

REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES

(Professional Elective- III)

Course code: 15CE1140

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Pre-requisites:

Concrete Technology, Reinforced Concrete Structures, Pre-stressed Concrete.

Course Outcomes:

At the end of the Course, the Student will be able to:

- CO 1** Estimate causes for distress and deterioration of structures.
- CO 2** Explain NDT techniques for condition assessment of structures for identifying damages in structures.
- CO 3** Evaluate structural properties
- CO 4** Select repair material and identify a suitable repair option
- CO 5** Select retrofitting strategy suitable for distress and formulate guide lines for repair management of deteriorated structures.

UNIT-I

(10 Lectures)

INTRODUCTION:

An overview of present repair practices, distress identification and repair management, Causes of distress in concrete structures-Holistic Models for deterioration of concrete, Permeability of concrete, aggressive chemical agents, durability aspects, Condition Survey-Definition, objectives, different stages-Preliminary inspection, planning stage, visual inspection, field laboratory testing stage, consideration for repair strategy.

UNIT-II (10 Lectures)**NON DESTRUCTIVE AND DESTRUCTIVE TESTING METHODS:**

Non-Destructive evaluation tests - Concrete strength assessment - Rebound hammer test - Ultrasonic pulse velocity tests, penetration resistance, pull out tests, core sampling and testing, Chemical tests - Carbonation tests and chloride content, Corrosion potential assessment, half cell potentiometer test, resistivity measurement, Identification and estimation of damage.

UNIT-III (10 Lectures)**EVALUATION OF STRUCTURAL PROPERTIES:**

Fire damage assessment, structural integrity and soundness assessment, interpretation and evaluation of results, Evaluation of reserve strength of existing structures, analysis necessary to identify critical sections, active and passive repairs, modeling of repaired composite structures

UNIT-IV (10 Lectures)**REPAIR MATERIALS AND CASE STUDIES:**

Selection of repair materials for concrete-Essential parameters for repair materials-Strength and durability aspects, cost and suitability aspects, Materials for repair.

Discussion of case studies- RCC buildings, water tanks, industrial structures-Identifying a suitable repair option for certain damage in a structure.

UNIT-V (10 Lectures)**REPAIR/ REHABILITATION METHODS AND STRATEGIES:**

Rehabilitation and retrofitting methods-repair options, performance requirements of repair systems, factors for selection of repair methods, Repair stages, Methods of repair including foundation rehabilitation methods, chemical and electrochemical method.

Repair/Rehabilitation strategies - Stress reduction technique, repair and strengthening of columns and beams, Compressive strength of concrete, cracks/joints, masonry, foundation, base isolation.

TEXT BOOKS:

1. Varghese P.C., “Maintenance, Repair & Rehabilitation And Minor Works of Buildings” 1st Edition, PHI Learning Private Ltd., New Delhi., 2014.
2. Santhakumar A.R., “Concrete Technology” Oxford University Press, 2007, New Delhi
3. CPWD Handbook on Repair and Rehabilitation of RCC buildings, Govt. of India Press, New Delhi.
4. Raikar, R.N., “Learning from failures - Deficiencies in Design, Construction and Service” R&D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.

REFERENCES:

1. Shetty, M.S; Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 1992.
2. Vidivelli, B; Rehabilitation of Concrete Structures, Standard Publishers Distributors, New Delhi, 2008
3. P.K.Guha, Maintenance and Repairs of Buildings, New Central Book Agency (P)Ltd, Kolkata.