## COURSE CONTENT

| COMPOSITE MATERIALS FOR AEROSPACE STRUCTURE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **III Semester: OE** | | | | | | | | |
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| BAEE32 | **Elective** | 3 | - | - | 3 | 40 | 60 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |
| **Prerequisite:** | | | | | | | | |

### I. COURSE OVERVIEW:

A course on composite materials typically covers the study of materials that are engineered from two or more constituent materials to obtain specific and enhanced properties. Composite materials are widely used in various industries, including aerospace, automotive, construction, and sports. The course provides students with a comprehensive understanding of the principles, properties, manufacturing processes, and applications of composite materials.

### II. COURSE OBJECTIVES:

**The students will try to learn:**

I. The types of composite materials
II. The various manufacturing process of composite materials
III. The various types of laminates used in composite materials

### III. COURSE OUTCOMES:

**After successful completion of the course, students will be able to:**

CO 1 Classify the various composite materials for their suitable section.
CO 2 Understand the basic concepts of composite material manufacturing methods for various applications.
CO 3 Understand the mechanical characteristics of composite materials for their characterization.
CO 4 Illustrate the various composite materials manufacturing process for their suitable selection.
CO 5 Classify the various types of laminates for their suitable selection in manufacturing composite materials.
CO 6 Understand the various joining methods of composite materials.

## IV. COURSE CONTENT:

**MODULE-I: INTRODUCTION (09)**
Definitions, Composites, Reinforcements and matrices, Types of reinforcements, Types of matrices, Types of composites, Carbon Fibre composites, Properties of composites in comparison with standard materials, Applications of metal, ceramic and polymer matrix composites.

**MODULE-II: MANUFACTURING METHODS (09)**
Hand and spray lay - up, injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs. Fibre/Matrix Interface, mechanical. Measurement of interface strength. Characterization of systems; carbon fibre/epoxy, glass fibre/polyester, etc.

**MODULE-III: MECHANICAL PROPERTIES -STIFFNESS AND STRENGTH (09)**
Geometrical aspects – volume and weight fraction. Unidirectional continuous fibre, discontinuous fibers, short fiber systems, woven reinforcements.

Mechanical Testing: Determination of stiffness and strengths of unidirectional composites; tension, compression, flexure and shear.

**MODULE-IV: LAMINATES (09)**
Plate Stiffness and Compliance, Assumptions, Strains, Stress Resultants, Plate Stiffness and Compliance, Computation of Stresses, Types of Laminates -, Symmetric Laminates, Antisymmetric Laminate, Balanced Laminate, Quasi-isotropic Laminates, Cross-ply Laminate, Angle ply Laminate. Orthotropic Laminate, Laminate Moduli, Hygrothermal Stresses.

**MODULE-V: JOINING METHODS AND FAILURE THEORIES (09)**
Joining –Advantages and disadvantages of adhesive and mechanically fastened joints. Typical bond strengths and test procedures.

## V. TEXT BOOKS:


1. Jones, R M, “Mechanics of Composite Materials”, Scripta Book Co.
2. Agarwal, B D and Broutman, J. D, “Analysis and Performance of Fiber Composites”, New York, John Willey and Sons, 1990


## VI. REFERENCE BOOKS:


1. Mallik, P. K, “Fiber Reinforced Composites: Materials, Manufacturing and Design”, New York-Marcel and Dekker, 1993.


## VII. ELECTRONICS RESOURCES:

1. http://memberfiles.freewebs.com/94/47/55224794/documents/airport%20planning%20and%20management.pdf
2. https://books.google.co.in/books?id=RYR6cu4YSBcC&dq=Planning%20and%20Design%20of%20Airports&source=gbs_similarbooks

## VIII. MATERIALS ONLINE

1. Course template.
2. Assignments.
3. Tutorial question bank.
4. Model question paper – I.
5. Model question paper – II.

6. Lecture notes.
7. Power point presentations.