

INSTITUTE	DIPLOMA STUDIES
PROGRAM	DIPLOMA ENGINEERING (CIVIL ENGINEERING)
SEMESTER	4
COURSE TITLE	CONCRETE TECHNOLOGY
COURSE CODE	09CI3404
COURSE CREDITS	3

Objective:

- 1 To understand the properties and suitability of cement, aggregates, water, admixtures, and special concretes used in construction.
- 2 To develop practical knowledge of concreting operations and quality control under different site conditions.
- 3 To understand the properties, behavior, and testing of fresh and hardened concrete.
- 4 To apply BIS provisions for concrete testing and mix design.
- 5 To develop awareness of modern trends, deterioration, repair, rehabilitation, and retrofitting of concrete structures.

Course Outcomes: After completion of this course, student will be able to:

- 1 Select suitable concrete ingredients by evaluating the properties of cement, aggregates, water, and admixtures for construction use.
- 2 Prepare and supervise concreting operations such as batching, mixing, transporting, placing, compaction, finishing, curing, and quality control under different site conditions.
- 3 Measure and interpret the properties of fresh and hardened concrete using relevant BIS tests, including workability, strength, and non-destructive testing.
- 4 Design concrete mix proportions as per IS 10262 for required grade and performance, with or without admixtures.
- 5 Select appropriate special concretes and explain modern trends in concrete technology for specific construction needs.
- 6 Explain the causes of deterioration and corrosion in concrete structures and suggest suitable methods of repair, rehabilitation, and retrofitting.

Pre-requisite of course:Not required

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	6	0	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Cement, Aggregate and Water Overview of Cement Manufacturing., Bogue's compounds and its functions, Physical and Chemical properties of cement., Testing of cement as per BIS., Various Grades and types of cements for different site conditions and its properties, Role of Aggregate, types of aggregate and it's source, Classification of aggregate, Soundness of aggregate, Alkali Aggregate Reaction, Grading of aggregate., Testing of aggregate as per BIS., Quality of water, impurities in mixing water and permissible limits as per BIS.	0
2	Concreting Operations Batching, mixing, transporting, placing, compaction, finishing and curing of concrete., Precautions for hot weather, cold weather and underwater concreting., Formwork stripping time, laitance and quality control during concreting.	0
3	Properties of Concrete Fresh Concrete and its properties:: Workability, harshness, segregation and bleeding., Measurement of workability by slump test and compaction factor test as per BIS., Hardened Concrete and its properties : Compressive Strength, Tensile (Split and Flexural) Strength, Bond Strength., Measurement of Compressive and Tensile Strength test as per BIS., Creep and Shrinkage of Concrete, Durability of Concrete and Factors affecting durability of concrete, Importance, limitations and different methods of Nondestructive Testing.	0
4	Mix Design of Concrete Objectives of mix design, nominal mix, design mix, Factors affecting Mix design., Different methods of Mix Design and its suitability., Concrete Mix Design as per IS 10262., Example of Mix design as per IS method for ordinary and standard grade of concrete without and with admixtures	0
5	Special Concrete and Modern Trends Special Concrete: Properties, Advantages and limitations of the following types of Special Concretes: Self-Compacting Concrete (SCC), Pervious Concrete, Fiber reinforced concrete, Ready mix concrete, Fly ash concrete, Recycled Aggregate Concrete, High performance Concrete, 3D printed Concrete., Admixtures in concrete: Purpose, properties and application for different types of admixtures such as accelerators, retarders, water reducing admixtures, air entraining agents and super plasticizers., Modern trends and research in concrete technology, relevant journals and institutes	0
6	Repairs, Rehabilitation and Retrofitting of Concrete Structure Definition of repair, rehabilitation and retrofitting., Deterioration of concrete, types, causes and prevention., Corrosion of reinforcement, causes and prevention., Repair and Rehabilitation stages, materials and techniques used., Retrofitting Methods	0
Total Hours		0

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment 1 Determine fineness of cement by sieving as per IS: 4031 (Part 1)	4
2	Experiment 2 Determination of water for cement paste of normal consistency as per IS: 4031 (Part 4)	4
3	Experiment 3 Determination of initial and final setting time of cement as per IS: 4031 (Part 5)	4
4	Experiment 4 Determination of compressive strength of cement as per IS: 4031 (Part 6)	4
5	Experiment 5 Determination of soundness of cement as per IS: 4031 (Part 3)	4
6	Experiment 6 Determination of fineness modulus and particle size distribution of coarse aggregate and fine aggregate as per IS: 2386 (Part 1)	4
7	Experiment 7 Determine flakiness and elongation index of coarse aggregate as per IS: 2386 (Part 1)	4
8	Experiment 8 Determine abrasion value of coarse aggregate as per IS: 2386 (Part 4)	4
9	Experiment 9 Determine impact value of coarse aggregate as per IS: 2386 (Part 4)	4
10	Experiment 10 Determine crushing value of coarse aggregate as per IS: 2386 (Part 4)	4
11	Experiment 11 Determination of bulking of fine aggregate as per IS: 2386 (Part 3)	4
12	Experiment 12 Determination silt content in fine aggregate as per IS: 2386 (Part 2)	4
13	Experiment 13 Determination of specific gravity and water absorption of aggregate (size 40 mm to 10 mm) as per IS: 2386 (Part 3)	4
14	Experiment 14 Determine bulk density and voids of aggregates as per IS: 2386 (Part 3)	4
15	Experiment 15 Concrete Mix Design as per IS 10262: 2019. Each student should be given different data for Grade with mineral admixture and/or Chemical admixture	10
16	Experiment 16 Determination of workability of concrete by slump cone test and compaction factor test as per IS: 1199	6

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
17	Experiment 17 Determination of compressive and tensile strength of concrete specimen as per IS: 516 and IS: 5816	2
18	Experiment 18 Demonstration of Non destructive test on concrete as per IS: 13311 (Demonstration by experts)	2
19	Experiment 19 Presentation of various types of admixtures and it's use in special concrete by performing Market Survey	4
20	Experiment 20 Demonstration of concrete repair materials and techniques (Demonstration by experts)	4
Total Hours		84

Textbook :

- 1 Concrete Technology, M. S. Shetty, S. Chand, 2016
- 2 Concrete Technology, M. L. Gambhir, McGraw Hill Education, 2019
- 3 Concrete Technology, A. M. Neville, J. J. Brooks, Pearson, 2015
- 4 Concrete Technology, A. R. Santhakumar, Oxford, 2019
- 5 Laboratory Manual on Concrete Technology, Hemant Sood, L.N.Mittal, P.D.Kulkarni, CBS, 2017

References:

- 1 Relevant latest editions of BIS codes such as IS 456, IS 10262, IS 1199, IS 2386, IS 4031, IS 516, IS 5816 and related standards shall be used., Relevant latest editions of BIS codes such as IS 456, IS 10262, IS 1199, IS 2386, IS 4031, IS 516, IS 5816 and related standards shall be used., Indian standards , BIS, 2020

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
20.00	30.00	50.00	0.00	0.00	0.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and the need of students. The teacher in addition to the conventional teaching method by blackboard may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

Instructional Method:

- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory.
- 3 Practical examination will be conducted at the end of the semester for an evaluation of the performance of students in the laboratory.
- 4 Students will use supplementary resources such as online videos, videos, & e-courses.

Supplementary Resources:

- 1 <https://nptel.ac.in/courses/105102012>
- 2 <https://onlinecourses.nptel.ac.in/>