25CVMJ206: Concrete Technology

w. e. f. Academic Year:	**2026-27**
Semester:	**3rd (Civil Engineering)**
Category of the Course:	**Professional Core Courses (PCC)**
Prerequisite:	Students should have basic knowledge of mathematics and general science, along with fundamental concepts of infrastructure and an essential understanding of material behavior required to understand the properties and testing of concrete.
Rationale:	The course provides understanding of the concept of concrete and to learn the techniques of incorporating to produce the concrete and various methods for the mix design of concrete has been thoroughly discussed. It will help the students in designing the concrete mix.

Course Outcomes:

After Completion of the Course, Student will able to:

	Course Outcome (CO)	**RBT Level (Cognitive Domain)**
CO1	Explain the composition, strength mechanism, and role of individual ingredients of concrete, including cement, aggregates, water, and admixtures, along with their properties, testing, and relevant Indian Standard specifications.	Explain
CO2	Describe and analyze the production processes of concrete and evaluate the properties of fresh and hardened concrete, including workability, strength, durability, elasticity, shrinkage, creep, and various destructive and non-destructive testing methods as per IS and ASTM standards.	Describe, Analyze, Evaluate
CO3	Apply principles of concrete mix design using IS, ACI, DOE, and Road Note-4 methods, considering variability, acceptance criteria, and factors affecting mix proportioning.	Apply
CO4	Analyze the behavior, characteristics, and applications of special concrete.	Identify, Understand
CO5	Analyze the advanced concreting techniques such as high-performance concrete, fiber-reinforced concrete, pumped concrete, and ready-mix concrete.	Understand, Apply

Teaching and Evaluation Scheme:

Teaching Scheme					**Examination Scheme**				
L	**T**	**P**	**C**	**Hrs/Week**	**IE**	**EE**	**CIA**	**Practical**	**Total Marks**
3	0	2	4	5	40	60	30	20	150

IE: Internal Exam CIA: Continuous Internal Assessment
EE: External Exam (End Semester) Practical: Practical Exam (End Semester)

Detailed Syllabus:

Unit No.	Topic	Hrs.	% of Weightage (Approx.)
UNIT: 1	**INTRODUCTION AND INGREDIENTS OF CONCRETE** **Introduction:** Concrete composition, general note on strength mechanism, recent practice, and future trends. **Ingredients of Concrete:** 1. Cement—Chemical composition, hydration, heat of hydration, hydrated structure, various types of cement, and testing of cement as per Indian standard. 2. Aggregates - Utility in concrete, classification, effect of geometry & texture, strength, mechanical properties, moisture content, water absorption, bulking of sand, deleterious substances, sieve analysis, various grading and grading requirements, sampling & testing as per Indian Standards. 3. Water - General Requirements & limiting values of impurities. 4. Admixtures—Admixtures and its benefits , Types of Admixtures - Accelerator and Retarder Plasticizer and Super Plasticizer Water roofing and Air entraining admixture	**12**	**25**
UNIT: 2	**CONCRETE & ITS PROPERTIES** 1. **Production of Concrete:** Batching, Mixing, Transporting, Placing, Compaction, Curing, 2. **Properties of Fresh Concrete:** Workability–Definition and requirement, factors affecting workability, various tests as per IS and ASTM. Segregation and bleeding, stiffening, re-tempering, Micro cracking 3**.Properties of Hardened Concrete:** Compressive and tensile strength and their relationship, various tests as per IS and ASTM. Factors affecting strength: water-cement ratio, gel space ratio, aggregate-cement ratio, properties of ingredients, effect of age, maturity, aggregate-cement-paste interface, various finishes of concrete. Introduction to aspects of elasticity, shrinkage, and creep. Tests for strength of concrete: Destructive, semi-destructive, and non-destructive tests with limitations, as well as test methods as per IS and ASTM.	**12**	**25**
UNIT: 3	**CONCRETE MIX DESIGN** Principles of mix proportioning, probabilistic parameters, factors governing selection of mix. Road note - 4, DOE, ACI and IS method of concrete mix design, Variability of test results, acceptance criteria, various IS code provisions.	**08**	**20**

UNIT: 4	**SPECIAL CONCRETE** Review of behaviour and characteristics of high strength concrete, high performance concrete, Ultra High-Performance Concrete, fiber reinforced concrete, mass concrete, light weight and heavy weight concrete, Precast concrete	**08**	**20**
UNIT: 5	**SPECIAL CONCRETE TECHNIQUES** Pumped concrete, underwater concrete, pre-placed concrete, vacuum de- watered concrete, hot and cold weather concreting, ready mixed concrete.	**05**	**10**
		45	**100**

List of Practical:

Sr.No.	Topic	Hrs
1	Introduction to Concrete Lab	2
2	Consistency of Standard Cement Paste.	2
3	Initial & Final Setting Time of Ordinary Portland Cement.	2
4	Soundness Test	2
5	Sieve Analysis of Fine aggregate & coarse Aggregate	2
6	Flakiness and Elongation Index	2
7	Specific Gravity and Water Absorption of Coarse Aggregate	2
8	Impact Value Test for Aggregate	2
9	Compaction Factor Test	2
10	Slump Test	2
11	Concrete mix proportioning as per IS 10262-2019	2
12	Compressive Strength Of Concrete	4
13	Rebound Hammer test	2
14	Site Visit of RMC plant/Construction site	2
		30

Learning Resources:

Reference Books:

1. M S Shetty; Concrete Technology, S. Chand Publication, New Delhi
2. P Kumar Mehta, Monteiro; Concrete Technology, Indian Concrete Institute
3. A.R. Santhakumar; Concrete Technology, Oxford University Press
4. A.M. Neville; Properties of Concrete, Pearson Education
5. M L Gambhir; Concrete Technology, Tata McGraw-Hill

Online References:

1. http://www.nptel.iitm.ac.in

Indian standard Codes of Practice and Other Design Standards

1. IS 456-2000
2. IS 269-1989
3. IS 516-1959
4. IS 1786-1985
5. IS 1893-2002
6. IS 12269-1987
7. IS 9103-1999
8. IS 8112-19

Teaching Learning Method

1. Lecture-based teaching-learning
2. Group-teaching and learning
3. Individual learning/self-study
4. Inquiry-based learning
5. Kinesthetic learning / Practicals
6. Expeditionary learning (Real-world problems)
7. Technology-based Learning
8. Peer teaching
9. Learning through problem-solving

Course Outcomes Mapping:

CO	Course Outcome (CO)	POs/PSOs Mapped	Cognitive Level (RBT)	Knowledge Category	Class Session (Lecture)
CO1	Explain the composition, strength mechanism, and role of individual ingredients of concrete, including cement, aggregates, water, and admixtures, along with their properties, testing, and relevant Indian Standard specifications.	PO1,PO2,PO3 PO4,PO5, PO11, PSO1,PSO2	Understand	Conceptual	12
CO2	Describe and analyze the production processes of concrete and evaluate the properties of fresh and hardened concrete, including workability, strength, durability, elasticity, shrinkage, creep, and various destructive and non-destructive testing methods as per IS and ASTM standards.	PO1,PO2,PO3 PO4,PO5, PO11, PSO1,PSO2	Describe, Analyze,	Conceptual & Procedural	12
CO3	Apply principles of concrete mix design using IS, ACI, DOE, and Road Note-4 methods, considering variability, acceptance criteria, and factors affecting mix proportioning.	PO1,PO2,PO3 ,PO4,PO5, PO6,PO11, PSO1,PSO2	Apply	Conceptual & Procedural	08
CO4	Analyze the behavior, characteristics, and applications of special concrete.	PO1,PO2,PO3, ,PO4,PO5, PO10,PO11, PSO1,PSO2	Analyze	Conceptual & Procedural	08
CO5	Analyze the advanced concreting techniques such as high-performance concrete, fiber-reinforced concrete, pumped concrete, and ready-mix concrete.	PO1,PO2,PO3. PO4,PO5,PO6 PO7,PO8,PO9, PO10,PO11, PSO1,PSO2	Analyze	Conceptual & Procedural	05

Mapping of COs with POs & PSOs:

CO	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	3	3	3	3	0	0	0	0	0	0	3	3
CO2	3	3	3	3	3	0	0	0	0	0	0	3	3
CO3	3	3	3	3	3	2	0	0	0	0	0	3	3
CO4	3	3	3	3	3	0	0	0	0	2	0	3	3
CO5	3	3	3	3	3	2	1	1	1	2	0	3	3

3: High, 2: Medium, 1: Low

Sustainable Development Goals (SDG) Integration

This course integrates sustainability by emphasizing durable, resource-efficient, and high-performance concrete technology for modern infrastructure. It focuses on responsible material selection, waste reduction, quality control, advanced concrete practices, and long-lasting construction systems that minimize environmental impact. The course aligns with SDG 4, SDG 9, SDG 11, and SDG 12.

CO	Course Outcome	Relevant SDGs	Justification
CO1	Explain the composition, properties, and testing of ingredients of concrete such as cement, aggregates, water, and admixtures.	SDG 4, SDG 12	Promotes knowledge of sustainable material selection and efficient resource utilization.
CO2	Analyze production methods and fresh/hardened properties of concrete including workability, strength, durability, and testing methods.	SDG 9, SDG 11	Supports quality construction practices for durable and resilient infrastructure.
CO3	Design concrete mixes using standard methods such as IS, ACI, DOE, and Road Note methods.	SDG 9, SDG 12	Encourages optimized mix design, reduced material wastage, and efficient concrete production.
CO4	Evaluate the behavior and applications of special concrete such as HPC, UHPC, fiber reinforced, lightweight, and precast concrete.	SDG 9, SDG 11, SDG 12	Promotes innovative materials for sustainable, efficient, and long-lasting structures.
CO5	Explain special concreting techniques such as pumped, underwater, ready-mix, and hot/cold weather concreting.	SDG 9, SDG 11	Enhances modern construction practices for safe and efficient infrastructure development.