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|  | | | **National Institute of Technology Meghalaya**  An Institute of National Importance | | | | | | | | | | **CURRICULUM** | | |
| Programme | | | **Master of Technology (Structural Engineering)** | | | | | Year of Regulation | | | | | **2018** | | |
| Department | | | **Civil Engineering** | | | | | Semester | | | | | **II** | | |
| Course Code | | Course Name | | Pre-requisite | | Credit Structure | | | | Marks Distribution | | | | | |
| L | T | P | C | INT | | MID | END | | Total |
| **CE 558** | | **REHABILITATION AND RETROFITTING OF CONCRETE STRUCTURES** | | **NIL** | | **3** | **0** | **0** | **3** | **50** | | **50** | **100** | | **200** |
| Course  Objectives | | To learn various distress and damages to concrete structures and understand the importance of rehabilitation/repair and retrofitting of concrete structures. | | | Course Outcomes | | CO1 | Having knowledge on various distress and damages of concrete structures. | | | | | | | |
| To provide some knowledge on the various types and properties of repair materials assess the damage to structures using various tests. | | |
| CO2 | Having knowledge on the various types of repairing and strengthening materials | | | | | | | |
| To develop understanding on the importance and methods of substrate preparation and learn various repair techniques of damaged structures, corroded structures. | | |
| CO3 | Assessing damage to structures and various repair techniques | | | | | | | |
| CO4 | Ability in assessing damages in concrete structures and respective repair techniques | | | | | | | |
| CO5 | Ability to identify different methodologies of repairs and strengthening in structures | | | | | | | |
| SYLLABUS | | | | | | | | | | | | | | | |
| No. | Content | | | | | | | | | | Hours | | | COs | |
| I | **Introduction**  Maintenance, rehabilitation, repair, retrofit and strengthening, need for rehabilitation of structures, cracks in R.C. buildings causes and effects | | | | | | | | | | 02 | | | CO1 | |
| II | **Repair materials**  Various repair materials, criteria for material selection, methodology of selection, health and safety precautions for handling and applications of repair materials. | | | | | | | | | | 04 | | | CO2 | |
| III | **Special mortars and grouting of concretes**  Polymer concrete, polymer grouts, epoxy bonding agents, protective coatings for concrete and steel. | | | | | | | | | | 04 | | | CO2 | |
| IV | **Damage diagnosis and assessment**  Visual inspection, non-destructive testing using rebound hammer, ultra-sonic pulse velocity, semi destructive testing, probe test, pull out test, chloride penetration test, carbonation, carbonation depth testing, corrosion activity measurement. | | | | | | | | | | 06 | | | CO3 | |
| V | **Crack repair**  Various methods of crack repair, grouting, routing and sealing, stitching, dry packing, autogenous healing, overlays, repair to active cracks, repair to dormant cracks. | | | | | | | | | | 06 | | | CO2 | |
| VI | **Jacketing techniques**  Column jacketing, beam jacketing, beam-column joint jacketing, reinforced concrete jacketing, steel jacketing, FRP jacketing. | | | | | | | | | | 06 | | | CO4, CO5 | |
| VII | **Strengthening**  Beam shear strengthening, Flexural strengthening, column strengthening, beam-column joint strengthening. | | | | | | | | | | 06 | | | CO4, CO5 | |
| Total Hours | | | | | | | | | | | 36 | | |  | |
| **Essential Readings** | | | | | | | | | | | | | | | |
| 1. Mailvaganam, N.P, “Repair and protection of concrete structures”, CRC Press,1991. | | | | | | | | | | | | | | | |
| 2. Emmons, P.H., “Concrete repair and maintenance Illustrated”, Galgotia publications Pvt. Ltd., 2001. | | | | | | | | | | | | | | | |
| 3. Agarwal, P., & Shrikhande, M., “Earthquake resistant design of structures” Prentice-Hall, New Delhi. | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | |
| 1. Handbook on repair and rehabilitation of RCC buildings, CPWD, Government of India. | | | | | | | | | | | | | | | |
| 2. Chakrabarti, A., “Handbook on seismic retrofit of buildings”, Narosa Publishing House, 2010. | | | | | | | | | | | | | | | |
| 3. IS 15988: 2013 Seismic Evaluation and Strengthening of Existing Reinforced Concrete Buildings - Guidelines | | | | | | | | | | | | | | | |
| 4. Roy, S.C.B, “Practical Problems and Solutions in Civil Engineering Works”, Nabhi Publication, New Delhi | | | | | | | | | | | | | | | |