

**JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE**  
**DEPARTMENT OF CIVIL ENGINEERING**

<b>Name of Subject</b>	<b>CONCRETE TECHNOLOGY</b>
<b>Subject Code</b>	<b>4CE4-08</b>
<b>Semester</b>	<b>IV</b>
<b>Internal Assessment</b>	<b>30 Marks</b>
<b>External Assessment</b>	<b>120 Marks</b>
<b>Credits</b>	<b>3</b>
<b>Name of Faculty</b>	<b>Mr. Krishan Kumar Saini</b> <b>Assistant Professor</b>

## **VISION AND MISSION OF INSTITUTE**

### **VISION**

**To become a renowned center of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities.**

### **MISSION**

- 1. Focus on evaluation of learning outcomes and motivate students to inculcate research Aptitude by project based learning.**
- 2. Identify, based on informed perception of Indian, Regional and global needs, areas of focus and provide platform to gain knowledge and solutions.**
- 3. Offer opportunities for interaction between academia and industry.**
- 4. Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.**

**JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE**  
**CIVIL ENGINEERING DEPARTMENT**

**VISION**

**To become a role model in the field of Civil Engineering for the sustainable development of the society.**

**MISSION**

- 1. To provide outcome base education.**
- 2. To create a learning environment conducive for achieving academic excellence.**
- 3. To prepare civil engineers for the society with high ethical values.**

## PROGRAMME OUTCOMES (PO)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering Fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society :** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability :** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

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**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

PEO1: Contribute to the development of civil engineering projects being undertaken by Govt. and private or any other sector companies.

PEO2: Pursue higher education and contribute to teaching, research and development of civil engineering and related field.

PEO3: Successful career as an entrepreneur in civil engineering industry.

**PROGRAM SPECIFIC OUTCOMES (PSOs):**

PSO1: Enhancing the employability skills by making the students capable of qualifying National level competitive examinations.

PSO 2: Inculcating in students technical competencies to deal with practical aspects of civil engineering.

PSO 3: Cognizance of social awareness and environmental necessity along with ethical responsibility to have a successful career and become an entrepreneur.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

II Year-IV Semester: B.Tech. (Civil Engineering)

### 4CE4-08: CONCRETE TECHNOLOGY

Credit: 3

Max. Marks: 150 (IA:30, ETE:120)

3L+0T+0P

End Term Exam: 3 Hours

SN	CONTENTS	Hrs.
1	<b>Introduction:</b> to objective, scope and outcome of the subject	1
2	<b>Ingredients of concrete:</b> Cement: hydration of cement and its basic compounds, structure of hydrated cement, C-S-H gel, heat of hydration, gel-space ratio etc.	2
3	<b>Aggregates:</b> types, physical properties and standard methods for their determination, including Grading of aggregates as per IS. Manufactured sand- properties and IS Specifications for use in concrete.	2
4	<b>Concrete:</b> Grade of concrete, proportioning of ingredients, water content and its quality, water/cement ratio and its role, Properties of fresh concrete including workability, air content, Flow ability, Segregation, Bleeding and Viscosity etc. Factors affecting, methods of determination.	4
5	Properties of hardened concrete such as strengths, permeability, creep, shrinkage, factors influencing, Standard tests on fresh and hardened concrete as per IS code. Aggregate- cement interface, its effect on properties of concrete.	4
6	<b>NDT:</b> Introduction and their importance. Application & use of Rebound Hammer, Ultra-sonic pulse velocity meter, Rebar & Cover meter, half-cell potential meter, corrosion resistivity meter, core sampling. Interpretation of their results,	4
7	<b>Concrete Handling in Field:</b> Batching, mixing, placing and transportation of concrete, equipments for material handling, various methods their suitability and precautions. Compaction of concrete: methods & equipments. Curing of concrete: various methods their suitability.	4
8	Durability of concrete. Causes of deterioration, Carbonation, Tests for durability assessment	3
9	<b>Admixture in concrete:</b> Chemical and mineral admixtures, their types and uses: accelerator, retarders, water-proofing, plasticisers, super plasticizers-types, their suitability. Fly ash-properties for use in concrete, specifications of flyash as per IS 3812, and effect on properties of concrete. GGBFS, Microsilica and metakaolin- propertie, specifications and utility in concrete.	7

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

### II Year-IV Semester: B.Tech. (Civil Engineering)

10	Concrete mix design (IS method)- with and without water reducing admixtures	2
11	<b>Form work:</b> Requirements, their types. Typical formworks and shuttering/centering for Columns, beams, slabs, walls, etc. Slip and moving formwork.	3
12	<b>Special types of concrete:</b> Sulphate resisting concrete, under water concreting, pumpable concrete: methods and issues in making, salient properties and applications.	3
13	Concretes with tailored properties- including high performance concrete, with specific properties in fresh and hardened states, self-compacting concrete-materials, mix proportioning, test methods, use and applications with case studies.	3
<b>TOTAL</b>		<b>42</b>

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## COURSE OUTCOMES

### 4CE4-08 CONCRETE TECHNOLOGY

1. Students will be able to understand various concrete ingredients along with their properties.
2. Students will be able to apply concrete handling and the NDT process in the field.
3. Students will be able to use admixtures in concrete and form work in structural element.
4. Students will be able to mix design of concrete and special concrete.

Subject Code	COs	Program Outcomes (POs)											
		PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
4CE4-08	CO-1	2	--	1	--	--	3	3	1	--	--	1	2
	CO-2	1	2	3	2	3	2	1	1	2	--	--	2
	CO-3	2	1	2	2	3	2	2	2	1	--	1	2
	CO-4	1	2	3	--	--	2	2	2	3	--	1	3

Subject Code	COs	Program Specific Outcomes (PSOs)		
		PSO-1	PSO-2	PSO-3
4CE4-08	CO-1	2	1	2
	CO-2	1	3	2
	CO-3	3	3	1
	CO-4	3	3	1



**JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE, JAIPUR**  
**DEPARTMENT OF CIVIL ENGINEERING**

Lecture Plan						
<b>Subject name: Concrete Technology</b> <b>Subject Code: 4CE4-08</b> <b>Year: II<sup>nd</sup></b> <b>Semester: IV<sup>th</sup></b>		<b>POs</b> <b>PO1; PO2;</b> <b>PO3;PO4;PO6;PO7;</b> <b>PO8;PO9;PO11;</b> <b>PO12</b>		<b>COs</b> CO1:- Students will be able to understand various concrete ingredients along with their properties. CO2:- Students will be able to apply concrete handling and the NDT process in the field. CO3:- Students will be able to analyze concrete admixtures and handling processes. CO4:- Students will be able to design form work and special concrete.		
S. No.	Lecture No.	Topic discussed to be	COs	Objective of Unit	Outcome of Lecture and CO	From page to
					Students are able to:-	
I	1	Introduction: Objective, scope and outcome of the course.	NA	To aware of outcome based education	To aware of outcome based education	NA
II	2	Understanding concrete ingredients	CO1	Understanding various concrete ingredients along with their properties	Understand concrete ingredients	T1 (66-68)
	3	Understanding concrete properties.	CO1		Understand concrete properties	T1 (69-81)
	4	Physical Properties of aggregates	CO1		Understand Physical Properties of aggregates	T3(40-43)
	5	Mechanical properties of aggregates	CO1		Understand Mechanical properties of aggregates	T3(46-55)
	6	Grade of Concrete	CO1		Understand Grade of Concrete	T1(298-306)

	7	Water Cement Ratio	CO1		Understand Water Cement Ratio	T3(115-119)
	8	Properties of fresh concrete	CO1		Understand Properties of fresh concrete	T2(124-137)
	9	Factors affecting concrete	CO1		Understand Factors affecting concrete	T3(77-79)
	10	Properties of hardened concrete	CO1		Understand Properties of hardened concrete	T3(94-100)
	11	Standard tests on hardened concrete	CO1		Understand Standard tests on hardened concrete	T1(311-315)
	12	cement interface	CO1		Understand cement interface	T1(316-317)
	13	cement interface effect on properties of concrete	CO1		Understand cement interface effect on properties of concrete	T1(317-322)
	14	Concrete Handling Batching, mixing,	CO2		Understanding to apply concrete handling and the NDT process in the field.	Understand Concrete Handling Batching, mixing,
	15	Placing and transportation of concrete	CO2	Understand placing and transportation of concrete		T3(125-127)
	16	Equipment's for material handling	CO2	Understand equipment's for material handling		T1(247-250)
	17	Compaction of concrete	CO2	Understand Compaction of concrete		T3(131-138)
	18	Introduction and importance NDT	CO2	Understand Introduction and importance NDT		T1(437-438)

	19	Application & use of NDT	CO2		Understand Application & use of NDT	T1(439)
	20	Rebound Hammer, Ultra-sonic pulse velocity meter	CO2		Understand Rebound Hammer, Ultra-sonic pulse velocity meter	T1(439-447)
	21	Interpretation of their results	CO2		Understand Interpretation of their results	T1(452-453)
	22	Durability of concrete	CO2		Understand Durability of concrete	T1(352-353)
	23	Causes of deterioration	CO2		Understand Causes of deterioration	T1(354-361)
	24	Tests for durability assessment	CO2		Understand Tests for durability assessment	T1(398-400)
	25	Chemical Admixture	CO3		Understanding use admixtures in concrete and form work in structural element.	Understand Chemical Admixture
	26	Mineral admixtures	CO3	Understand mineral admixtures		T1(174-176)
	27	Admixtures types and uses	CO3	Understand admixtures types and uses		T1(128-131)
	28	GGBFS effect on properties of concrete	CO3	Understand GGBFS effect on properties of concrete		T1(189-191)
	29	Specifications of fly ash	CO3	Understand specifications of fly ash		T1(176-182)
	30	Microsilica and metakaolin	CO3	Understand Microsilica and metakaolin		T1(184-188)
	31	Admixture specifications and utility in concrete	CO3	Understand Admixture specifications and utility in concrete		T1(129-131)
	32	Requirements Form work	CO3	Understand Requirements Form work		T4(2-3)

	33	Types formworks	CO3		Understand Types formworks	T5(7-10)	
	34	Typical formworks	CO3		Understand Typical formworks	T5(15-20)	
	35	Concrete mix deign	CO4	Understanding mix design of concrete and special concrete.	Understand Concrete mix deign	T1(459-461)	
	36	Concrete mix with and without water reducing admixtures	CO4		Understand Concrete mix with and without water reducing admixtures	T1(489-499)	
	37	Sulphate resisting concrete	CO4		Understand Sulphate resisting concrete	T1(526-528)	
	38	Under water concreting	CO4		Understand under water concreting	T1(262-264)	
	39	Methods and issues in making concrete	CO4		Understand methods and issues in making concrete	T1(242-247)	
	40	High performance concrete	CO4		Understand High performance concrete	T3(408-409)	
	41	Self-Compacting Concrete materials	CO4		Understand Self-Compacting Concrete materials	T1(572-576)	
	42	Test methods for SCC	CO4		Understand test methods for SCC	T1(577-588)	
	<b>Reference books:</b>				<p><b>T1:</b> CONCRETE TECHNOLOGY by M.S. Shetty, Sixth Edition</p> <p><b>T2:</b> CONCRETE TECHNOLOGY by M L Gambhir, Third Edition</p> <p><b>T3:</b> CONCRETE TECHNOLOGY by A.M. Neville, J.J. Brooks Second Edition</p> <p><b>T4:</b> Formwork for Concrete Structures by R. L. Peurifoy, Fourth Edition</p> <p><b>IS Code:</b> 10262:2009, 10262:2019, 456:2000</p>		

## **Content beyond syllabus**

### 1. Light weight concrete

Source: Concrete Technology, Second Edition A. M. Neville and J. J. Brooks

ISBN: 9780-273-73219-8 Page no. 339 – 355.

### 2. Factors Contributing to Cracks in Concrete

Source: Concrete Technology, M.S. Shetty

ISBN: 978-812-190-003-4 Page no. 361 – 370.