

**II Year - II Semester**  
**20CE4638**

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## **REPAIR AND REHABILITATION OF STRUCTURES**

### **Course Outcomes**

At the end of this course the student will be able to

- Explain deterioration of concrete in structures
- Carryout analysis using NDT and evaluate structures
- Assess failures and causes of failures in structures
- Carryout Physical evaluation and submit report on condition of the structure.
- Understand different repair techniques

### **SYLLABUS**

#### **UNIT I**

**Deterioration of concrete in structures:** Physical processes of deterioration like Freezing and Thawing, Wetting and Drying, Abrasion, Erosion, Pitting, Chemical processes like Carbonation, Chloride ingress, Corrosion, Alkali aggregate reaction, Sulphate attack Acid attack, temperature and their causes, Mechanism, Effect, preventive measures. - Cracks: Cracks in concrete, type, pattern, quantification, measurement & preventive measures.

#### **UNIT II**

**Non Destructive Testing-** Nondestructive test methods for concrete including Rebound hammer, Ultrasonic pulse velocity, Rebar locator, Corrosion meter, Penetration resistance and Pull out test, Core cutting-Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

#### **UNIT III**

**Failure of buildings:** Definition of building failure-types of failures- Causes of Failures- Faulty Design, Accidental over Loading, Poor quality of material and Poor Construction practices- Fire damage - Methodology for investigation of failures-diagnostic testing methods and equipments-repair of cracks in concrete

#### **UNIT IV**

**Materials for repair and rehabilitation** -Admixtures- types of admixtures purposes of using admixtures- chemical composition- Natural admixtures- Fibers- wraps- Glass and Carbon fiber wraps- Steel Plates-Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.

#### **UNIT V**

**Repair Techniques:** Grouting, Jacketing, Shotcreting, externally bonded plates, Nailing, Underpinning and under water repair; Materials, Equipment, Precautions and Processes.

**TEXT BOOKS:**

1. 'Maintenance & Repair of Civil Structures' by B.L. Gupta & Amit Gupta.
2. 'Rehabilitation of Concrete Structures' by B. Vidivelli, Standard Publishers.
3. 'Concrete Bridge Practice Construction, Maintenance & Rehabilitation' by V. K. Raina.

**REFERENCES:**

1. 'Concrete Structures- protection Repair and Rehabilitation' by R.Doodge Woodson, BH Publishers