



**Lok Jagruti Kendra University**  
University with a Difference

# **Diploma in Civil Engineering**



**Course Code: 025050402**

**Concrete Technology**

<b>Programme / Branch Name</b>		Diploma in Civil Engineering				
<b>Course Name</b>	Concrete Technology				<b>Course Code</b>	025050402
<b>Course Type</b>	HSSC	BSC	ESC	PCC	OEC	PEC

**Legends:** HSSC: Humanities and Social Sciences Courses      BSC: Basic Science Courses  
 ESC: Engineering Science Courses      PCC: Program Core Courses  
 OEC: Open Elective Courses      PEC: Program Elective Courses

## 1. Teaching and Evaluation Scheme

Teaching Hours / Week				Evaluation Scheme			
L	T	P	Total Credit	CCE	SEE (Th)	SEE (Pr)	TOTAL
3	0	2	4	50	50	50	150

**Legends:**  
 L: Lectures      T: Tutorial      P: Practical  
 CCE: Continuous & Comprehensive Evaluation  
 SEE (Th): Semester End Evaluation (Theory)  
 SEE (Pr): Semester End Evaluation (Practical)

## 2. Prerequisites

- ✓ Building Materials
- ✓ Construction Technology
- ✓ Civil Engineering Workshop

## 3. Rationale

Concrete is a construction material composed of cement, fine aggregates (sand) and coarse aggregates mixed with water which hardens with time. Portland cement is the commonly used type of cement for the production of concrete. Concrete technology deals with the study of the properties of concrete and its practical applications. In building construction, concrete is used for the construction of foundations, columns, beams, slabs and other load-bearing elements. The knowledge of concrete and its properties in the plastic condition and hardened condition is highly important to make civil engineering structures safe and serviceable. This course aims to help the student to use relevant types of concrete in different site conditions. After completion of this syllabus, students will supervise and control the quality of concreting operations in various situations.

## 4. Objectives

- ✓ To use relevant types of cement in different site conditions.
- ✓ To use relevant aggregates for required concrete works.
- ✓ To use relevant admixtures for concreting for different conditions.
- ✓ To design concrete mix of desired compressive strengths as per IS method.
- ✓ To determine the important properties of fresh and hardened concrete.
- ✓ To understand the concepts of special concrete and its uses.

## 5. Contents

Unit No.	Unit Name	Topics	Learning Outcomes	% Weightage	Hours
1.	Materials used in Concrete	1.1. Cement and Testing of Cement 1.1.1. General 1.1.2. Early History of Modern Cement 1.1.3. Manufacture of Portland Cement 1.1.4. Wet Process 1.1.5. Dry Process 1.1.6. Chemical Composition 1.1.7. Hydration of Cement 1.1.8. Types of Cement 1.1.9. ASTM Classification 1.1.10. Field Testing 1.1.11. Standard Consistency Test 1.1.12. Setting Time Test 1.1.13. Strength Test	<ul style="list-style-type: none"> <li>Evaluate the Physical Properties of Cement.</li> <li>Understand the Field Test on Cement.</li> <li>Perform the Laboratory Test on Cement.</li> </ul>	30	14
		1.2. Aggregates and Testing of Aggregates 1.2.1. General 1.2.2. Classification 1.2.3. Source 1.2.4. Size 1.2.5. Shape 1.2.6. Texture 1.2.7. Bulking of Aggregates 1.2.8. Grading of Aggregates 1.2.9. Test for Determination of Flakiness Index 1.2.10. Test for Determination of Elongation Index 1.2.11. Mechanical Properties of Aggregates	<ul style="list-style-type: none"> <li>Evaluate the Physical Properties of Aggregates.</li> <li>Perform the Laboratory Test on Aggregates.</li> </ul>		

		<p>1.3. Water 1.3.1. Introduction 1.3.2. Qualities of Water</p>	<ul style="list-style-type: none"> <li>Know the Qualities of Water for Making Concrete.</li> </ul>		
		<p>1.4. Admixtures 1.4.1. General 1.4.2. Admixtures 1.4.3. Plasticizers 1.4.4. Superplasticizers 1.4.5. Retarders 1.4.6. Accelerators 1.4.7. Air-entraining Admixture 1.4.8. Damp-proofing and Waterproofing Admixture 1.4.9. Air-detraining Agents</p>	<ul style="list-style-type: none"> <li>Understand the Concept of Using Admixtures in a Concrete.</li> </ul>		
2.	<b>Fresh Concrete</b>	<p>2.1. General 2.2. Workability 2.3. Measurement of Workability 2.4. Segregation 2.5. Bleeding 2.6. Setting Time of Concrete 2.7. Process of Manufacture of Concrete 2.8. Curing of Concrete 2.9. Ready-Mixed Concrete in India</p>	<ul style="list-style-type: none"> <li>Evaluate the Properties of Fresh Concrete.</li> <li>Perform the Laboratory Test on Fresh Concrete.</li> <li>Understand the Manufacturing Process of Concrete</li> </ul>	20	8
3.	<b>Testing of Hardened Concrete</b>	<p>3.1. Introduction 3.2. Compression Test 3.3. Curing 3.4. Effect of the Height/Diameter Ratio on Strength 3.5. Comparison Between Cube and Cylinder Strength 3.6. Determination of Tensile Strength-Split Cylinder Test 3.7. Non-Destructive Testing Methods-Schmidt's Rebound</p>	<ul style="list-style-type: none"> <li>Evaluate the Properties of Hardened Concrete.</li> <li>Perform the Laboratory Test on Hardened Concrete.</li> <li>Learn the Non-Destructive Testing Methods.</li> </ul>	20	8

		Hammer Test, Pullout Test, Resonant Frequency Method, Pulse Velocity Method			
4.	Concrete Mix Design	4.1. General 4.2. Concept of Mix Design 4.3. Variables in Proportioning 4.4. Various Methods of Proportioning 4.5. Common Terminologies 4.6. Calculation of Standard Deviation and Coefficient of Variation 4.7. Indian Standard Concrete Mix Proportioning-Guidelines 4.8. Illustrative Example of Mix Design	<ul style="list-style-type: none"> <li>Design Concrete Mix as per IS Method.</li> </ul>	10	4
5.	Special Concrete Concreting Methods &	5.1. Light-weight Concrete 5.2. Aerated Concrete 5.3. No-fines Concrete 5.4. Fibre Reinforced Concrete 5.5. Polymer Concrete 5.6. Cold Weathering Concrete 5.7. Hot Weathering Concrete 5.8. The Guniting or Shotcrete 5.9. Ferrocement 5.10. Pervious Concrete	<ul style="list-style-type: none"> <li>Gain Knowledge about Special Concrete and Their Uses.</li> </ul>	20	8
				<b>Total Hours</b>	<b>42</b>

## 6. List of Practicals / Exercises

The practicals/exercises have been properly designed and implemented in an attempt to develop different types of skills so that students can acquire the competencies/programme outcomes. Following is the list of practicals/exercises.

Sr. No.	Practical / Exercises	Key Competency	Hours
1.	To determine the normal consistency of a given sample of cement.	Laboratory Test on Cement.	2
2.	To determine the initial and final setting time of a given sample of cement.	Laboratory Test on Cement.	2
3.	To determine the soundness of a given sample of cement by the Le-Chatelier method.	Laboratory Test on Cement	2
4.	To determine the compressive strength of a given sample of cement.	Laboratory Test on Cement.	2
5.	To determine the particle size distribution of coarse aggregates by sieving.	Laboratory Test on Aggregate.	2
6.	To determine flakiness index and elongation index of coarse aggregates.	Laboratory Test on Aggregate.	2
7.	To determine the aggregate crushing value of coarse aggregate.	Laboratory Test on Aggregate.	2
8.	To determine the aggregate impact value of coarse aggregate.	Laboratory Test on Aggregate.	2
9.	To determine the aggregate abrasion value of coarse aggregate by using the Los Angeles machine.	Laboratory Test on Aggregate.	2
10.	To determine the relative consistency of freshly mixed concrete by slump cone test.	Laboratory Test on Fresh Concrete.	2
11.	To determine the relative consistency of freshly mixed concrete by compacting factor test.	Laboratory Test on Fresh Concrete.	2
12.	To determine the compressive strength of cubic concrete specimens.	Laboratory Test on Hardened Concrete.	2
13.	To determine the splitting tensile strength of cylindrical concrete specimens.	Laboratory Test on Hardened Concrete.	2
14.	To determine the compressive strength of concrete by using the rebound hammer.	Field Test on Hardened Concrete.	2
<b>Total Hours</b>			<b>28</b>

## 7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	App %	C %	E %	An %
1.	Materials used in Concrete	20	45	5	0	0	30
2.	Fresh Concrete	20	45	15	10	0	10
3.	Testing of Hardened Concrete	10	50	10	10	0	20
4.	Concrete Mix Design	10	40	30	20	0	0
5.	Special Concrete & Concreting Methods	10	30	30	0	0	30

**Legends:** R: Remembering U: Understanding  
App: Applying C: Creating  
E: Evaluating An: Analyzing

## 8. Textbook

- 1) Concrete Technology by M.S. Shetty, S. Chand & Company Pvt. Ltd.

## 9. Reference Books

- 1) Concrete Technology by M.L.Gambhir, Tata McGraw-Hill Ltd.
- 2) Properties of Concrete by A.M. Neville, Pearson Education.
- 3) Concrete Technology by S. S. Bhavikatti, I.K. International Publishing House Pvt. Limited.

## 10. List of Publications

- 1) IS 12269(1987)- Ordinary Portland Cement-53 Grade Specification.
- 2) IS 383(1970)- Specifications for Coarse & Fine Aggregate from Natural Sources for Concrete.
- 3) IS 2386(Part I to VIII) (1963)- Methods of Test for Aggregates for Concrete.
- 4) IS 456(2000)- Plain and Reinforced Concrete-Code of Practice.
- 5) IS 516(1959)- Methods of Tests for Strength of Concrete.
- 6) IS 2430(1986)- Methods for Sampling of Aggregates for Concrete.
- 7) IS 10262(2009)- Guidelines for Concrete Mix Design Proportioning.
- 8) SP 23(1982)- Handbook on Concrete Mixes.
- 9) IS 13311(Part 2)(1992)- Non-Destructive Testing of Concrete-Methods of Test.

## 11. Open Sources (Website, Video, Movie)

- 1) [www.nptel.com](http://www.nptel.com)
- 2) LJP-Civil-Concrete Technology (Youtube)