GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering
Level: PG
Branch: Civil Engineering(65)
Course / Subject Code: ME01065091
Subject Name :Advance Concrete Materials and Technology

w. e. f. Academic Year:	2024-2025
Semester:	1st Semester
Category of the Course:	PEC

Prerequisite:	Concrete Technology
Rationale:	This course explores the advance materials of concrete, and attempts to bring about the understanding of concrete behavior from a fundamental perspective. The course discusses the structure, mix design and properties of concrete making various special concrete like fiber reinforced concrete, Light weight concrete high performance concrete, self-compacting concrete etc.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Classify the supplementing cement materials	R,U
02	Estimate Concrete mix design for specific purposes	N, C
03	Interpret and relate application of special concretes	U,A
04	Illustrate the sustainable concretes	U, E

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction:** Introduction of Recent advances in Concrete Technology, Concrete Structures in Special Environments, Concreting under Special Circumstances, Selection of material, Various concrete making materials, Sustainable Development concept	7	15
2.	**Supplementing Cement Materials (SCMs):** Concepts of various SCMs, Application and uses of various SCMs, Selections of SCMs, Fly ash, ground granulated blast furnaces slag and silica fume, Rice husk Ash, manufacture, physical characteristics, effects on properties of concretes. Chemical and Mineral Admixtures: Plasticizers, Super plasticizers, retarder, accelerators, Curing compounds and their effects on properties of concrete. Epoxy resins and screeds for rehabilitation – Properties and Applications	10	25
3.	**Concrete Mix Design:** Introduction, Review of methods and philosophies, Initial laboratory tests of concrete, mix design for special purposes, Ready Mixed Concrete -Types of plant, truck mixer efficiency, effects of prolonged agitation, quality control: acceptance and compliance, Codal Provisions for concrete Mix Design- BIS, ACI, DoE.	9	20
4.	**Special Concretes:** Light weight concrete, High performance concrete, self-compacting concrete, fiber reinforced concrete, High density and radiation shielding concrete, High volume fly ash concrete, Self-healing Concrete, Ferrocement concrete, Pumped Concrete, Roller Compacted Concrete, polymer concrete	12	25
5.	**Sustainable Concrete:** Sustainable concrete materials, Green Concrete, Geo Polymer Concrete,Recycled concrete, Energy Efficiency of sustainable Concrete, Healthassessment of concrete	7	15
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**20**	**20**	**20**	**10**	**10**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Advanced Concrete Technology by John Newman and Ban SengChoo.
2. Concrete Microstructure, Properties and material by P. Kumar Mehta & Paulo J M Monteiro.
3. Concrete Technology by A.R. Santhakumar, IIT Madras
4. Concrete Technology by Gambhir M. L.
5. Concrete Technology by Shetty M. S.
6. Design of Concrete Mixes by Krishna Raju.
7. Progress in cement and concrete in series by S N Ghosh
8. Properties of Concrete by Neville A. M.

(b) Open source software and website:

1. NPTEL lecture series
2. MIT open source materia

Suggested Course Practical List: If any

1. Study on water / cement ration on workability
2. Study on water / cement ratio on strength of concrete
3. Study and evaluate the effect of admixtures on workability and strength properties of concrete
4. Design a concrete mix using supplementing cement materials for special concrete (select any one special concrete)
5. Nondestructive testing – impact hammer test , UPV test

Minimum 5 assignment questions from above topics including concrete mix design for special concretes

List of Laboratory/Learning Resources Required:

CTM, UTM

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