

RCPIT B Tech Civil Honours Track Structural Engineering (AY- 2026-27)

S. No.	Semester	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
				L	T	P	Continuous Assessment				ESE		
							TA	Term Test 1 (TT1)	Term Test 2 (TT2)	Average of (TT1 & TT2)			
						[A]			[B]	[C]	[A+B+C]		
1	IV	RCP23VH1251	Advanced Concrete Technology	3		-	25	15	15	15	60	100	3
	IV	RCP23VH1251L	Advanced Concrete Technology Lab			2	25	-	-	-	25	50	1
2	V	RCP23VH1301	Modern formwork System	3	1	-	25	15	15	15	60	100	4
3	VI	RCP23VH1601	Advanced Design of Concrete Structure	3	1	-	25	15	15	15	60	100	4
4	VI	RCP23VH1601L	Advanced Design of Concrete Structure Lab		-	2	25				25	50	1
5	VII	RCP23VH1701	Earthquake Analysis and Design of Structures	3	1		25	15	15	15	60	100	4
6	VII	RCP23VH1701L	Earthquake Analysis and Design of Structures Lab			2	25	-	-	-	25	50	1
Total				12	3	6	175	60	60	60	315	550	18

Prepared by

Checked by

BOS Chairman

Dean Academic/Dy. Director

C.O.E

Director



Program: Honors Track (Structural Engineering)	SY B Tech	Semester: IV
Advanced Concrete Technology (RCP23VH1251)		
Advanced Concrete Technology Laboratory (RCP23VH1251L)		

Pre-requisite

- 1) Concrete Technology

Course Objectives:

- 1) Understand and evaluate the properties and performance of advanced cementitious materials, sustainable materials, and nanomaterials used in concrete.
- 2) Analyze and compare the behavior and applications of high-performance and special concretes such as HPC, SCC, FRC, and UHPC.
- 3) Apply advanced mix design principles and quality control techniques for high-grade concrete as per relevant IS codes.
- 4) Explore and interpret the role of smart materials, structural health monitoring (SHM), and emerging technologies in enhancing durability and performance of concrete structures

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the characteristics and applications of advanced cementitious materials, recycled materials, and nanomaterials in sustainable concrete	2	Understand
CO2	Analyze the properties, behavior, and field applications of high-performance and special concretes such as HPC, SCC, FRC, and UHPC.	4	Analyze
CO3	Design high-grade concrete mixes (M40–M100) using IS 10262:2019 and evaluate their performance through appropriate quality control measures.	3	Apply
CO4	Analyze the effectiveness of smart materials, nanotechnology, and structural health monitoring techniques in improving durability and service life of structures.	4	Analyze

Course Contents

Unit-I Advanced Cementitious & Sustainable Materials 06 Hrs.

Mineral admixtures: Fly ash, GGBS, silica fume, metakaolin properties and effects. Supplementary cementitious materials (SCMs) and blended cements, Use of recycled aggregates in concrete. Carbon footprint reduction and sustainable concrete practices. The role of Nano-materials in concrete.

Unit-II High Performance & Special Concretes 06 Hrs.

High Performance Concrete (HPC) characteristics and applications .Self Compacting Concrete (SCC): mix design and tests (slump flow, L-box, V-funnel) Fiber Reinforced Concrete (FRC): types and applications Ultra High Performance Concrete (UHPC) and geopolymer concrete High strength and high durability concrete. Applications in modern infrastructure.

Unit-III Advanced Mix Design & Quality Control 08 Hrs.

Mix design for high-grade concrete (M40–M100) as per IS 10262:2019. Rheology of fresh concrete Quality control in production (batching, mixing, and transportation) Equipment's used in concrete RMC Plant, Transits mixer, Needle vibrator, tower crane, Concrete paver , concrete pump Case studies of construction site.

Unit-IV Smart Concrete & Structural Health Monitoring 08 Hrs.

Smart materials in concrete: self-healing concrete, Nano-concrete Use of nanomaterials (Nano-silica, carbon nanotubes) Embedded sensors in concrete (fibre optic, piezoelectric sensors) Structural Health Monitoring (SHM) concepts and applications. Crack detection and durability monitoring techniques IoT and AI applications in smart infrastructure Future trends in concrete technology

Text books:

1. M.S. Shetty & A.K. Jain, Concrete Technology: Theory and Practice, S. Chand Publishing, 8th Edition, 2022, (ISBN-9789352533801)
2. M.L. Gambhir, Concrete Technology: Theory and Practice, McGraw Hill Education (India), 5th Edition, 2017, (ISBN-9781259062554/978-1-259-06255-4).
3. A.M. Neville, Properties of Concrete, Pearson Education, 6th Edition, 2019, (ISBN-9780273755807/978-0-273-75580-7).
4. John Newman, Ban Seng Choo & Philip Owens, Advanced Concrete Technology, Wiley-Blackwell, 2nd Edition, 2021, (ISBN-9781119806219/978-1-119-80621-9).
5. A.M. Neville & J.J. Brooks, Concrete Technology, Pearson Education, 2nd Edition, 2020, (ISBN-9780273732198/978-0-273-73219-8)

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1. A.M. Neville, Properties of Concrete, Pearson Education, 6th Edition, 2019, (ISBN-9780273755807/978-0-273-75580-7).
2. John Newman, Ban Seng Choo & Philip Owens, Advanced Concrete Technology, Wiley-Blackwell, 2nd Edition, 2021, (ISBN-9781119806219/978-1-119-80621-9).
3. P. Kumar Mehta & Paulo J.M. Monteiro, Concrete: Microstructure, Properties and Materials, McGraw Hill, 4th Edition, 2023, (ISBN-9781264258789/978-1-264-25878-9).
4. Gert De Schutter (Editor), Modern Concrete Technology Series - Sustainable Concrete, CRC Press/Taylor & Francis, 1st Edition, 2018, (ISBN-9781138745523/978-1-138-74552-3).

Concrete Technology Laboratory (RCP23VH1251L)

List of Experiments

Term work shall consist of performing minimum five experimental sets from the list below.

- 1) Evaluation of Properties of Concrete with Mineral Admixtures (Fly Ash, GGBS, Silica Fume, Metakaolin) (any one of given material)
- 2) Design and Testing of High-Performance Concrete mix design as per IS 10262:2019
- 3) Determination of Workability of SCC using Slump Flow, L-Box, V-Funnel Tests.
- 4) Study of Fiber Reinforced Concrete (FRC)
- 5) Mix Design Using Recycled Aggregates.
- 6) Study of Ready-Mix Concrete (RMC) Plant Operations.
- 7) Non-Destructive Testing (NDT) of Concrete
- 8) Structural Health Monitoring (SHM) / Smart Concrete Applications.

Program: Honors Track (Structural Engineering)	TY B Tech	Semester: V
Modern Formwork system (RCP23VH1301)		

Course Objectives

- To understand the fundamentals and types of formwork systems used in construction.
- To learn the design principles and selection of modern formwork systems for different structural elements.
- To develop the ability to apply safe, economical, and efficient formwork practices in construction projects.

Course Outcomes (COs)

CO No.	Course Outcome	Level
CO1	Explain the fundamentals, types, and safety requirements of formwork systems.	L2
CO2	Compare conventional and modern formwork systems for different applications.	L4
CO3	Analyze formwork loads and perform basic formwork design calculations.	L4
CO4	Apply suitable formwork systems for various structural elements.	L3

Course Contents

UNIT I: Fundamentals of Formwork Systems (8 Hours)

Introduction to formwork, fundamentals, classification, functions, requirements, selection criteria, materials, accessories, and safety requirements of modern formwork systems used in concrete construction. Design principles, planning considerations, and relevant Indian Standard (IS) Codes as per the material for the safe, economical, and efficient design of formwork systems

UNIT II: Conventional and Modern Formwork Systems (9 Hours)

Study the importance of conventional formwork characteristics, advantages, limitations of different formwork like steel formwork, aluminium formwork (MIVAN Technology), plastic formwork, modular formwork systems, table (flying) formwork, and tunnel formwork. Compare different formwork systems based on structural performance, construction efficiency, economy, durability, reusability, safety, and suitability for various construction projects.

UNIT III: Formwork Design Concepts

Study the fundamental principles of formwork design, including design criteria, design philosophy, and the factors influencing the selection and design of formwork systems.

To analyze the various loads acting on formwork and apply basic design principles to ensure strength, stability, safety, and serviceability of temporary structures. Solve numerical problems related to the design of beam, slab, column, and wall formwork.

UNIT IV: Formwork Systems for Different Structural Elements

Formwork different element, stripping time of structures for Foundations, column, Beam, slab, Special structure, Bridge pier, slab, Retaining wall, formwork for multistore building, slip formwork vertical structures such as silos, chimneys, towers draw typical cross sections showing components parts of formwork.

UNIT V: Formwork Failure and safety

Causes of Formwork Failure, Common Deficiencies in Design Leading to Formwork Failure, Case Studies in Formwork Failure, Precautions to be taken during casting Formwork Failure Recommendations on Safe Practices, Suggested Checklists for formwork.

Reference Books:

1. Duggal, S. K. (2023). *Modern formwork technology and temporary structures*. McGraw Hill Education.
2. Jain, A. K., Jain, A. K., & Punmia, B. C. (2022). *Building construction* (11th ed.). Laxmi Publications.
3. Kumar, S. (2021). *Building construction* (20th ed.). Standard Publishers Distributors.
4. Shetty, M. S., & Jain, A. K. (2022). *Concrete technology: Theory and practice* (9th ed.). S. Chand & Company Ltd.
5. Subramanian, N. (2023). *Design of concrete structures* (2nd ed.). Oxford University Press. Standards.