|  |  |  |
| --- | --- | --- |
|  | **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** |
| CourseObjectives | 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 |