



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3150610

SUBJECT NAME: CONCRETE TECHNOLOGY

SEM- V

**Type of course:** Professional core course

**Prerequisite:** Material Science

**Rationale:** Concrete is the most widely used construction material in the world made by mixing Portland cement with sand, crushed rocks and water. It plays an important role in Infrastructure and Private building construction. It is heterogeneous and has complex microstructure. Understanding the basic behaviour of concrete is very important for civil engineering students to become efficient civil engineering professionals. 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

### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

### Content:

Sr. No.	Content	Total Hrs	% Weightag
1.	<b>General:</b> Historic development, Composition of concrete, Advantages of concrete over other materials, Advances and future trends in concrete, Overview of Sustainability and Concrete development.	2	10
2.	<b>Ingredients of Concrete:</b> 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 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	10	20
3.	<b>Fresh Concrete:</b> 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	5	20



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	concrete. Curing & various methods of curing.		
4.	<p><b>Hardened Concrete:</b></p> <p>Strengths of hardened concrete (Tensile &amp; Compressive strength, Flexural &amp; Bond strength), standard test methods as per IS and ASTM, Failure mechanism under compression &amp; tension, Stress-strain behaviour of concrete, Overview of Modulus of elasticity, Dimensional stability – Creep &amp; Shrinkage</p>	5	20
5.	<p><b>Durability &amp; Permeability of concrete:</b></p> <p>Causes of deterioration in concrete and durability problems, Factors affecting durability, Transport mechanism of gases &amp; fluids in concrete, Cracking &amp; causes of cracking, Carbonation induced &amp; corrosion induced cracking, Alkali-aggregate reaction, Degradation by freeze &amp; thaw, Sulphate attack, Durability under sea-water (marine environment).</p>	5	10
6.	<p><b>Mix design of Concrete:</b></p> <p>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.</p>	5	10
7.	<p><b>Special concrete and Concreting methods:</b></p> <p>High strength concrete, High performance concrete, Fiber reinforced concrete, Polymer modified concrete, Self-compacting concrete, Light weight concrete, , Light-weight &amp; heavy weight concrete, High volume fly ash concrete.</p> <p><b>Special concreting methods:</b> Pumped concrete, Ready mix concrete, Under-water concreting, Hot &amp; cold weather concreting, Precast concrete, Pre-placed concrete</p>	5	5
8.	<p><b>Miscellaneous Topics:</b></p> <p>Non-Destructive testing of concrete – Introduction to Destructive, semi-destructive &amp; 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.</p> <p>Overview of Fracture Mechanics – Origin of fracture mechanics, Understanding the quassi-brittle nature of concrete, Failure of concrete under low stress, Micro—cracking, crack propagation, stress concentration at openings.</p>	5	5

**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	40	5	5	5	5

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



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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.

## Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Identify the important ingredients of concrete and its role in influencing the behaviour of concrete under different environment conditions	45
CO-2	Infer the results of the various experiments related to different ingredients of concrete, fresh concrete & hardened concrete	25
CO-3	Apply the concepts of Mix design to produce the concrete of adequate strength and durability	20
CO-4	Choose the correct type of concrete and concreting technology required for particular exposure and site condition	5
CO-5	Describe the underlying principle and interpretation of different types of the non-destructive & semi destructive testing methods	5

## Term Work:

1. Term work shall consist of tests on cement and aggregate, fresh concrete and hardened concrete.
2. Term work shall include Presentation on the topics assigned by lab faculty member.
3. Term work shall include field visit and students will have to submit a report on it.
4. Oral/Practical marks include viva-voce on practical performed and submitted reports.

## Reference Books:

1. A.M.Neville ; Properties of Concrete
2. D.F.Orchard; Concrete Technology
3. P Kumar Mehta, Monteiro; Concrete Technology
4. 4 A R Santhakumar; Concrete Technology
5. M S Shetty; Concrete Technology
6. M L Gambhir; Concrete Technology