

Branch Name:	CIVIL ENGINEERING
Program Code:	ET106
Course Title:	Concrete Technology
Course Code:	2ET1060402T
Pre-requisite Course:	Basic knowledge of Concrete Materials

Course Objectives:

CO-1: To understand the properties of ingredients of concrete.

CO-2: To study the behaviour of concrete at its fresh and hardened state.

CO-3: To study about the concrete design mix and special concrete.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Unit No	Topic	Total Hours	Weight age (%)
01	Introduction: Introduction of concrete, Historic development, Composition of concrete, Advantages of concrete over other materials.	04	10
02	Ingredient of Concrete: Cement - Chemical composition, hydration, heat of hydration, hydrated structure, various types of cement, testing of cement as per Indian standard. Aggregates - 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. Water - General Requirements & limiting values of impurities. Admixtures - Additives and admixtures, types, necessity and benefit Mineral admixture – Supplementary cementitious materials(SCMs), Accelerator, retarder, water reducing elements, plasticizer and super-plasticizer, their functions and dosage.	10	22

03	Properties of concrete: Fresh concrete – workability, factors affecting workability, tests for workability, segregation and bleeding, Hardened concrete - factors affecting strength of concrete, strength of concrete in compression, tension and flexure stress- strain characteristics and elastic properties, shrinkage and creep Durability & permeability of concrete - chemical attack, sulphate attack, resistance to abrasion and cavitation, resistance to freezing and thawing, resistance to fire, marine atmosphere, quality control, frequency of sampling, test specimens, statistical analysis of test results, standard deviation, acceptance criteria	10	22
04	Mix design of Concrete: Principles of concrete mix design, Parameters and factors influencing mix design, Indian Standard methods of mix design, Acceptability criteria, variability of results, Various provisions of IS code for sound concrete.	06	15
05	Special concrete and Concreting methods: Self-compacting concrete, ready mix concrete, high performance concrete, fiber reinforced concrete, precast concrete, prestress concrete, High strength concrete, polymer concrete, light weight concrete, heavy weight concrete, fly ash concrete, graphic concrete, light –generating concrete, self-Healing concrete, pumped concrete, under water concreting, hot & cold weather concreting.	06	15
06	Digital Transformation in Concrete Technology: 3D Printing of concrete, Concrete maturity meter	02	06
07	Non-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.	04	10

Reference Books:

1. Concrete Technology; M.S. Shetty, S Chand Publication.
2. Concrete Technology; A.M. Neville, Pearson Publication.
3. Concrete Technology; M.L. Gambhir, Tata McGraw Hill Publication.
4. Concrete Technology; A. R. Santhakumar, Oxford University Press.
5. Concrete Technology; P Kumar Mehta, Monteiro,, Indian Concrete Institute
6. IS: 456-2000; Code of Practice – Plain and Reinforced Concrete
7. IS 10262-2019 ; Concrete Mix Proportioning — Guidelines

Course Learning Outcomes (CLO):

1. Identify the important ingredients of concrete and its role.
2. Analyze the engineering properties of Civil Engineering materials like aggregate, cement, Concrete, steel and other materials.
3. Find properties of fresh concrete through experiments and evaluate the strength of hardened concrete based on results.
4. Apply the concept of mix design to produce concrete of adequate strength and durability.
5. Choose suitable concrete and concreting method for particular site condition.
6. Study about digitalization in concrete construction.
7. Describe the underlying principle and interpretation of different types of the non-destructive & semi destructive testing methods

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify the important ingredients of concrete and its role.	L2
CLO2	Analyze the engineering properties of Civil Engineering materials like aggregate, cement, Concrete, steel and other materials.	L4
CLO3	Find properties of fresh concrete through experiments and evaluate the strength of hardened concrete based on results.	L5
CLO4	Apply the concept of mix design to produce concrete of adequate strength and durability.	L3
CLO5	Choose suitable concrete and concreting method for particular site condition.	L4
CLO6	Study about digitalization in concrete construction.	L2
CLO7	Describe the underlying principle and interpretation of different types of the non-destructive & semi destructive testing methods	L2

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

Mapping of CLOs with POs & PSOs

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
Course Learning Outcomes	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
CLO1	M	M	M										M	M	M
CLO2	H		M	M									M	M	M
CLO3	H		M	M										M	M
CLO4	M	M	M	M									M	M	
CLO5		M	M	M									M	M	
CLO6				M	M									M	M
CLO7	M	M	M	M	M								M	M	

H: High, M: Medium, L: Low