

19CE4501A – REPAIR AND REHABILITATION OF STRUCTURES

Course Category:	Program Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	19CE3404 - Construction Materials and Concrete Technology	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	Identify the physical causes for deterioration of concrete	K1
CO2	Assess the damage through semi destructive and Non-destructive testing methods	K2
CO3	Categorize the suitable repair materials.	K6
CO4	Identify and analyse various cracks and its repair methods.	K1
CO5	Demonstrate the various rehabilitation and strengthening techniques	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2					2	2		3	2
CO2	2	2	2	2	2					2	2		3	2
CO3	2	2	2	2	2					2	2		3	2
CO4	2	2	2	2	2					2	2		3	2
CO5	2	2	2	2	2					2	2		3	2
Avg.	2	2	2	2	2					2	2		3	2

1- Low

2-Medium

3-High

Course Content

UNIT-1	<p>Durability and Deterioration of Concrete Physical causes: Durability of concrete, causes of distress in concrete structures, Shrinkage in concrete, honeycombing in concrete, creep of concrete, Temperature changes – Internally generated temperature differences, externally generated temperature differences, Fire on concrete, Thermal movement in concrete, Corrosion: Corrosion process, Damages due to corrosion</p>	CO1
UNIT-2	<p>Damage Assessment Investigation of Damage- Observation, Assessment Procedure Non-Destructive Testing Methods: Introduction, Non-Destructive Testing Methods, Surface Hardness Test, Ultrasonic Pulse velocity test, Semi-Destructive Testing Systems: Core Sampling and Testing, Half -Cell potential survey</p>	CO2
UNIT-3	<p>Repair Materials Polymeric repair materials, Polymeric coatings, Polymer concrete/mortar composites, Fibre reinforced concrete, Glass fibre reinforced concrete, Polypropene fibre, Carbon fibres, fibre reinforced polymer composites, Concrete made with industrial wastes, Bacterial concrete.</p>	CO3
UNIT-4	<p>Evaluation and Repair of Cracks: Symptoms and Diagnosis of Distress, Evaluation of cracks, Selection of Repair Procedure, Repair of cracks-Preparation of Surface, Repair Techniques, Common types of repairs: Sealing of cracks, Flexible sealing, providing additional steel, Stitching of cracks, Repair by jacketing, Autogenous Healing.</p>	CO4
UNIT-5	<p>Rehabilitation and Strengthening Techniques Rehabilitation Techniques: Replacement Mortar- Epoxy bonded epoxy mortar,</p>	CO5

	<p>Replacement Concrete- Epoxy-bonded Replacement concrete, Application, Shotcrete or Gunite, Grouting- Portland Cement Grouts, Polymer Grouts, Epoxy Grouting, Resin injection, Sprayed concrete, Slab jacking technique, Cathodic Protection</p> <p>Strengthening methods: Introduction-Need for strengthening, Structural Concrete Strengthening, Column Strengthening, Strengthening with external reinforcement, External Post-tensioning, Section Enlargement, Guidelines for Seismic rehabilitation of existing buildings.</p>
Learning Resources	
Text Books	<ol style="list-style-type: none"> 1. B.Vidivelli, Rehabilitation of Concrete Structures, 1/e, Standard Publishers Distributors, 2018. 2. M.L.Gambhir, Concrete Technology: Theory and Practice, 4/e, Tata McGraw Hill Education Private Limited, 2013.
Reference Books	<ol style="list-style-type: none"> 1. Peter.H.Emmons and Gajanan.M.Sabnis, Concrete Repair and Maintenance, 2/e, Galgotia Publications Pvt Ltd, 1992. 2. S.Mahaboob Basha, A textbook of Concrete Technology, 1/e, Anuradha Publications, 2011. 3. J.Bhattacharjee, Concrete Structures Repair Rehabilitation and Retrofitting, 1/e, CBS, 2017. <p>P.C.Varghese, Maintenance Repair and Rehabilitation and Minor works of Buildings, 1/e, Prentice Hall India Learning Private Limited, 2014.</p>
e-Resources & other digital material	<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/105/106/105106202/ - 2. https://freevideolectures.com/course/3489/ocean-structures-and-materials/16 3. https://www.rilem.net/agenda/repair-and-rehabilitation-of-concrete-structures-1242