GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Geotechnical Engineering

Course / Subject Code: ME01076071

Course / Subject Name : Forensic Geotechnical Engineering

w.e.f. Academic Year:	2024-25
Semester:	1st Semester
Category of the Course:	PCC

Prerequisite:	Geotechnical Engineering, Foundation Engineering, Advance Soil Mechanics
Rationale:	Forensic geotechnical engineering plays a vital role in identifying, analyzing, and resolving failures in soil and foundation structures. The primary rationale for this field lies in its ability to enhance the safety, reliability, and longevity of civil engineering projects. By investigating geotechnical failures, engineers can determine the root causes of issues such as settlement, soil movement, and foundation instability, thereby preventing future occurrences and mitigating risks. Forensic geotechnical engineering is also essential for legal and financial accountability. It provides critical evidence in disputes over construction defects and failures, helping to assign responsibility and support insurance claims. Moreover, it aids in the development of remediation plans, ensuring that affected structures are repaired effectively and safely.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Explain the need of Forensic Geotechnical investigation
02	Learn the concept of Back Analysis.
03	Outline the Instrumentation, Monitoring and Case studies in Forensic Geotechnical Investigation.
04	Student will be able to analyze failures connected with geotechnical and geological origin to improve professional practice, codes of analysis and design as well as practice.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial/ Practical		
L	T	PR	C	ESE (E)	PA/ CA (M)	PA/CA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No.of Hours	% of Weightage
1.	Concept of Forensic Investigation, Necessity, Objectives of Forensic Geotechnical Investigation, Methods of Forensic Investigation.	7	10
2.	Project reconnaissance and characterization of the distress, including document search such as plans, codes, and other technical specifications followed in the original design.	8	15
3.	Diagnostic tests – Analysis of field data – selection of laboratory tests based on actual field parameters to evaluate the behavior of soil/ground. Scope and extent of application of Forensic Engineering techniques in geotechnical and foundation failure investigations, settlement of structures, expansive soils, lateral movement, other geotechnical and foundation problems, groundwater and moisture problems., Case studies	12	35
4.	Back analysis: Selection of theoretical model - methods of analysis, Instrumentation and Monitoring, Development of the most probable failure hypothesis - cross-check with original design.	9	20
5.	Performing reliability checks, Legal issues involving jurisprudence system, insurance, repairs, reducing potential liability, responsibility of geotechnical engineers and contractors.	9	20
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
12	16	14	10	10	8

WhereR:Remember;U:Understanding;A:Application,N:AnalyzeandE:EvaluateC:Create(aspe r Revised Bloom's Taxonomy)

References/SuggestedLearningResources:

(a) Books:

1. Forensic Geotechnical Engineering Developments in Geotechnical Engineering- V.V.S. Rao and G.L. Shivakumar Babu (eds) Springer India
2. Geomechanics of failures- A.M. Puzrin et al, Springer Science + Business Media B.V.2010.
3. Forensic Geotechnical and Foundation Engineering. Robert W. Day.
4. A Guide to Soil Mechanics. Malcolm D. Bolton
5. Saxena, D.S., "Technical, Ethical, and Legal Issues with Forensic Geotechnical Engineerin - A Case History", Proceedings, 13th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering, Kolkata, India, 11 Dec-ember 2007

(b)Open source software and website:

1) http://nptel.ac.in/
2) http://ocw.mit.edu/courses/civil-and-environmental-engineering/
3) https://geomechanics.ethz.ch/education/courses/forensic-geotechnical-engineering.htm

Suggested Course Practical List:

1) Soil exploration Tests
2) Bearing capacity determination Tests (Directly/Indirectly)
3) Non destructive Soil Tests
4) Geophysical Soil Tests

Minimum 5 assignment questions from above topics.

List of Laboratory/Learning Resources Required:

1) SPT/CPT/SCPT/DCPT/PLT
2) Triaxial/Direct Box Shear/Vane Shear Test/Compaction Test/Consolidation Test
3) SASW/MASW/Seismic Refraction Test

Suggested Project List:

1) Forensic investigation of any failed structural foundation/slope failure/RE wall failure/subgrade failure/pile failure, etc. .
2) Collection of data of geotechnical failures both due to natural hazards/calamity and remedial measures suggested/implemented

Suggested Activities for Students:

1) Visit of Forensic Labs or research organization of National level and prepare report.
2) Referring IS/BS/ASTM CODES and Practicing Manuals

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