Course Syllabus
Gyanmanjari Institute of Technology
Semester-5

Subject: Concrete Technology - BETCV15315
Type of Course: Professional Core
Prerequisite: Knowledge of Building Construction and Material

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	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activity

Course Content:

Sr. No	Course content	Hrs.	% Weightage
1	**Basic of concrete Technology:** Historic development, Composition of concrete, Advantages of concrete over other materials, Advances and future trends in concrete, Overview of Sustainability and Concrete development. **Ingredients of Concrete: 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,	12	25

	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		
2	**Fresh Concrete & Hardened Concrete:** 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 concrete. Curing & various methods of curing. Strengths of hardened concrete (Tensile & Compressive strength, Flexural & Bond strength), standard test methods as per IS and ASTM, Failure mechanism under compression & tension, Stress-strain behaviour of concrete, Overview of Modulus of elasticity, Dimensional stability –Creep & Shrinkage	10	25
3	**Durability & Permeability of concrete:** Causes of deterioration in concrete and durability problems, Factors affecting durability, Transport mechanism of gases & fluids in concrete, Cracking & causes of cracking, Carbonation induced & corrosion induced cracking, Alkali-aggregate reaction, Degradation by freeze & thaw, Sulphate attack, Durability under sea-water (marine environment). **Mix design of Concrete:** 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.	10	20
4	**Special concrete and Concreting methods:** High strength concrete, High performance concrete, Fiber reinforced concrete, Polymer modified concrete, Self-compacting concrete, Light weight concrete, Light-weight & heavy weight concrete, High volume fly ash concrete. **Special concreting methods:** Pumped concrete, Ready mix concrete, Under-water concreting, Hot & cold weather concreting, Precast concrete, Pre-placed concrete	07	15
5	**Miscellaneous Topics:** Non-Destructive testing of concrete – Introduction to Destructive, semi-destructive & Non-destructive	06	15

	testing methodology, Problems faced during Non-destructive evaluation, Test methods like Rebound Hammer test, Ultra-sonic pulse velocity, Penetration tests, Pull out tests. 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.		
	Total	**45**	**100**

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Prepare the Chart:** The faculty will assign the preparation of a chart on the classification of aggregates to a group of two students, who will then upload it on the GMIU Web Portal.	10
2	**Make spreadsheet of Mix Design of Concrete:** Faculty will assign the preparation of Mix design excel sheet to a group of two students with use of various method of mix design. And upload on GMIU Web Portal.	10
3	**Filed visit of RMC plant** The faculty will arrange a field visit to an RMC plant. After the visit, students will prepare a detailed report, including the plant layout, and upload it on the GMIU Web Portal.	10
Total		**30**

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	30%	20%	10%	-	10%

Course Outcome:

After learning the course, the students should be able to:	
CO1	Identify the important ingredients of concrete and its role in influencing the behavior of concrete under different environment conditions
CO2	Infer the results of the various experiments related to different ingredients of concrete, fresh concrete & hardened concrete
CO3	Apply the concepts of Mix design to produce the concrete of adequate strength and durability
CO4	Choose the correct type of concrete and concreting technology required for particular exposure and site condition.
CO5	Describe the underlying principle and interpretation of different types of the non-destructive & semi destructive testing methods.

List of Practical: -

Sr. No	Descriptions	Unit No	Hrs.
1	Determine the Fineness of Cement	1	2
2	Determine the Standard Consistency of Cement	1	
3	Determine the Initial and Final Setting Time of Cement	1	2
4	Determine the Soundness of Cement	1	
5	Determine the Compressive Strength of Cement	1	2
6	Determine the Impact Value of Aggregate	1	2
7	Determine the Crushing Value of Aggregate	1	2
8	Determine the Abrasion Value of Aggregate	1	2
9	Determine the Water Absorption of Aggregate	1	2
10	Determine the Flakiness and Elongation Index of Aggregate	1	2
11	Determine the Fineness Modulus of Fine and Course Aggregate	1	2
12	Determine the Slump Value of Fresh Concrete	2	2
13	Determine the Compaction Value of Fresh Concrete	2	
14	To perform Flow Test of Fresh Concrete	2	2
15	To perform Vee-bee Consistency of Fresh Concrete	2	2
16	Determine the Compressive Strength of Harden Concrete by Compression Test	2	2

17	Determine the Compressive Strength of Harden Concrete by Split Cylinder Test	2	2
18	Determine the Compressive Strength of Harden Concrete by Rebound Hammer Test	5	2
Total			**30**

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
From the content 10% topics are suggested for flipped mode instruction.
Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory
The internal evaluation will be done on the basis of Active Learning Assignment
Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
Design based Problems (DP)/Open Ended Problem:

Reference Books & Code Provisions:

[1] Concrete Technology, M S Shetty, S Chand & Company Ltd.
[2] Concrete Technology, M L Gambhir; 5th Edition, McGraw Hill
[3] Properties of Concrete, A.M. Neville; 5th Edition, pearson.