



RCETMECHCC04 - Composite Materials Applications

Course outcomes:

- Explain the mechanical behavior of layered composites compared to isotropic materials.
- Apply constitutive equations of composite materials and understand mechanical behavior at micro and macro levels.
- Determine stresses and strains relation in composites materials.

Syllabus:

UNIT-I

Introduction: 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

UNIT-II

Manufacturing methods : 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.

UNIT-III

Mechanical Properties -Stiffness and Strength: 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.

UNIT-IV

Laminates : 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, Angleply Laminate. Orthotropic Laminate, Laminate Moduli, Hygrothermal Stresses.



UNIT-V

Joining Methods and Failure Theories : Joining –Advantages and disadvantages of adhesive and mechanically fastened joints. Typical bond strengths and test procedures.

Reference Text Books

1. Analysis and Performance of Fibre Composites, BD Agarwal and LJ Broutman.