



MAINTENANCE AND REPAIR OF CONCRETE STRUCTURES

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Department of Civil Engineering

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PRE-REQUISITES : Completed 3rd year of a Bachelor program in civil engineering

INTENDED AUDIENCE : Undergraduate Students, Graduate students, research scholars, practicing engineers, repair experts, and scientists, working in the areas of concrete science and technology

INDUSTRIES APPLICABLE TO :

- Govt. agencies and public/private companies involved in the design, construction, and maintenance of concrete structures:
- Govt agencies: National Highway Authority (NHAI), Central Public Works Department (CPWD) and PWD/Housing departments of various states
- Chemical manufacturers: BASF, SIKA corporation, Euclid chemicals, and other chemical admixture companies
- Cement companies: ACC Ltd., Ambuja cement, JSW cement Ltd, JK Cement Ltd, Penna Cement Industries Ltd, Ultratech cement Ltd, and other cement industries
- Steel companies: JSW steel, Tata Steel, Steel Authority of India Ltd., and other steel industries
- Repair contractors: Vector Corrosion Technologies, HILTI, and other cathodic protection industries
- Owners/Builders/Structural Consultants: L&T Construction, Shapoorji Pallonji Construction Limited (SPCL), DLF Limited, Tata Housing, STUP Consultants, Engineers India Limited (EIL)

COURSE OUTLINE :

This course will help students learn how to identify various deterioration mechanisms or damage mechanisms in concrete structures (say, deterioration of metallic reinforcement and cementitious materials). The course will discuss both the scientific aspects and its use while practicing repair works at site. Use of various non-destructive, partially-destructive tools to assess the condition of the structure will be discussed. Also, tips on selecting measurable parameters that are useful in deciding the further repair and maintenance practices will be provided. Following this, practices for typical near-surface repair, corrosion protection, structural strengthening, structural stabilization, etc. will be discussed in detail. At the end of the course students will be able to suggest evaluation and repair/retrofitting methods for extending the service life of concrete structures. Importance for preventive maintenance practices (instead of corrective maintenance practices) will be discussed throughout the coursework.

ABOUT INSTRUCTOR :

Prof. Radhakrishna G. Pillai is an Associate professor at the Department of Civil Engineering at the Indian Institute of Technology Madras, Chennai, India, where he is working since 2010. He earned his M.S. and Ph.D. in Civil Engineering from Texas A andM University (TAMU), College Station, Texas, USA. He has co-authored more than 70 publications in the areas of structural and materials performance, concrete technology, and corrosion mechanisms and service life estimation in concrete structures. In addition, he is a lead investigator for various research projects funded by public and private agencies involving corrosion, condition assessment and restoration of concrete structures.

COURSE PLAN :

Week 1 : Introduction, significance of corrosion, and corrosion mechanisms

Week 2 : Embedded metal corrosion

Week 3 : Deterioration of cementitious systems – Sulphate and Acid attack

Week 4 : Deterioration of cementitious systems – Alkali Silica Reaction (ASR), Shrinkage, and others

Week 5 : Concrete assessment using non-destructive tests (NDT)

Week 6 : Concrete assessment and load effects

Week 7 : Surface repair – Condition assessment

Week 8 : Surface repair – Analysis, strategy, and design

Week 9 : Surface repair – Material requirement, surface preparation, placement of repair material

Week 10 : Strengthening and stabilization – Introduction and beam shear capacity strengthening

Week 11 : Strengthening and stabilization – Column strengthening

Week 12 : Strengthening and stabilization – Flexural strengthening