

Branch Name:	Civil Engineering
Semester/Year:	Semester III / Second Year
Subject Title:	Rehabilitation and Retrofitting of Structures (Elective -IV)
Subject Code:	1ET2060301
Pre-requisite:	Concrete Technology

Course Objective: To learn all aspects of rehabilitation and retrofitting of buildings.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	2	-	5	60	40	-	-	100

Subject Contents				
Sr. No	Topic	Total Hours	Weightage (%)	
01	Durability of concrete: Factors affecting durability of concrete, Corrosion of reinforcements in concrete, Carbonation, Chloride ingress, Alkali-silica reaction, Freeze-thaw effects, Chemical attack, Abrasion, erosion and cavitation, Weathering and efflorescence	08	20	
02	Defects and deterioration in buildings, Survey and assessment of structural conditions in RCC structures. Damage/condition assessment and various methods (for quantification) for its evaluation, Rapid Visual Screening (RVS) and ways to do RVS of damaged/deteriorated structures, Overview of health monitoring techniques.	08	20	
03	Non-destructive testing of concrete quality, Non-destructive testing of connections in steel, Corrosion assessment in reinforcements in RCC elements and components in steel structures; Design principles, techniques and working mechanism various instruments used for NDT evaluations (for strength, durability etc.) like Rebound Hammer, UPV, impact echo etc.; Technology used in various advanced instruments like Imaging techniques, GPR, Thermography, Tomography etc.	11	25	
04	Materials for repairs, rehabilitation and retrofitting processes, Methods for repairs, rehabilitation and retrofitting including surface preparation, Study of failures of buildings and lesson learnt, Role of quality control in construction as Preventive Measures Maintenance of buildings.	11	25	
05	Strengthening of Earthquake-damaged buildings; Introduction to Push-over analysis.	04	10	

Course Outcome:

After learning the course, the students should be able to:

1. Detect defects and deterioration in buildings,
2. Survey and assess structural conditions in RCC structures,
3. Understand and apply rehabilitation and retrofitting processes,
4. Understand non-destructive testing and interpretation of the results for concrete and steel structures

List of Tutorials:

1. Study of rehabilitation/retrofitting of RCC/Masonry buildings covering (a) damage assessment by visual inspection and using various techniques including NDT (b) one/two alternatives for rehabilitation/retrofitting (considering strength criteria & serviceability criteria).
2. Case study of construction and design failures.
3. Market survey for material for repairs.
4. Case study of repairing/rehabilitation structures and retrofitting of EQ damage/deficit structure.
5. Presentations / finding engineering applications /preparation of learning material based on the syllabus.

List of Reference Books:

1. Concrete Microstructures, properties and materials - P Kumar Mehta and Paulo J. M. Monterio
2. Properties of concrete - A. M. Neville
3. Materials for construction - Lai, James, S.
4. Structural condition assessment - Robert T. Ratay
5. Handbook of retrofitting earthquake damaged buildings

E - Resources:

<http://nptel.ac.in/>