

## COMPOSITE MATERIALS

<b>Course Code</b>	20ME4501D	<b>Year</b>	III	<b>Semester</b>	I
<b>Course Category</b>	Professional Elective-I	<b>Branch</b>	ME	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Pre-requisites</b>	AP,CM, MSM
<b>Continuous Internal Evaluation</b>	30	<b>Semester End Evaluation</b>	70	<b>Total Marks</b>	100

**Course Outcomes:** Upon successful completion of the course, the student will be able to

CO	Statement	Skill	BTL	Units
CO1	Explain the need for composite materials to fulfill the demand of various applications.	Understand, Communication	L2	1,2,3,4,5
CO2	Outline the fabrication techniques of different types of composite materials.	Understand, Communication	L2	3,4,5
CO3	Relate the construction, constituents & characteristics of the composite materials.	Apply, Communication	L3	1,2
CO4	Identify the strengthening mechanics adopted in a particular type of composite material.	Apply, Communication	L3	4

**Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: High, 2: Medium, 1: Low)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1							2		1	3	1
CO2	3	1	1							2		1	3	1
CO3	3	1	1	2						2		1	3	1
CO4	3	1	1	2						2		1	3	1

## Syllabus

UNIT	Contents	Mapped CO
I	<b>Introduction:</b> Definitions and classification, benefits of composites, Factors affecting properties of composites. <b>Fiber Reinforced Composites:</b> Short and Long Fiber, Influence of Fiber Length, Influence of Fiber orientation and concentration on Mechanical Properties.	CO1 CO3
II	<b>Matrix Materials:</b> Common matrix materials in Polymers, metals, ceramics and their applications. <b>Reinforcements:</b> Fabrication, Properties and applications of Glass fibers, Boron Fibers, Carbon Fibers. ceramic Fibers: Oxide fibers, Non oxide Fibers, Whiskers.	CO1 CO3
III	<b>Metal Matrix Composites (MMCs):</b> Types of Metal Matrix Composites, Important Metallic Matrices Processing: Stir casting, Spray deposition, Liquid Infiltration, squeeze casting, spray forming and diffusion bonding.	CO1 CO2
IV	<b>Strengthening Mechanisms in MMCs:</b> Dislocation Strengthening, Orowan Strengthening, grain size strengthening, Work hardening, Applications of MMCs. <b>Processing of MMCs by Friction Stir Processing:</b> Groove Filling Method, Drill Hole Method, Powder Metallurgy Route and In Situ	CO1 CO2 CO4

	Method.	
V	<b>Ceramic Matrix Composites (CMCs):</b> Processing of CMCs-Cold Pressing, Hot Pressing, Chemical Vapour Deposition, Electrophoretic Deposition, Properties and applications of CMCs.	CO1 CO2

### Learning Resource

#### Text books:

1. Chawla, Krishan K. Composite materials: science and engineering. Springer Science & Business Media, 2012.
2. Matthews, Frank L., and Rees D. Rawlings. Composite materials: engineering and science. CRC press, 1999.

#### Reference books

1. Donald R. Askeland, "Essential of Materials Science and Engineering", Thomson Learning, 5th Edition – 2006
2. R. Balasubramaniam, Callister's, Material Science and Engineering, 2/e, WileyIndia, 2014.

#### E-Resources & other digital Material:

1. <https://www.classcentral.com/course/swayam-introduction-to-composites-10005>
2. <https://nptel.ac.in/courses/112/104/112104229/>
3. <https://nptel.ac.in/courses/112/104/112104168/>
4. <https://nptel.ac.in/courses/101/106/101106038/>
5. <https://nptel.ac.in/courses/112/104/112104249/>
6. <https://nptel.ac.in/courses/112/104/112104161/>