MEPE4003 INTRODUCTION TO COMPOSITE MATERIALS (3-0-0)

MODULE – I (8 Hours)

Introduction: Introduction and overview of composite materials and their need, classification of composites, classification of Matrix- Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC), Carbon Fibre composites, Properties of composites in comparison with standard materials, Applications of metal, ceramic and polymer matrix composites.

MODULE – II (8 Hours)

Manufacturing methods: Hand lay-up processes – Spray up processes, Compression moulding, Reinforced reaction injection moulding, Resin transfer moulding, Pultrusion, Filament winding, Injection moulding.

Processing of cast composites- Spray processes (Osprey Process, Rapid solidification processing), In-situ Dispersion Processes (Stir-casting & Compo casting, Screw extrusion), Liquid-metal impregnation technique (Squeeze casting, Pressure infiltration, Lanxide process).

MODULE – III (8 Hours)

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 (3 point and 4 point bend tests) and shear.

MODULE – IV (6 Hours)

Recent developments in Composites: Self-healing composites, Molecular composites, Micro and Nanocomposites, Biocomposites, Left handed composites, Stiffer than stiff composites, Carbon / carbon composites (Advantages and limitations of carbon matrix).

MODULE – V (6 Hours)

Joining Methods and Failure Theories: Joining –Advantages and disadvantages of adhesive and mechanically fastened joints. Modes of fracture; Toughening mechanisms in composites.

Text Books

1. Chawla K.K., Composite materials, Springer, New York, 1998.
2. Analysis and Performance of Fiber Composites,Agarwal,B.D. and Broutman, L. J.,John Wiley & Sons.
3. Mathews F.L. and Rawlings R.D., Composite materials: Engineering and Science, Chapman and Hall, London, England, 1st edition, 1994.
4. Strong A.B., Fundamentals of Composite Manufacturing, SME, 1989.
5. Sharma S.C., Composite materials, Narosa Publications, 2000.
6. Mallick, P.K, Composite Materials Technology: Process and Properties, Hanser, New York, 1990.