Unit I

Chapter 1 : Introduction to Composites 1-1 to 1-16

Definitions, Need of Composites, Classification of Composites, Reinforcements and matrices, Types of reinforcements, Types of matrices, Types of composites, Natural Composites, Carbon Fiber composites, Properties of composites in comparison with standard materials. Advantages and Disadvantages. Natural Composites, Hybrid materials and their difference with Composite materials, Applications.

Unit II

Chapter 2 : Polymer Matrix Composite 2-1 to 2-18

Polymer resins – thermosetting resins, thermoplastic resins – reinforcement fibers – roving's – woven fabrics – non woven random mats – various types of fibers. PMC processes – hand layup processes – spray up processes – compression molding – reinforced reaction injection molding – resin transfer molding – Pultrusion – Filament winding – Injection molding. Fiber reinforced plastics (FRP), Glass Fiber Reinforced Plastics (GFRP). Laminated Composites.

Unit III

Characteristics and types of MMC, Advantages and limitations of MMC, Reinforcements - particles – fibers.Effect of reinforcement - volume fraction - rule of mixtures.Processing of MMC - powder metallurgy process - diffusion bonding - stir casting- squeeze casting, A spray process, Liquid infiltration In-situ reactions-Interface-measurement of interface properties.

Unit IV

Geometrical aspects : volume and weight fraction (Numerical). Large particle composites and the rule of mixtures for elastic constants, failure, fatigue, and long-term strength, methods of optimum design of materials and structures, Micromechanics of a Lamina, Unidirectional continuous fiber, discontinuous fibers, short fiber systems, woven reinforcements –Mechanical Testing: Determination of stiffness and strengths of unidirectional composites; tension, compression, flexure and shear (Numerical).

Unit V

Test Environments, Mechanical Test (Tensile, compression, shear & Fatigue) Bond Strength / Ply Adhesion ASTM F904, Testing Techniques for Composite Double Cantilever Beam, End Notch Flexure, Inter laminar Share Strength, Materials Non-destructive Inspection (NDI) of Composites, Thermographic testing of composites. ASTM & ISO standards for composites materials.

Unit VI

Applications of Composites material for Aerospace and Transportation application, viz LCA/LCH, Automobile Industry-lightweight, cost-effective, multi-material technology, compatibility with automation systems and rapid processing. Energy Applications-Ecofriendly Prime movers, Infrastructure and Building Applications, Maine Applications- Boats and Ships, Ecofriendly storage Tanks Sports Industry-Protective Equipment's.

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