GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering
Level: PG
Branch: Construction Engineering and Management
Subject Code: ME02014101
Subject Name: Maintenance and Rehabilitation of Structures

w.e.f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	NIL
Rationale:	Concrete structures are particularly susceptible to deterioration due to aging, environmental exposure, and other factors. Repairing and rehabilitating concrete structures can help prevent catastrophic failures. The rationale for the subject is to teach students how to maintain and repair buildings and structures to prevent damage and extend their lifespan.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes
01	Understand the concept of maintenance of the structures.
02	Inspection and evaluation of the damaged structure.
03	Analyse the structures through serviceability and durability point of view.
04	Compare the different materials used for the repairing and its proper application.
05	Evaluate the techniques and methodology for the repairing of the structures.

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	**MAINTENANCE AND REPAIR STRATEGIES** Maintenance, Repair and Rehabilitation, Facets of Maintenance, Importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration Non destructive testing	**08**	**18**
2	**SERVICEABILITY AND DURABILITY OF CONCRETE** Quality assurance for concrete – Strength, Durability and Thermal properties of concrete, Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion – Effects of cover thickness and cracking	**10**	**22**
3	**MATERIALS FOR REPAIR** Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro- cement, Fibre reinforced concrete.	**08**	**18**
4	**TECHNIQUES FOR REPAIR AND PROTECTION METHODS** Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Engineered demolition techniques for dilapidated structures – case studies.	**10**	**22**
5	**REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES** Repairs to overcome low member strength. Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.	**09**	**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	30	10	10	0

Where R:Remember; U:Understanding; A:Application, N:Analyze and E:Evaluate C:Create(as per

Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

1. Denison Campbell, Allen and Harold Roper (1991) Concrete Structures: Materials, Maintenance and Repair, Longman Publication Group.
2. Allen R T, Edwards, S C and Shaw, J D N (2013) Repair of Concrete Structures, 2nd Edition, Springer.
3. Raikar, R N (1987) Learning from failures - Deficiencies in Design, Construction and Service - R & D Centre (SDCPL), Raikar Bhavan, Bombay.
4. Gupta, B L (2009) Maintenance and Repair of Civil Structures, Standard Publication, Delhi.
5. Gibson, E J (Ed.) (1979) Developments in building maintenance (Vol. 1), Applied Science Publishers.
6. Campbell-Allen, D, and Roper, H (1991) Concrete structures: materials, maintenance and repair, J H Libraries.

Tutorials / Students Activities may include :

1. Case - studies for Maintenance and Rehabilitation of structures
2. Market Survey and Study for Materials for Repairs
3. Preparation for Method statements for Protection procedures
4. Report on different types of Cracks
5. Use of Non-destructive testing equipments in laboratory and in field
6. Study of Special concretes in Laboratory such as Polymer concrete, Foamed Concrete, Fibre Reinforced Concrete, Concrete made with industrial wastes etc
7. Seminars

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