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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 | | | | | **I** | | |
| Course Code | | Course Name | | Pre-requisite | | Credit Structure | | | | Marks Distribution | | | | | |
| L | T | P | C | INT | | MID | END | | Total |
| **CE 559** | | **Advance Concrete Technology** | | **NIL** | | **3** | **0** | **0** | **3** | **50** | | **50** | **100** | | **200** |
| Course Objectives | | To develop the student’s knowledge on understanding of concrete making materials including supplementary cementitious materials | | | Course Outcomes | | CO1 | Student will be gaining the a solid foundation on various materials in concrete and admixtures | | | | | | | |
| To develop understanding on developing first-hand knowledge on concrete production process and properties and uses of concrete as a modern material of construction | | | CO2 | Student will be able to possess the analytical and design related to strength and durability properties of conventional cement concrete and various types of special concrete. Know the different microstructure analysis of concrete. | | | | | | | |
| SYLLABUS | | | | | | | | | | | | | | | |
| No. | Content | | | | | | | | | | Hours | | | COs | |
| I | **Introduction:** Different types of cementitious materials, Micro structural aspects of cement paste; Models of hydrated Portland  cement gel. | | | | | | | | | | 06 | | | CO1 | |
| II | **Admixtures and Construction Chemicals :**Benefits of admixtures, type of admixtures, plasticizers, action of plasticizers, super - plasticizers, classification of super plasticizers, effect of super-plasticizers, doses of super plasticizers, super plasticizers-cement compatibility, waterproofing admixture, antibacterial and similar admixtures, IS codal provisions for concrete mix design. | | | | | | | | | | 06 | | | CO2 | |
| III | **Strength and durability of concrete :**Factors affecting the strength, curing of concrete, strength in tension, failure in compression, aggregate cement paste interface, effect of age on strength of concrete, relationship between compressive and tensile strength, bond strength. Causes of inadequate durability, transportation mechanism in concrete, diffusion, absorption, water permeability of concrete, air and vapour permeability, carbonation, acid attack on concrete, sulphate attack on concrete, efflorescence, Marine concrete, alkali-silica reaction, chloride attack, and test for penetrability of concrete to chlorides. | | | | | | | | | | 06 | | | CO1, CO2 | |
| IV | **Special concrete and concreting techniques**  Introduction, light weight concrete, ultra-light weight concrete, concrete with different cementitious materials like  fly ash, ggbs, silica fume etc., fiber reinforced concrete, polymer concrete composites, jet cement concrete, gap  graded concrete, high performance concrete, self-compacting concrete, foamed concrete. | | | | | | | | | | 08 | | | CO2 | |
| V | **Microstructure analysis techniques**  Working principle of Scanning Electron Microscope (SEM), Energy Dispersive X-ray Spectrometry (EDS), X-ray  Powder Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR) analysis techniques, TGA (Thermo  gravimetric analysis) and DTA (Differential Thermal Analysis). | | | | | | | | | | 10 | | | CO2 | |
| **Total Hours** | | | | | | | | | | | **36** | | |  | |
| **Essential Readings** | | | | | | | | | | | | | | | |
| 1. Neville, A.M.,“Properties of Concrete’’, Standard Publishers Distributors, 5thedition 2012. | | | | | | | | | | | | | | | |
| 2. Zongjin, L., “Advanced Concrete Technology”, Wiley, 2011 | | | | | | | | | | | | | | | |
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| **Supplementary Readings** | | | | | | | | | | | | | | | |
| 1. Varshney, ‘’Concrete Technology”, Khanna Publishers, New Delhi 1st edition 1982 | | | | | | | | | | | | | | | |
| 2. Shetty. M.S.,‘’Concrete Technology”, S.Chand& Company Ltd, 1st edition 2006 | | | | | | | | | | | | | | | |
| 3. Santhakumar, A.K., “Concrete Technology”, Oxford Press, 1st edition 2006. | | | | | | | | | | | | | | | |