

<p align="center">Course Title: Concrete Technology [As per Choice Based Credit System (CBCS) scheme] SEMESTER – IV</p>			
Subject Code	15CV44	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<p align="center">CREDITS – 04</p>			
<p>Course objectives: This course will enable students to:</p> <ol style="list-style-type: none"> 1. Recognize the importance of material characteristics and their contributions to strength development in Concrete 2. Proportion ingredients of Concrete to arrive at most desirable mechanical properties of Concrete. 3. Ascertain and measure engineering properties of concrete in fresh and hardened state which meet the requirement of real time structures. 			
<p align="center">Contents</p>		<p align="center">Teaching Hours</p>	<p align="center">Revised Bloom's Taxonomy (RBT) Level</p>
<p>Module-1: Concrete Ingredients</p>			
<p>Cement – Cement manufacturing process, steps to reduce carbon footprint, chemical composition and their importance, hydration of cement, types of cement. Testing of cement. Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing. Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, requirement. Recycled aggregates Water – qualities of water. Chemical admixtures – plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures – Pozzolanic and cementitious materials, Fly ash, GGBS, silica fumes, Metakaolin and rice husk ash.</p>		<p align="center">10 Hours</p>	<p align="center">L1, L2, L3</p>
<p>Module -2: Fresh Concrete</p>			
<p>Workability–factors affecting workability. Measurement of workability–slump, Compaction factor and Vee-Bee Consistometer tests, flow tests. Segregation and bleeding. Process of manufacturing of concrete- Batching, Mixing, Transporting, Placing and Compaction. Curing – Methods of curing – Water curing, membrane curing, steam curing, accelerated curing, self-curing. Good and Bad practices of making and using fresh concrete and Effect of heat of hydration during mass concreting at project sites.</p>		<p align="center">10 Hours</p>	<p align="center">L1, L2, L3</p>
<p>Module -3: Hardened Concrete</p>			
<p>Factors influencing strength, W/C ratio, gel/space ratio, Maturity concept, Testing of hardened concrete, Creep –factors affecting creep. Shrinkage of concrete – plastic shrinking and drying shrinkage, Factors affecting shrinkage. Definition and significance of durability. Internal and external factors influencing durability, Mechanisms- Sulphate attack – chloride attack, carbonation, freezing and thawing. Corrosion, Durability requirements as per</p>		<p align="center">10 Hours</p>	<p align="center">L1, L2, L3</p>

IS-456, Insitu testing of concrete- Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications and limitations.		
Module -4: Concrete Mix Proportioning		
Concept of Mix Design with and without admixtures, variables in proportioning and Exposure conditions, Selection criteria of ingredients used for mix design, Procedure of mix proportioning. Numerical Examples of Mix Proportioning using IS-10262	10 Hours	L1, L2, L3, L4
Module -5: Special Concretes		
RMC- manufacture and requirement as per QCI-RMCPCS, properties, advantages and disadvantages. Self-Compacting concrete- concept, materials, tests, properties, application and typical mix Fiber reinforced concrete - Fibers types, properties, application of FRC. Light weight concrete-material properties and types. Typical light weight concrete mix and applications	10 hours	L1, L2, L3, L4
<p>Course Outcomes: After studying this course, students will be able to:</p> <p>CO1: Relate material characteristics and their influence on microstructure of concrete. (L2,L3)(PO1)</p> <p>CO 2: Distinguish concrete behaviour based on its fresh and hardened properties. [L2, L4] (PO1, PO2)</p> <p>CO 3: Illustrate proportioning of different types of concrete mixes for required fresh and hardened properties using professional codes. [L3] (PO1, PO2, PO3)</p>		
<p>Program Objectives (as per NBA):</p> <ul style="list-style-type: none"> • Engineering Knowledge (PO1) • Problem Analysis (PO2) • Design / development of solutions (PO3) 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have ten questions. • Each full question consists of 16 marks. • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Neville A.M. “Properties of Concrete”-4th Ed., Longman. 2. M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi. 3. Kumar Mehta. P and Paulo J.M. Monteiro “Concrete-Microstructure, Property and Materials”, 4th Edition, McGraw Hill Education, 2014 4. A.R. Santha Kumar, “Concrete Technology”, Oxford University Press, New Delhi (New Edition) 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. M L Gambir, “Concrete Technology”, McGraw Hill Education, 2014. 2. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81-8487-186-9 3. Job Thomas, “Concrete Technology”, CENGAGE Learning, 2015 4. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement and Concrete] 		

5. Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete-BMTPC
6. Specification and Guidelines for Self-Compacting Concrete, EFNARC, Association House