

COURSE TITLE : CONCRETE TECHNOLOGY

COURSE CODE : 6015

COURSE CATEGORY : E

PERIODS/WEEK : 4

PERIODS/SEMESTER : 60

CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Study of ingredients of concrete	15
2	Properties of concrete and its ingredients, field tests	15
3	Properties and mix design	15
4	Special concrete and defects in concrete	15
Total		60

COURSE OUTCOME

Sl.	Sub	Student will be able to
1	1	Comprehend the properties of concrete ingredients.
	2	Know the different types of cement for different fields' applications.
	3	Design economic mix proportion for different exposure conditions and intended purposes as per the standards
2	1	Understand the properties of fresh and hardened concrete
	2	To understand the field and laboratory tests on concrete in plastic and hardened stage.
	3	Use different types of admixtures to improve the properties of concrete for different
3	1	Understand the field applications of different types of concrete
	2	Know the standard values of the properties of concrete
	3	Understand the defects in concrete

SPECIFIC OUTCOME

MODULE – I

1.1.0 Understand the ingredients of concrete and their basic properties.

- 1.1.1 State the importance of concrete as a versatile building material
- 1.1.2 Identify the ingredients of concrete
- 1.1.3 Explain the functions of cement in concrete.
- 1.1.4 Classify different types of cement
- 1.1.5 Explain the methods of storing cement
- 1.1.6 Explain the chemistry of hydration of cement
- 1.1.7 Explain the field tests for cement
- 1.1.8 Illustrate various lab tests of cement.
- 1.1.9 Explain the Hydration process of cement
- 1.1.10 Explain the test procedures for properties of aggregate as per BIS standard.
- 1.1.11 State the quality of water used for concreting.
- 1.1.12 Explain the term water-cement ratio and its importance.
- 1.1.13 Identify additive and admixtures suitable for various purposes and explain their properties.

MODULE – II

2.1.0 Comprehend the properties of wet and hardened concrete

- 2.1.1 Explain workability, resistance to segregation and bleeding in concrete.
- 2.1.2 Identify the factors affecting consistency and workability.
- 2.1.3 Identify factors causing segregation and bleeding and effects due to that.
- 2.1.4 Describe the procedure of various tests for measurement of workability.
- 2.1.5 Differentiate between batching and mixing.
- 2.1.6 Explain various methods of batching, mixing, transporting, placing, compacting and finishing.
- 2.1.7 Explain the importance of curing of concrete and methods of curing.
- 2.1.8 State the important properties of hardened concrete.
- 2.1.9 Identify the factors influencing the strength of concrete – Compressive strength – Flexural strength – Tensile strength
- 2.1.10 Explain the Stress-strain characteristics of concrete
- 2.1.11 State different modulus of elasticity of concrete
- 2.1.12 Differentiate between modular ratio and Poisson's ratio
- 2.1.13 Differentiate between creep & shrinkage, identify their cause and effect.
- 2.1.14 Explain the properties stiffness, ductility, fatigue and impact resistance of concrete.
- 2.1.15 Explain the bond strength in concrete and the factors affecting that.
- 2.1.16 Explain testing of properties of hardened concrete such as compressive strength, flexural strength, split tensile strength and modulus of elasticity.

MODULE – III

3.1.0 Comprehend the concrete mix design process.

- 3.1.1 Explain the basic principles of mix design.
- 3.1.2 Identify the variable parameters in mix design.

- 3.1.3 List various methods of mix design.
- 3.1.4 Define the common terminologies used in mix design.
- 3.1.5 Design a concrete mix as per IS-10262-2009

MODULE – IV

4.1.0 Know Special Concrete and their uses

- 4.1.1 List different types of special concrete used for specific applications.

4.2.0 Understand the problems in concreting under special condition

- 4.2.1 Identify the situations where special care has to be taken while concreting.
- 4.2.2 Explain the methods of concreting under water and underground.
- 4.2.3 Explain the precautions to be taken while concreting in extremely cold and hot weather.
- 4.2.4 State the precautions to be taken in mass concreting and concreting in marine environment.

4.3.0 Understand the factors affecting durability of concrete.

- 4.3.1 List the factors affecting the durability of concrete.
- 4.3.2 Find out the causes for permeability, Freezing & Thawing, Sulphate attack, Carbonation, Creep & Shrinkage, Corrosion of reinforcement.
- 4.3.3 Identify the problems due to permeability, Freezing & Thawing, Sulphate attack, Carbonation, Creep & Shrinkage, Corrosion of reinforcement in concrete.
- 4.3.4 Explain the remedial measures for permeability, Freezing & Thawing, Sulphate attack, Carbonation, Creep & Shrinkage, Corrosion of reinforcement in concrete.

COURSE CONTENT

MODULE – I

Ingredients of concrete-Importance of concrete – Ingredients of cement concrete and their functions – Relevant IS – standards .Cement, chemical composition, Types, Storage, Chemistry of Hydration - Testing of cement – field test, fineness tests, consistency test, setting time, soundness test, strength test- Grade of cement - Heat of hydration.

Aggregates: – Functions - Classification - Alternate materials for fine and coarse aggregate – Aggregates Size & shape-Texture-Tests for aggregate crushing strength, Impact test – abrasion tests (Dovel & Los Ageless abrasion tests) - Flakiness index - Elongation index - Gradation- Fineness modulus -Unit weight-Specific gravity - Bulking of fine aggregate- Moisture content - Alkali-aggregate reaction.

Water- Quality of water – water cement ratio – Effect of water-cement ratio.

Additive and admixtures:– Chemical and mineral admixtures - Accelerators- Retarders, Supper plasticizers- Air entraining agents - Water proofing agents - Their properties and effect.

MODULE - II

Properties of Concrete: - Properties of fresh concrete - Workability of concrete – Factors affecting workability –Measurement of workability – Tests for workability - Slump test- Compaction factor test- Vee - Bee test -consistency – Segregation - bleeding – Batching and Mixing, transporting, placing,

compacting and finishing of concrete by various methods. Curing of concrete - need and effect of curing- different methods of curing.

Properties of concrete in the hardened state: – Strength – Compressive strength and flexural strength - Factors affecting strength of concrete – Stiffness –Poisson’s ratio – Ductility – Fatigue – Impact - Elasticity – Modular ratio & Poisson’s ratio - Creep & Shrinkage – Bond strength-Durability (Definition, cause and effect of these parameters)

Testing of Hardened Concrete: – Compression test (cube & cylinder) – Comparison between cube and cylinder strength–Flexural strength test - Split tensile strength test – Modulus of Elasticity – (Tangent, Secant and Chord modulus).

MODULE – III

Concrete Mix Design:- Principles of Mix proportioning - Variables in proportioning – List the Methods of proportioning - Definition of terminology- Mean strength, variance, standard deviation and co-efficient of variation. Target strength – Relationship between target strength and mean strength - Concrete mix design based on IS 10262 – 2009.

MODULE – IV

Special concrete and concreting under special condition:- Special Concrete – classifications – Light weight concrete – Air entrained concrete - High Strength concrete- High performance concrete-differentiate HSC and HPC – Polymer concrete - Geo Polymer concrete-Steel fiber reinforced - Sulphur concrete – Self compacting concrete – No-fines concrete – Pre-packed concrete – Guniting or shotcreting . (Brief description and their applications only).

Concreting under special condition: - Underground & Under water concreting – Concreting in cold and hot weather – Mass concreting – Concreting in marine environment (Methods and precautions under each situation)

Common defects in concrete: - Permeability - Freezing and Thawing – Sulphate attack– Carbonation – Creep & Shrinkage – Leaching - Corrosion of reinforcement (Causes, problems, remedial measures or repairs in each case).

REFERENCES:

- | | | |
|-----------------------------|-----------------------|---------------------------|
| 1) M.S.Shetty | : Concrete Technology | ; S.Chand& Company |
| 2) A.R. Santhakumar | : Concrete Technology | ; Oxford University press |
| 3) A.M.Neville & J.J.Brooks | : Concrete Technology | ; Pearson |
| 4) L.M Gambir | : Concrete Technology | ; Tata Mc Graw Hill |
| 5) Krishnaswamy | : Concrete Technology | ; PHI Publication |