THEORY AND APPLICATIONS OF CEMENT COMPOSITES

I Semester: ST								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BSTC04	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	30	70	100
Contact Classes: 45	**Total Tutorials: Nil**	**Total Practical Classes: Nil**				**Total Classes: 45**		

I. COURSE OVERVIEW:

Concrete as one of the conventional composite material is invariably one of the most robust and versatile material. It performs extremely well under compression, however high strength concrete tends to be brittle. Concrete these days is modified in order to enhance its capacity for long term performance under harsh environmental & structural loads. Cement and concrete composites have made this possible. These composites comprise of binder or a matrix that binds together different types of fibers or fragments as per the requirements. The final product in form of composite is light, strong, flexible and more efficient in comparison to conventional composite i.e. concrete.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The Formulation of constitutive behaviour of composite materials: Ferro cement, SIFCON and Fibre Reinforced Concrete by understanding their strain- stress behavior.
II. The concept of Estimating strain constants using theories applicable to composite materials.
III. The analysis and design of structural elements made of cement composites.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Explain the stress-strain and characteristics of Characteristics of Composite Materials	Understand
CO 2	Formulate the constitutive behaviour of various composite materials.	Create
CO 3	Classify the materials based on orthotropic and anisotropic behaviour.	Understand
CO 4	Estimate elastic constants using theories applicable to composite materials.	Evaluate
CO 5	Analyse the structural elements made of cement composites as ferrocement, SIFCON and fibre reinforced concrete.	Analyze
CO 6	Design structural elements made of cement composites as ferrocement, SIFCON and fibre reinforced concrete.	create

IV. SYLLABUS:

MODULE-I: INTRODUCTION (09)

Classification and Characteristics of Composite Materials: Basic Terminology, Advantages. Stress-Strain Relations, Orthotropic and Anisotropic Materials, Engineering Constants for Orthotropic Materials, Restrictions on Elastic Constants, Plane Stress Problem, Biaxial Strength, Theories for an Orthotropic Lamina.

MODULE-II: MECHANICAL BEHAVIOUR (09)

Mechanics of Materials Approach to Stiffness- Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness, Bounding Techniques of Elasticity, Exact Solutions, Elasticity

Solutions with Continuity, Halpin, Tsai Equations, Comparison of approaches to Stiffness.

MODULE-III: CEMENT COMPOSITES (09)

Types of Cement Composites, Terminology, Constituent Materials and their Properties, Composite Materials- Orthotropic and Anisotropic behavior.

Construction Techniques for Fibre Reinforced Concrete: Ferro cement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing

MODULE-IV: MECHANICAL PROPERTIES OF CEMENT COMPOSITES (09)

Behavior of Ferro cement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion

MODULE-V: APPLICATION OF CEMENT COMPOSITES (09)

FRC and Ferrocement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behaviour, Constitutive relationship, Elastic Constants.Analysis and Design of Cement Composite Structural Elements: Ferrocement, SIFCON and Fibre Reinforced Concrete.

V.TEXT BOOKS:

1. Jones R. M ," Mechanics of Composite Materials", Taylor and Francis,BSP Books, 2nd Edition, 1998.
2. Pama R. P, "Ferrocement – Theory and Applications", IFIC, 1980.

VI.REFERENCE BOOKS:

1. Pama R. P, "Ferrocement – Theory and Applications", IFIC, 1980.
2. Swamy R.N , "New Concrete Materials", Blackie, Academic and Professional, Chapman & Hall, 1st Edition, 1980.

VII. WEB REFERENCES:

1. http://nptel.ac.in/courses/101104010/

VIII. E-TEXT BOOKS:

1. http://nptel.ac.in/courses/105108124/pdf/Lecture_Notes/LNm11.pdf