CL801 MATERIALS AND PROCESSES FOR POLYMER COMPOSITES 4-0-0-4

General introduction to composite materials: Concept and definition, classification of composites based on matrices. Functional roles of reinforcement and matrix, Fiber, flake and particulate reinforced polymer composites. Fibre Reinforcements (glass, carbon/graphite, Boron, Kevlar), Matrices (Thermo plastics and thermosets). Rule of mixtures, stress-strain relationships. Determination of volume fraction of reinforcement, Tailoring of structural properties through laminar-sequencing and choice of fiber fractions/fiber orientations. Fibre Treatments, Interface and Interphase modifications, Mechanical behavior of FRP composites: Fiber controlled and matrix dependent properties (tensile, compressive, shear), fracture toughness, dynamic mechanical properties. Experimental determination of composite properties by standard test methods. Composite precursors: Sheet and bulk moulding compounds, prepreg materials and their choice in specific applications. Fabrication processes for FRP Composites: lay up, vacuum bagging, pultrusion, filament winding, RTM,RIM, RRIM, RFI, autoclave moulding, injection moulding etc., Room temperature and hot curing of composites, Hybrid Composites processing using twin screw extruder – feeding of reinforcements. Rheology of Composite, Composite post processing- joining composite elements. Recycling of Composites-environmental issues.

TEXT BOOKS/ REFERENCES:

1. S. T. Peters (Ed), "*Handbook of Composites",* Springer, 1997.
2. T. Astrom, "*Manufacturing of Polymer Composites*", CRC Press, 1997.
3. P. K Mallick, "*Fiber Reinforced Composites: Materials, Manufacturing and Design*, CRC Press, 2007.
4. F.C. Campbell (Ed), "*Manufacturing Processes for Advanced Composites"* Elsevier, 2004.
5. S Advani and K T Hsiao (Eds), "*Manufacturing Techniques for Polymer Matrix Composites (PMCs)"*, Elsevier, 2012.