

## PMM213: COMPOSITE MATERIALS

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

**Course Objective(s):** To classify composites, introduce common types of fibers and matrices, manufacturing of composites, mechanical properties and applications of composites. To understand the overview of mechanical and physical properties of a range of composite materials systems. To understand the mechanisms of composite deformation and fracture.

**Introduction:** Composites and their classification, Particulate composites, Hybrid composites, Long aligned fiber composites.

**Reinforcements:** Glass fibers, Boron fibers, Carbon fibers, Organic fibers, Ceramic fibers, Non-oxide fibers, Comparison of different types of fibers.

**Matrix Materials:** Polymers, metals, Ceramic matrix materials and their properties

**Processing of Composites:** Hand lay-up, Pre peg processing, Press molding, Vacuum molding, Filament winding, extrusion, Pultrusion, liquid metal infiltration process, Diffusion bonding and powder metallurgy methods, joining of composites, Basic properties of GRP, CFRP, Al-B, Casting and Particulate composites.

**Interfaces:** Wettability, Crystallographic nature of interface, Interactions at the interface, Types of bonding at the interface, Test for measuring interfacial strength.

**Failure/ Fracture of Composites:** Tensile strength, Compressive strength, Fractures modes in composites, Maximum stress theory, Maximum strain criterion, Maximum work criterion, Comparison of failure theories.

**Properties and Applications:** Modulus, Strength, Thermal characteristics, Aging, Fatigue, Creep, Transport properties, Matrix connectivity, Aerospace application, Structural, Defense biomedical application, Machine tools, Automobiles applications

### **Course Learning Outcomes (CLO):**

Student will be able to:

1. Asses the applicability and selection of a composite material for a specific application;
2. Mechanics analysis of composite materials;
3. Self-directed learning, incorporating researching properties of composite materials.

### **Recommended Books:**

1. *Chawla K.K., Composite Materials, Springer (2008)*
2. *Harris B., Engineering Composite Materials, Maney Publishing (1998).*
3. *Callister, W.D., Materials Science & Engineering: An Introduction, Wiley & Sons (2007)*