GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering
Level: Post Graduate
Subject Code: ME03000211
Subject Name: Construction Failures

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

Prerequisite:	Basic Civil Engineering
Rationale:	Rapid economic development and fast-track modern construction practices can trigger catastrophic structural failures. To investigate structural failures scientifically, this course will become very useful. This course would help to understand construction failures along with structural evaluation of existing structures. This course gives insight into various repairing techniques and methodologies to be followed during maintenance of the structures.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes	RBT Level
01	Classify the different types of failures encountered in structures.	R/U
02	Distinguish the failures and repairs in Masonry and Concrete.	U
03	Relate the solution with the problem	A

**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
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA/CA (M)	PA/CA (I)	ESE (V)	
3	0	0	3	70	30	00	00	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	**Definition of error, defect, and failure – Causes of failures:** Overview of engineering failures, engineering negligence and malpractices, case studies of failures due to improper workmanship, design errors, construction errors, abuse and misuse of building, lack of maintenance, subsidence of foundations, fire, earthquake etc.	**6**	10
2	**Masonry and Concrete Failures, Repairs:** Classification of cracks in Masonry and RCC structures, underlying mechanisms causing the cracks, shrinkage cracks, cracks due to foundation movement and settlement of soils, thermal movement cracks, loading cracks, characteristics of flexural, shear, torsion and shrinkage cracking in RCC structures, tools to detect the cracks, repair methodologies to mend the cracks.	**14**	30
3	**Man-Made and Natural Failures, Rehabilitation:** Failure of structures due to construction deficiencies, design errors, inferior quality of materials, corrosion of reinforcement, changes in occupancy, overloading. Failures of structures due to natural causes such as earthquakes, flooding, landslides, soil instability, natural ageing and deterioration.	**15**	30
4	**Maintenance Problems and Their Solutions:** Definition and requirement of maintenance**,** Category of inspection and maintenance**,** Overview of building maintenance Inventory of items as per the category of building maintenance	**10**	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**
20	**30**	**50**	**00**	**00**	**00**

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. Forensic Structural Engineering Handbook, Robert T. Ratay, McGraw-Hill Professional; 2nd edition (16 January 2010).
2. Forensic Engineering: Damage Assessments for Residential and Commercial Structures, Stephen E. Petty, CRC Press; 2nd edition (24 September 2021)
3. Structural Condition Assessment, Robert T. Ratay, John Wiley & Sons Inc; 1st edition (11 February 2005)
4. Repair And Rehabilitation Of Concrete Structures, Modi P.I. and Patel Chirag, PHI Learning Pvt Ltd (1 January 2016)

(b) Open source software and website:

https://ndl.iitkgp.ac.in/
https://nptel.ac.in/

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