



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-2

Subject : Repair and Rehabilitation of Structures - METCP12512

Type of course: Minor Stream

Prerequisite: NIL

Rationale: The repair and rehabilitation of structures is to extend their lifespan, ensure safety, and maintain functionality. Over time, buildings and infrastructure are subjected to wear and tear, environmental factors, and usage stresses, which can lead to deterioration and structural deficiencies.

Repair involves fixing specific defects to restore the structure to its original condition. This can include addressing issues such as cracks, corrosion, and water damage. Rehabilitation, on the other hand, involves upgrading and enhancing the structure to meet current standards and improve performance, often incorporating modern materials and technologies.

These processes are crucial for preserving historical buildings, ensuring the safety of occupants, and maintaining the value of assets. Additionally, repair and rehabilitation are often more cost-effective and environmentally sustainable than demolition and new construction. By maintaining and improving existing structures, we can optimize resource use, reduce waste, and contribute to the sustainable development of urban environments.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Class Room Instructions; T– Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.



Course Content:

Sr. No	Course content	Hrs	% Weightage
1	<p>Introduction: Importance of maintenance - Types of maintenance - Decay of structures- Role of the Maintenance Engineer - Quality Assurance for concrete construction - Design and construction errors.</p> <p>Deterioration of Structures Causes of deterioration of concrete, steel, masonry and timber structures - surface deterioration - efflorescence - Causes and preventive measures.</p>	16	25%
2	<p>Corrosion of Structures Corrosion mechanism - Effects of cover thickness and cracking - Methods of corrosion protection – Inhibitors - Coatings - Cathodic protection for reinforcements.</p> <p>Inspection and Assessment of Distressed structures Visual inspection – Non-destructive tests –Ultrasonic pulse velocity method – Rebound hammer technique– Pullout tests – Core test.</p>	16	25%
3	<p>Materials for Repair Special concretes and mortar - Concrete chemicals - Special elements for accelerated strength gain - Expansive cement-Polymer concrete – Ferro cement, Fibre reinforced concrete – Fibre reinforced plastics.</p> <p>Techniques for Repair Techniques for repairing of spalling and disintegration of structures - Grouting –Autogenous healing- Pre-packed concrete- Protective surface coating.</p>	16	25%
4	<p>Strengthening of distressed buildings Repairs to overcome low member strength – Deflection - Chemical disruption - Weathering wear - Fire leakage - Marine exposure- Use of FRP- NDT tests</p>	12	25%
	Total	60	100

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	<p>Assessment and Inspection Techniques: Faculty will provide students with photos or drawings of damaged structural elements. In pairs or small groups, they conduct a visual inspection and identify signs of deterioration or damage. They discuss their findings and propose appropriate inspection techniques for further evaluation.</p>	10
2	<p>Structural Repair Techniques:</p>	10



	Faculty will give the structural situation and student will demonstrate common repair techniques such as concrete repair, grouting, and epoxy injection. Provide students with sample materials and tools to practice basic repair procedures.	
3	Rehabilitation Strategies for Historic Structures: Analyze a case study of a historic structure undergoing rehabilitation. Students develop a rehabilitation plan for the historic structure, considering factors such as structural integrity, aesthetic preservation, and sustainability.	10
Total		30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	NA	NA	NA	NA	NA	NA

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.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Explain the role of the maintenance engineer
CO2	Describe the causes of deterioration of concrete, steel, masonry and timber structures
CO3	Identify the effect of corrosion on structures
CO4	Explain the NDT techniques to assess the condition of the structures
CO5	Describe various properties and applications of repair materials
CO6	Explain the techniques for repairing

List of Assignment

Assignment and tutorial base on above mention topic.



Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Text Books:

[1] Modi, P.I., Patel, C.N. (2016). Repair and Rehabilitation of Concrete Structures, PHI India, New Delhi.

Reference Books:

- [1] IABSE, (2010). Case Studies of Rehabilitation, Repair, Retrofitting, and Strengthening of Structures, Volume 12, Structural Engineering Documents (SED), Switzerland.
- [2] Varghese, P.C. (2014), Maintenance, Repair & Rehabilitation and Minor Works of Buildings, PHI India, New Delhi.
- [3] Handbook on Repair and Rehabilitation of RCC Building by CPWD Government of India, New Delhi

