

B Tech. II Semester –III

Subject Name: Concrete and Construction Technology

Subject Code: BTCL13302

Type of course: PCC III

Prerequisite: Material Science

Rationale: The course on Concrete technology acquaints the students with this second largest material in use after water. It will help the students to explore the material, its properties, intrinsic nature and application & also the recent advances in field of concrete technology, Construction technology is also a core subject in civil engineering. This subject is intended for gaining useful knowledge with respect to facts. Concepts, principles and procedures related to building construction system s

Teaching and Examination Scheme:

| TEACHING SCHEME | | | | Theory Marks | | | Practical Marks | | Total |
|-----------------|---|---|---|--------------|-----|-----|-----------------|-----|-------|
| L | T | P | C | TEE | CA1 | CA2 | TEP | CA3 | |
| 3 | 0 | 2 | 4 | 60 | 25 | 15 | 30 | 20 | 150 |

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

| Sr. No. | Content | Total Hrs. | Module Weightage % |
|---------|---|------------|--------------------|
| 1 | Introduction: Historic development, Composition of concrete, Advantages of concrete over other materials, Advances and future trends in concrete, Overview of Sustainability and Concrete development. | 07 | 5% |
| 2 | Ingredients of Concrete: Cement: Chemical composition, Hydration of cement, structure of hydrated cement, Tests on cement, Various types of cement Aggregates: Classification of aggregates, IS specifications, Properties of aggregates, Grading, Types of grading, Sampling & Testing of | 07 | 17% |

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| | aggregates Water – General requirements & limiting values of impurities Admixtures: Additives & Admixtures, Types of admixtures, Applications, Mineral admixtures – Fly ash, silica fume, GGBS and other pozzolanic materials. Chemical Admixtures: Accelerators, Retarders, Water reducing admixtures, Plasticizers, Super plasticizers, Dosage and application. | | |
| 3 | Fresh Concrete, Mix design and Hardened Concrete: Properties of fresh concrete, Definition and Measurement methods of workability as per IS and ASTM standards, factors affecting workability, Segregation & Bleeding, Slump loss, Re-tempering, Site preparations for concreting, Mixing, Conveying, Placing, Compaction, Finishing of concrete. Curing & various methods of curing. Principles of concrete mix design, Parameters and factors influencing mix design, Indian Standard methods of mix design Strengths of hardened concrete (Tensile & Compressive strength, Flexural & Bond strength), standard test methods as per IS and ASTM, Failure mechanism under compression & tension, Stress-strain behavior of concrete, Overview of Modulus of elasticity, Dimensional stability – Creep & Shrinkage | 07 | 17% |
| 4 | Durability & Permeability of concrete : Causes of deterioration in concrete and durability problems, Factors affecting durability, Transport mechanism of gases & fluids in concrete, Cracking & causes of cracking, Carbonation induced & corrosion induced cracking, Alkali-aggregate reaction, Degradation by freeze & thaw, Sulphate attack, Durability under sea-water (marine environment). | 5 | 12% |
| 5 | Miscellaneous Topics: Special concrete and Concreting methods, on- Destructive testing of concrete – Introduction to Destructive, semi destructive & Non-destructive testing methodology, Problems faced during Non-destructive evaluation, Test methods like Rebound Hammer test, Ultra-sonic pulse velocity, Penetration tests, Pull out tests. Overview of Failure of concrete under low stress, Micro—cracking, crack propagation, stress concentration at openings.. | 6 | 14% |
| 6 | Introduction of various Civil Engineering structures: Functions of various components of building and other structures | 6 | 14% |
| 7 | Building Construction and Items: Brick and stone masonry, Selection of suitable type of masonry, Construction procedures. , Ingredients of concrete, Production of concrete, transportation, placing, compaction, curing , Concrete in different situations viz. hot weather, cold weather, under water etc, Purpose & types of scaffolding and centering , Suitability | 6 | 14% |

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|-----------|--|----------|-----------|
| | of scaffolding as per situations and type of structures, Erection of centering for different component, Plastering and Pointing, Damp Proof Coarse, Anti-termite measures and treatments, Construction joints-need and materials used, Plumbing and electrification- various types of fittings and laying procedure. | | |
| 8. | Construction Machinery: Machineries used for earthwork and for other construction works. | 3 | 7% |

Suggested Specification table with Marks (Theory):

| Distribution of Theory Marks | | | | | |
|------------------------------|-----------|-----------|-----------|-----------|----------|
| R Level | U Level | A Level | N Level | E Level | C Level |
| 20 | 20 | 30 | 15 | 15 | 0 |

Legends: **R:** Remembrance; **U:** Understanding; **A:** Application, **N:** Analyze and **E:** Evaluate **C:** Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

| Sr no | Title of book /article | Author(s) | Publisher and details like ISBN | Year of publication | Publication Edition |
|-------|--|-----------------|---------------------------------|---------------------|---------------------|
| 1 | Properties of Concrete | Adam Neville | Pearson | 2011 | 5 th |
| 2 | Concrete Technology | M S Shetty | S Chand | 2008 | 8 th |
| 3 | Concrete Technology | M L Gambhir | McGraw Hill Education | 2017 | 5 th |
| 4 | Concrete Technology | A R Santhakumar | Oxford University Press | 2006 | 2 nd |
| 5 | Building Construction | Dr B.C. Punmia, | Word press | 1984 | 1 st |
| 6 | Building Construction | Shushil Kumar | Standard publishers | 2017 | 20 th |
| 7 | Building Construction | S. C.Rangwala | Charotar publication | 2016 | 33 rd |
| 8 | Construction Planning, Equipments and method | R. L. Perurifoy | Mcgraw-hill | 2010 | 8 th |

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Course Outcomes:

| Sr. No. | CO statement After successful completion of this course, the students will be able to | Marks % Weightage |
|---------|--|----------------------|
| CO-1 | Learn the basic elements of a Fresh and Hard Concrete (<i>U - Cognitive level</i>) | 30 |
| CO-2 | Learn the fundamentals of Durability of concrete (<i>U - Cognitive level</i>) | 25 |
| CO-3 | Learn the mix design of concrete (<i>U - Cognitive level</i>) | 20 |
| CO-4 | Able to understand various civil engineering structure. (<i>U - Cognitive level</i>) | 15 |
| CO-5 | Able to basic use of various construction equipment and machineries (<i>U - Cognitive level</i>) | 10 |

Mapping with POs:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 | PS O3 |
|-------------------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|----------|----------|----------|----------|
| CO-1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 1 |
| CO-2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 |
| CO-3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 1 |
| CO-4 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | 2 |
| CO-5 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 2 |
| Rationale* | 10 | 8 | 9 | 9 | 9 | 8 | 8 | 7 | 8 | 8 | 10 | 9 | 9 | 9 | 8 |

Rationale*: All CO's are compatible and matching to the derived POs to several extents. The study of this subject enables to impart knowledge to the civil engineering students Construction Technology, Hard and Fresh Concrete, Concrete Mix Design, Durability of concrete.

List of Experiments:

1. To determine Fineness Modulus of Aggregate
2. To determine the Fineness Modulus of Ordinary Portland Cement (OPC)
3. To determine the Standard Consistency of Ordinary Portland Cement (OPC)

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4. To determine the Initial Setting Time (IST) & Final Setting Time (FST) of Ordinary Portland Cement (OPC)
5. To determine soundness of Ordinary Portland Cement (OPC)
6. To determine Compressive Strength of Cement Mortar Cube
7. To determine Workability of Cement Concrete by Compaction Factor Test
8. To determine Workability of Cement Concrete by Slump Test
9. Testing of Concrete Cubes by Destructive & Non-destructive Testing of Concrete
- 10 To determine the Split Tensile Strength of Cylindrical Concrete Specimens
11. To determine the Flexural Strength of Cement Concrete
12. Sketches of foundations, Masonry, Scaffolding, DPC, and Building Components.
- 13 Arrange Field Visits at construction site where the subject related works are in progress

Major Equipments:

1. Universal Testing Machine
2. Compressive testing Machine
3. Concrete Mixtures
4. Rebound Hammer
5. UPV

List of Open learning website:

<https://nptel.ac.in/courses/105102012>