

**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.

1.1	Need of Composite Materials .....	1-1
1.2	Definitions of Composite Materials .....	1-2
1.3	Classification of Composite Materials .....	1-2
1.3.1	Particle-reinforced Composites .....	1-3
1.3.1.1	Large-particle Composites .....	1-3
1.3.1.2	Dispersion-strengthened Composites .....	1-4
1.3.2	Fiber-reinforced Composites .....	1-5
1.3.2.1	Influence of Fiber Length .....	1-5
1.4	Types of Matrices and Composites .....	1-6
1.4.1	Polymer Matrix Composites .....	1-7
1.4.1.1	Glass Fiber Reinforced Polymer (GFRP) Composites .....	1-7
1.4.1.2	Carbon Fiber Reinforced Polymer (CFRP) Composites .....	1-7
1.4.1.3	Aramid Fiber Reinforced Polymer Composites.....	1-8
1.4.2	Metal Matrix Composites .....	1-8
1.4.3	Ceramic Matrix Composites .....	1-9
1.4.4	Carbon - Carbon Composites .....	1-10
1.4.5	Hybrid Composites and their Difference with Composite Materials .....	1-10
1.4.6	Laminar Composites .....	1-11
1.4.7	Sandwich Panels .....	1-12
1.5	Types of Composite Materials .....	1-13
1.6	Properties of Composites in Comparison with Standard Materials.....	1-14
1.7	Advantages and Disadvantages of Composite Materials .....	1-14
1.8	Applications of Composite Materials.....	1-15

**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.

2.1	Polymer Matrix Composites .....	2-1
2.1.1	Market Potential and Applications .....	2-1
2.1.2	Research and Development Priorities.....	2-2
2.2	Constituents of Polymer Matrix Composites.....	2-2
2.2.1	Matrix (Polymer Resins - Thermosetting Resins, Thermoplastic Resins).....	2-2
2.2.1.1	Thermoses .....	2-3
2.2.1.2	Thermoplastics.....	2-3
2.2.2	Reinforcement Fibers and Their Types .....	2-3
2.2.2.1	Woven Fabric .....	2-5
2.2.2.2	Comparison between Nonwovens, Mats and Woven Roving.....	2-5
2.2.3	Interphase.....	2-6
2.3	Properties of Polymer Matrix Composites.....	2-7
2.4	Design, Processing and Testing.....	2-7
2.4.1	Design .....	2-7
2.4.2	Manufacturing.....	2-8
2.5	Advantages and Disadvantages of Polymer Matrix Composites .....	2-9
2.5.1	Advantages .....	2-9
2.5.2	Disadvantages .....	2-9
2.6	Factors Affecting PMC Properties .....	2-10
2.7	Fabrication of Polymer Matrix Composite (PMCs).....	2-11
2.7.1	Hand lay-up.....	2-11
2.7.2	Bag Molding Process .....	2-11
2.7.3	Pultrusion .....	2-11



2.7.4	Filament Winding.....	2-12
2.7.5	Preformed Molding Compounds.....	2-12
2.7.6	Resin Transfer Molding.....	2-13
2.7.7	Injection Molding.....	2-13
2.7.8	Reaction Injection Molding (RIM).....	2-14
2.7.9	Reinforced Reaction Injection Molding.....	2-14
2.7.10	Spray-up.....	2-14
2.8	Fiber Reinforced Plastics (FRP).....	2-15
2.8.1	The Development of FRP.....	2-15
2.8.2	Common Properties of FRP.....	2-15
2.8.2.1	Fibers that are commonly used.....	2-15
2.8.3	Applications of FRP.....	2-16
2.9	Glass Fiber Reinforced Plastics (GFRP).....	2-16
2.10	Laminated Composites.....	2-16
2.10.1	Laminates.....	2-17
2.11	Applications of Polymer Matrix Composite (PMC).....	2-17

### Unit III

## Chapter 3 : Metal Matrix Composite

**3-1 to 3-15**

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.

3.1	Metal Matrix Composites (MMCs): Characteristics of MMCs.....	3-1
3.2	Types of Metal Matrix Composites(MMCs).....	3-2
3.3	Advantages, Disadvantages and Properties of Metal Matrix Composites.....	3-3
3.3.1	The mechanical properties of metal matrix composites (MMCs) in general: The properties of metals (reinforcements - particles - fibers).....	3-4
3.4	Processing of MMCs: Manufacturing Metal Matrix Composites.....	3-4
3.4.1	Applications of Metal Matrix Composites (MMCs).....	3-5



3.4.2	Fabrication of Metal Matrix Composites(MMCs) (Table 3.5.3).....	3-6
3.4.2.1	Liquid-Infiltration or Hot-Pressing.....	3-6
3.4.2.2	Plasma Spraying.....	3-7
3.4.2.3	Hot-Pressing .....	3-7
3.4.2.4	Chemical Vapor Deposition (via In-situ).....	3-8
3.5	Effect of Reinforcement -Volume Fraction -Rule of Mixtures.....	3-9
3.5.1	Modulus .....	3-9
3.5.2	Strength .....	3-10
3.5.3	Thermal Characteristics .....	3-13
3.5.4	Creep, Fatigue, and High Temperature Properties.....	3-13

### Unit IV

## Chapter 4 : Mechanics of Composite Materials

**4-1 to 4-35**

**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).

4.1	Composite Materials .....	4-1
4.1.1	Properties of Composite Materials .....	4-1
4.1.2	Matrices and Fibers .....	4-1
4.1.2.1	Matrices .....	4-1
4.1.2.2	Fibers .....	4-2
4.2	Optimum Design of Materials and Structures .....	4-3
4.2.1	Lamina or Ply Properties .....	4-3
4.2.2	Isotropic Materials .....	4-3
4.2.3	Anisotropic Materials .....	4-4
4.3	Micromechanics of a Lamina.....	4-5



4.3.1	Reinforcement - Matrix mixture properties (Geometrical aspects - Volume and weight fraction).....	4-5
4.3.2	Fiber Mass Fraction.....	4-5
4.3.3	Fiber Volume Fraction.....	4-6
4.3.4	Mass Density of Ply or Lamina.....	4-6
4.3.5	Ply Thickness.....	4-7
4.4	Unidirectional Ply.....	4-7
4.4.1	Elastic Modulus.....	4-7
4.4.2	Ultimate Strength of a Lamina or Ply.....	4-9
4.4.3	Woven Ply (Woven Reinforcement).....	4-11
4.4.3.1	Woven Fabrics in Various Forms.....	4-11
4.4.3.2	Fabric Layer Elastic Modulus.....	4-12
4.5	Mats and Reinforced Matrices.....	4-14
4.5.1	Mats.....	4-14
4.5.2	Microspherical Fillers.....	4-16
4.5.3	Other forms of Traditional Reinforcement.....	4-16
4.5.4	Fabrics with Many Dimensions.....	4-17
4.5.4.1	Carbon Reinforcement in a Four-Dimensional Architecture.....	4-17
4.6	Mechanical Testing (Determination of Stiffness and Strength of Unidirectional Composites; Tension, Compression, Flexure, and Shear).....	4-18
4.6.1	Tensile Test, for Instance.....	4-18
4.6.1.1	Delamination Test, for Instance.....	4-18
4.6.1.2	Tensile Strength Along the Longitudinal Axis :.....	4-19
4.6.1.3	Compressive Strength along the Longitudinal Axis.....	4-21
4.6.1.4	Tensile Strength in the Transverse Direction.....	4-22
4.6.1.5	Transverse Compressive Strength.....	4-24
4.6.1.6	In-Plane Shear Strength.....	4-24



4.7	Fiber-Reinforced Composites (Unidirectional Continuous Fiber, Discontinuous Fibers, Short Fiber Systems).....	4-25
4.7.1	Influence of Fiber Length.....	4-25
4.8	Geometrical Aspects - Volume and Weight Fraction (Problems).....	4-26

### Unit V

## Chapter 5 : Testing, Inspection and Standards in Composites

**5-1 to 5-38**

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.

5.1	An Insight into Characterization and Testing of Composite Materials Using Experiments.....	5-1
5.2	Constituent Materials Characterization.....	5-2
5.2.1	Characterization of Mechanical Properties of Fibers.....	5-2
5.2.2	Characterization of Thermal Properties of Fibers.....	5-4
5.2.3	Characterization of Matrix.....	5-4
5.2.4	Characterization of Interface / Interphase.....	5-5
5.3	Characterization of Composite Materials on a Physical Level.....	5-6
5.3.1	Density.....	5-6
5.3.2	Ratio of Fiber to Volume.....	5-6
5.3.3	Ratio of Void Volume (Porosity).....	5-7
5.3.4	Thermal Expansion Coefficients.....	5-7
5.4	Determination of Unidirectional Laminae's Tensile Properties.....	5-7
5.5	Unidirectional Laminae Compressive Properties Determination.....	5-9
5.6	Study of Shear Properties of Unidirectional Laminae.....	5-11
5.7	Properties of Through-Thickness.....	5-14
5.7.1	Through-Thickness Compressive Properties.....	5-16
5.8	Shear Strength between Laminas (Interlaminar Shear Strength).....	5-16
5.9	Study of Interlaminar Fracture Toughness.....	5-18
5.9.1	Mode I - Fracture Toughness.....	5-18
5.9.2	Mode II - Fracture Toughness.....	5-21



5.9.3	Mixed-Mode (I and II) - Testing.....	5-22
5.9.4	Mode III - Fracture Toughness.....	5-24
5.10	Materials Nondestructive Inspection (NDI) of Composites.....	5-24
5.10.1	Most Common Nondestructive Testing Techniques .....	5-24
5.10.2	Acoustic Emission Testing.....	5-25
5.11	Thermographic Testing of Composites .....	5-27
5.12	ASTM & ISO Standards for Composites Materials.....	5-31

## Unit VI

### Chapter 6 : Application of Composite Materials

**6-1 to 6-46**

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, Marine Applications- Boats and Ships, Ecofriendly storage Tanks Sports Industry-Protective Equipment's.

6.1	Aircraft Composite Components .....	6-1
6.2	Composites Allocation Based on their Nature.....	6-2
6.2.1	A Few Remarks .....	6-2
6.3	Structural Strength in Specific Areas.....	6-2
6.4	Aircraft of a Large Transport.....	6-3
6.5	Business Jets and Regional Aircraft .....	6-6
6.6	Light Aircraft.....	6-8
6.7	Aircraft that are used as Fighters.....	6-10
6.8	Composite Aircraft Parts Architecture and Manufacturing.....	6-11
6.9	System of Braking .....	6-14
6.10	Helicopters.....	6-16
6.11	Propellers for Airplanes.....	6-21
6.11.1	Reaction engine for aircraft .....	6-24
6.12	Automotive Industry and Composite Materials.....	6-26
6.13	Parts Made of Composite Materials .....	6-27
6.14	Turbines (wind).....	6-31



6.15	Infrastructure in the Civil Sector .....	6-33
6.16	Energy Storage in Green Nanocomposites.....	6-36
6.17	Shipbuilding and Composites .....	6-37
6.18	Sports and Recreation.....	6-40
6.19	Various Other Applications of Composite Materials.....	6-42

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