

COMPOSITE MATERIALS
(Professional Elective - II)

B.Tech. IV Year I Sem.
Course Code: ME721PE

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Course Objective: The prime objective of this course is to introduce, classify, and process composite materials which are novel and widely applied materials. The applications of composite materials that would suit the requirements are also dealt in detail as an integral part.

Course Outcome: The student will apply the concepts learnt during the course to design, and apply a composite material for a specific application.

UNIT - I

Introduction: Definition – Classification of Composite materials based on structure and matrix. Advantages and disadvantages application of composites based on structure – Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT - II

Reinforcements: Preparation, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical behavior of composites; Rule of mixtures, Inverse rule of mixtures. Loading under Isostrain and Isostress conditions.

UNIT - III

Manufacturing of Polymer matrix composites; Preparation of Moulding compounds and prepregs – hand lay-up method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications

UNIT - IV

Manufacturing of Metal Matrix Composites; Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications polymer composites

UNIT - V

Manufacturing of Ceramic Matrix Composites; Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites; Knitting, Braiding, Weaving. Properties and applications

TEXT BOOKS:

1. Composite Materials – K. K. Chawla
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007

REFERENCE:

1. Composite Materials Science and Applications – Deborah D.L. Chung
2. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi