluated at institute level	

Mapping of Cos and POs:

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	3	-	-	-	1	2	1	1	1
CO2	1	1	1	1	1	-	1	1	-	-	1	-
CO3	1	-	1	2	-	1	2	1	-	2	-	1
CO4	1	-	-	2	1	2	1	1	-	1	-	1
CO5	-	2	1	-	1	1	1	1	1	1	-	2

Note: The strength of mapping is to be written as 1: low, 2: Medium, 3: High


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First Year M. Tech.

Semester-I (w.e.f. A.Y. 2025-26)

Marine Geotechniques(25PCE11272)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week	No. of Credits		
Lectures:	4	4	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	4	4	OE/POE :	-

Course Outcomes: At the end of this course, students shall be able to

BL Level

CO1	Identify the marine soil deposits along the coast lines	BL-II: Understand
CO2	Comprehend Geotechnical challenges of marine sediments	BL-II: Understand
CO3	Select suitable marine foundations for offshore structures	BL-IV: Analyze
CO4	Analyze behaviour of marine soil deposits under cyclic loading condition	BL-IV: Analyze
CO5	Know about numerical modeling of marine Foundations	BL-II: Understand

Unit	Course Contents	No. of Lectures (Hrs.)
Unit 1	Marine soil deposits: Offshore environment, Offshore structures and foundations, Specific problems related to marine soil deposits, Physical and engineering properties of marine soils	08
Unit 2	Behavior of Soils Subjected to Repeated Loading: Effect of wave loading on offshore foundations, Behavior of sands and clays under cyclic loading, Laboratory experiments including repeated loading, Cyclic behavior of soils based on fundamental theory of mechanics, Approximate engineering methods which can be used for practical cases	12
Unit 3	Site Investigation of Marine Soil Deposits: Challenges of site investigation in marine environment, Different site investigation techniques, Sampling techniques, Recent advancements in site investigation and sampling used for marine soil deposits	10
Unit 4	Foundations in Marine Soil Deposits: Embankments in soft soils, Different offshore and near shore foundations, Gravity platforms, Jack-up rigs, pile foundations. caissons, spudcans	08
Unit 5	Numerical Modeling of Marine Foundations: Subjected to Wave Loading: Numerical modeling of cyclic behavior of soils, empirical models, Elastic-plastic models, FEM analysis of marine foundations subjected to wave loading	10

Text Books:

1)	Randolph M. and Susan G., Offshore Geotechnical Engineering, CRC Press, 2017, 1st Edition
2)	Thompson D. and Beasley D. J., Handbook of Marine Geotechnical Engineering, Military Bookshop; 2012, Illustrated edition.

Reference Books:

1)	Robert. M. Koerner., Handbook of Marine Geotechnical Engineering, Xlibris, 2012, 6th Edition
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2) Military Soils Engineering: The Official U.S. Army / U.S. Marine Corps Technical Manual TM 3-34.6/ McRp 3-17.7g, 2012

3) Mark R. and Susan G., Offshore Geotechnical Engineering, CRC Press, 2011, 1st Edition.

In Semester Examination (MSE):
 MSE shall be based upon student's performance in three tests conducted and evaluated at institute level

Mapping of Cos and POs:

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	1	1	-	-	-	-	1
CO2	1	1	2	1	1	1	1	-	1	1	1	1
CO3	1	1	2	1	-	2	1	-	-	-	1	2
CO4	1	-	-	2	-	-	1	-	1	1	-	1
CO5	1	1	2	1	2	1	1	-	1	1	1	1

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First Year M. Tech.

Semester-I (w.e.f. A.Y. 2025-26)

Unsaturated Soil Mechanics (25PCE11273)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week	No. of Credits		
Lectures:	4	4	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	4	4	OE/POE:	-

Course Outcomes: At the end of this course, students shall be able to

BL Level

CO1	Interpret the Soil Water Characteristic Curve	BL-III: Applying
CO2	Comprehend the unsaturated flow	BL-II: Understand
CO3	Analyze the stress state variables	BL-IV: Analyze
CO4	Apply the unsaturated strength behaviour to Engineering structures	BL-III: Applying
CO5	Predict volume change behavior of soils	BL-III: Applying

Unit	Course Contents	No. of Lectures (Hrs.)
Unit 1	Introduction: Unsaturated soil, Gravimetric and Volumetric water content, Pore water pressure, Matric and Osmotic suction, Soil Water Characteristic Curve (SWCC), Hysteresis in SWCC, Methods to determine SWCC	10
Unit 2	Seepage in unsaturated soil: Permeability and Hydraulic Conductivity, Hydraulic Conductivity Function (HCF), One-dimensional steady state flow, Darcy's and Gardner's Principles, Transient Flow, Infiltration, Numerical Modelling, Capillary Barriers.	10
Unit 3	Introduction of unsaturated soil: Extended Mohr Coulomb's criterion, Shear strength and pore pressure parameters, Measurements of unsaturated shear strength parameters	10
Unit 4	Strength characteristics of unsaturated soil: Unsaturated shear strength models, Applications in Bearing Capacity, Lateral Earth Pressure, and Slope stability in Unsaturated soils	08
Unit 5	Volume Change behavior of soils: Stress state variables for unsaturated soils, Stress Deformation Behavior, Volumetric continuity, Volume-Mass Constitutive Relations, Swelling and Collapse behavior.	10

Text Book:

- 1) Ning Lu and William J. Likos, Unsaturated Soil Mechanics, John Wiley & Sons Inc., 2004
- 2) Murray E. J. and Shivakumar V., Unsaturated Soils: A fundamental interpretation of soil behaviour, Wiley-Blackwell, 2010, 1st edition.

Reference Books:

- 1) Charles W. W. Ng, and Menzies B., Advanced Unsaturated Soil Mechanics and Engineering, CRC Press, 2007, 1st edition (Reprint 2019)
- 2) Fredlund D. G. and Rahardjo H., Soil Mechanics for Unsaturated Soils, John Wiley & Sons Inc.,


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1993, 1st edition

In Semester Examination (MSE):

MSE shall be based upon student's performance in three tests conducted and evaluated at institute level

Mapping of Cos and POs:

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO↓												
CO1	1	1	-	-	-	2	1	1	-	-	1	2
CO2	1	-	-	-	-	2	1	1	-	-	1	2
CO3	1	-	1	-	-	2	1	1	-	-	1	2
CO4	1	-	-	1	-	1	1	1	-	-	1	2
CO5	1	1	-	-	-	2	1	1	-	-	1	2

Note: The strength of mapping is to be written as 1: low, 2: Medium, 3: High



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First Year M. Tech.

Semester-I (w.e.f. A.Y. 2025-26)

Computational Methods in Geotechnical Engineering (25PCE11274)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week	No. of Credits		
Lectures:	4	4	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	4	4	OE/POE :	-

Course Outcomes: At the end of this course, students shall be able to

BL Level

CO1	Solve linear and non-linear equations using numerical techniques.	BL-III: Applying
CO2	Apply the basic concepts of tensor algebra and calculus in continuum mechanics problems.	BL-III: Applying
CO3	Analyze the behaviour of geotechnical structures using finite difference and finite element methods.	BL-IV: Analyze
CO4	Apply the constitutive modeling in Geomechanics.	BL-III: Applying
CO5	Apply the knowledge of critical state soil mechanics	BL-III: Applying

Unit	Course Contents	No. of Lectures (Hrs.)
Unit 1	Solution of Non-linear and Linear Equations: Bisection, False Position, Newton-Raphson, Jacobi's, Gauss Seidel method	10
Unit 2	Solution of ODE using numerical techniques: Initial value problems and boundary value problems; Taylor series method, Picard's method, Euler's method, Runge-Kutta method	10
Unit 3	Finite Difference Method: Boundary value and Initial value problems - Dirichlet conditions, Neumann conditions; Ordinary and partial differential equations; Non-linear problems	10
Unit 4	Introduction to Finite Element Method: Formulation of weak form, interpolation functions	08
Unit 5	Constitutive modelling of soil: Critical state soil mechanics: Elastic-plastic constitutive models; Cam	10

Text Book:

1)	Jain M K, Iyengar SRK and Jain R K, Numerical Methods for Scientific and Engineering computations, New Age International (P) Ltd. Publishers, New Delhi, 2012, 3rd edition.
2)	Naylor D J and Pande G N, Finite Elements in Geotechnical Engineering, Pineridge Press Ltd., UK, 1981.

Reference Books:

1)	C S Desai and JT Christian, Mc Numerical Methods in Geotechnical Engineering. Graw Hill, 1977.
2)	Y. M. Cheng, J. H. Wang, Li Liang, W. H. Fung, W. H. Fung Ivan, Numerical Methods and Implementation in Geotechnical Engineering, 2020.

In Semester Examination (MSE):

MSE shall be based upon student's performance in three tests conducted and evaluated at institute level

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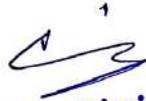
Mapping of Cos and POs:

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO↓												
CO1	1	2	1	1	-	-	-	-	-	-	-	1
CO2	1	2	2	-	-	-	-	-	-	1	1	1
CO3	1	1	2	1	-	-	-	-	2	1	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-

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Semester-I (w.e.f. A.Y. 2025-26)

Research Methodology and IPR (25PME11671)

Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	2	2	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	2	2	OE/POE:	-

Course Outcomes: At the end of this course, students shall be able to		BL Level
CO1	Discuss research methodology and the technique of defining a research problem	BL-II: Understand
CO2	Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.	BL-II: Understand
CO3	Explain various research designs, sampling designs, measurement and scaling techniques and also different methods of data collections.	BL-II: Understand
CO4	Explain several parametric tests of hypotheses, Chi-square test, art of interpretation and writing research reports	BL-II: Understand
CO5	Discuss various forms of the intellectual property, its relevance and business impact in the changing global business environment and leading International Instruments concerning IPR.	BL-II: Understand

Unit	Course Contents	No. of Lectures (Hrs.)
Unit 1	Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.	5
Unit 2	Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration, Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.	5
Unit 3	Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Design, Introduction, Sample Design, Sampling and Nonsampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.	5
Unit 4	Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data	5


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	Collection, Case Study Method, Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports	
Unit 5	Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999, The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act 1999, Copyright Act, 1957, Trade Names, copyrights	6
Text Book:		
1)	Research Methodology: C R Kothari, Viswa Prakasam Publication, 2014.	
2)	Research Methods: M M Munshi & K Gayathri Reddy, HPH, 2015.	
Reference Books:		
1)	Research Methods: the concise knowledge base, Trochim, Atomic Dog Publishing, 2005.	
2)	Conducting Research Literature Reviews: From the Internet to Paper, Fink A, Sage Publications, 2009.	
In Semester Examination (MSE):		
MSE shall be based upon student's performance in three tests conducted and evaluated at institute level		

Mapping of Cos and POs:

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO↓												
CO1	1	-	-	-	-	1	1	-	1	1	1	1
CO2	1	-	-	-	-	1	-	1	-	1	-	1
CO3	1	-	1	-	1	1	-	-	-	2	1	1
CO4	-	1	-	-	-	-	-	1	-	2	-	1
CO5	1	2	1	2	-	1	1	1	-	3	1	1

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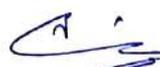
	FABTECH EDUCATION SOCIETY'S FABTECH TECHNICAL CAMPUS COLLEGE OF ENGINEERING & RESEARCH (An Autonomous Institute)			
	First Year M. Tech.			
	Semester-I (w.e.f. A.Y. 2025-26)			
	Hands on Research & Analysis Tool (25PEE11471)			
Teaching Scheme:		Evaluation Scheme:		
	No. of Hrs./week	No. of Credits		
Lectures:	-	-	MSE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:	2	1	ESE:	-
Total:	2	1	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				BL Level
CO 1	Apply analytical and numerical methods using tools like MATLAB, Python, and simulation software to model and solve basic engineering and research problems.			BL- 3,4
CO 2	Demonstrate proficiency in using modern research tools, including LaTeX, reference managers, optimization platforms, and AI-based tools for effective technical documentation and research exploration.			BL-3,6
Course Description- This course offers hands-on experience through small, assignment-based activities using various research and analysis tools. The content is organized into modules, each requiring specific prerequisite knowledge to effectively complete the associated practical sessions. Students will be introduced to widely used research tools and their applications, enabling them to explore the field of research with the foundational knowledge gained from this course.				
Ex.	Experiment Details			No. of Ex. Sessions (hrs.)
Ex. 1	Assignment on analytical modeling using MATLAB or any equivalent software			04
Ex. 2	Implementation of any one numerical method using Python			02
Ex. 3	A case study on basic simulations using any one analysis Software			06
Ex. 4	Hands on with LATEX word processing software			04
Ex. 5	Hands on reference manager Tools			02
Ex. 6	Assignment on AI research Tools			02
Ex. 7	Introduction to any one optimization tool			02

Mapping of Cos and POs:

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO↓												
CO1	1	-	-	-	-	1	1	-	1	1	1	1
CO2	1	-	-	-	-	1	-	1	-	1	-	1

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