**20CE3102 – CONCRETE TECHNOLOGY**

**(Civil Engineering)**

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| **Course Category** | Professional Core | **Credits:** | 3 |
| **Course Type** | Theory | **Lecture - Tutorial - Practical** | 3 - 0 - 0 |
| **Prerequisite** | Building Materials & Construction | **Sessional Evaluation** | 40 |
| **Semester End Exam Evaluation** | 60 |
| **Total Marks** | 100 |

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| **Course Outcomes** | CO1 | Identify various types of cements and admixtures. |
| CO2 | Determine the properties of aggregates used in concrete. |
| CO3 | Identify the properties of concrete in the fresh state and Methods of curing. |
| CO4 | Perform destructive and non-destructive tests on concrete. |
| CO5 | Understand the durability requirements of concrete. |
| CO6 | Design the concrete mix using various codes and apply various special concretes for their specific applications. |
| **Course**  **Content** | **UNIT– I**  **CEMENT:**Introduction – Chemical composition of cement – Physical properties of cement – Types of cement: Ordinary portland cement – Rapid hardening cement – Sulphate resisting cement – Portland slag cement – Quick setting cement – Supersulphatedcement – Low heat cement – Portland pozzolana cement – Air entraining cement– Coloured cement – High alumina cement – Masonry cement – Expansive cement – Oil well cement.  **ADMIXTURES:** Introduction – Classification: Plasticizers – Super plasticizers– Accelerators – Retarders – Waterproofing admixtures – Colouring admixtures – corrosion inhibiting admixtures – Air entraining agents – Pozzolanic (mineral) admixtures: Fly-ash – Silica fume.  **UNIT – II**  **CONCRETE AGGREGATES:**Introduction – Classification: Heavy weight aggregates – Normal weight aggregates –Mechanical properties – Moisture content and its effects – Deleterious substances – Alkali-aggregate reaction – Thermal properties – Grading curves and grading requirements – Gap-graded aggregate – Maximum aggregate size – Use of ‘Plums’ – Handling of aggregates.  **UNIT – III**  **FRESH CONCRETE:**Introduction –Workability – Factors affecting workability – Measurement of workability – Comparison of workability tests – Segregation – Bleeding – Mixing of concrete – Concrete mixers – Vibration of concrete – Types of vibrators – Ready mixed concrete – Pumped concrete –Pre-packed concrete and Vacuum processed concrete.  **CURING OF CONCRETE:**Introduction – Curing conditions – Methods of curing – Influence of temperature – Steam curing at atmospheric pressure – High pressure steam curing.  **UNIT – IV**  **HARDENED CONCRETE:**Introduction – Water/Cement ratio–Duff Abram’s law – Gel/ Space ratio – Griffith’s hypothesis – Maturity concept ofconcrete– Factors affecting strength- Nature of strength of concrete – Strength in tension and compression–Relation between compression and tensile strengths – Testing of hardened concrete – Compression tests – Tension tests – Flexure tests – Cylinder splitting tension tests – Non-destructive testing methods: Rebound hammer test – Ultrasonic pulse velocity test.  **UNIT – V**  **ELASTICITY, SHRINKAGE AND CREEP:** Modulus of elasticity – Types – Factors affecting modulus of elasticity –Poisson’s ratio – Mechanism of shrinkage – Factors affecting shrinkage – Types of shrinkage: Plastic shrinkage – Drying shrinkage – Autogeneous shrinkage – Carbonation shrinkage– Creep of concrete – Factors affecting creep – Relation between creep and time – Nature of creep – Effect of creep.  **DURABILITY:**Introduction – Factors affecting durability – Permeability – Chemical attack of Concrete – Efflorescence – Thermal properties of concrete – Resistanceofconcrete to fire.  **UNIT – VI**  **CONCRETE MIX DESIGN:** Introduction – Objectives of mix design – Basic considerations – Factors influencing the choice of mix proportions – Design of concrete mixes by IS 10262 :2019&ACI methods.  **SPECIAL CONCRETES:** Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete –Polymer concrete – Self compacting concrete. | |
| **Text**  **and**  **Reference books** | **TEXT BOOKS:**   1. M.S. Shetty, *Concrete Technology Theory and Practice,*S. Chand & Company Ltd.,8thRevised Edition,2019. 2. Dr.R.P.Rethaliya, *Concrete Technology,*Charotar Publishing House, 2nd Edition, 2018. 3. V.N.Vazirani and S.P.Ratwani, *Concrete Technology,*Khanna Publishers, 6th Edition, 2016.   **REFERENCE BOOKS:**   1. A.M.Neville,J.J.Brooks, *Concrete Technology,* Pearson. 2nd Edition,2019, Concrete Manual by U.S. Bureau of Reclamation. 2. P.Kumar Mehta, Paulo J.M. Monteiro, *Concrete: Microstructure, Properties, and Materials,* McGraw Hill Education, 4th edition, 2017. 3. M.L.Gambhir, *Concrete Technology Theory and Practice,* McGraw Hill Education, 5th edition, 2017. | |

**CO-PO Mapping:** 3-High mapping, 2-Moderate mapping, 1-Low mapping, - Not mapping

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | 1 | - | - | - | 1 | - | - | 1 | - | - | 1 | 1 | - | 2 | 1 |
| **CO2** | 1 | 1 | - | - | - | - | - | 1 | - | - | 1 | 1 | - | 1 | 1 |
| **CO3** | 1 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | - | 1 | 1 |
| **CO4** | 2 | 1 | 1 | 2 | - | - | - | - | - | - | - | 2 | - | 1 | 2 |
| **CO5** | 1 | 1 | - | - | - | - | 1 | - | - | - | - | 1 | - | 2 | - |
| **CO6** | 3 | 3 | - | 1 | - | - | - | - | - | - | 1 | 2 | 1 | 3 | 3 |