

ME328 Composite Material Technology										
L	T	P	Credit	Area		CWS	PRS	MTE	ETE	PRE
3	0/1	2/0	4	DEC/GEC		15/25	25	20/25	40/50	-

**Objective:** To enable the students to understand the fundamentals of matrix materials and reinforcements, and reinforcement materials. To understand elastic moduli, and Kirchoff hypothesis,

Syllabus										Contact Hours
<b>Unit-1</b>	<b>Introduction to Composite Materials:</b> Definition, Classification, Types of matrix materials and reinforcements, Characteristics & selection, Fiber composites, laminated composites, Particulate composites, Prepregs, and sandwich construction. <b>Metal Matrix Composites:</b> Re-inforcement materials, Types, Characteristics and selection, Base metals, Selection, Applications.									
<b>Unit-2</b>	<b>Macro Mechanics of a Lamina:</b> Hooke's law for different types of materials, Number of elastic constants, Derivation of nine independent constants for orthotropic material, Two - dimensional relationship of compliance and stiffness matrix. Hooke's law for two-dimensional angle lamina, engineering constants - Numerical problems. Invariant properties. Stress-Strain relations for lamina of arbitrary orientation, Numerical problems.									
<b>Unit-3</b>	<b>Micro Mechanical Analysis of a Lamina:</b> Introduction, Evaluation of the four elastic moduli, Rule of mixture, Numerical problems. <b>Biaxial Strength Theories:</b> Maximum stress theory, Maximum strain theory, Tsai-Hill theory, Tsai, Wu tensor theory, Numerical problems.									
<b>Unit-4</b>	<b>Macro Mechanical Analysis of Laminate:</b> Introduction, code, Kirchoff hypothesis, CL T, A, B, and D matrices (Detailed derivation) Engineering constants, Special cases of laminates, Numerical problems.									
<b>Unit-5</b>	<b>Manufacturing:</b> Lay up and curing - open and closed mould processing, Hand lay, Up techniques, Bag moulding and filament winding. Pultrusion, Pulforming, Thermoforming, Injection moulding, Cutting, Machining and joining, tooling, Quality assurance, Introduction, material qualification, Types of defects, NDT methods.									
<b>Unit-6</b>	<b>Application Developments:</b> Aircrafts, missiles, Space hardware, automobile, Electrical and Electronics, Marine, Recreational and sports equipment-future potential of composites.									
	<b>Total</b>									
<b>Reference Book:</b>										
1	<b>Composite Materials handbook</b> , Mein Schwartz Mc Graw Hill Book Company, 1984.									
2	<b>Mechanics of composite materials</b> , Autar K. Kaw CRC Press New York.									
3	<b>Mechanics of Composite Materials</b> , Rober M. Joness Mc-Graw Hill Kogakusha Ltd.									
4	<b>Stress analysis of fiber Reinforced Composite Materials</b> , Michael W, Hyer Mc-Graw Hill International.									
5	<b>Composite Material Science and Engineering</b> , Krishan K. Chawla Springer.									
6	<b>Fibre Reinforced Composites</b> , P.C. Mallik Marcel Decker.									

## Course Outcomes

CO1	The student will develop a knowledge of the manufacturing of composite materials.													
CO2	The student will develop a working knowledge of the various testing and performance protocols for composite materials.													
CO3	The student will develop an understanding of the economics of composite materials.													
CO4	Summarize the manufacture of metal matrix, ceramic matrix and composites.													
CO5	Describe the manufacture of polymer matrix composites.													
CO6	Describe the properties of various reinforcements of composite materials.													

**CO-PO/PSO Matrix**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	1	0	1	0	0	3	3	2	2
CO2	2	3	3	2	1	1	0	1	2	0	2	2	2	2	2
CO3	2	2	2	3	1	1	0	0	0	0	0	3	3	1	1
CO4	3	3	3	3	2	2	1	0	1	0	0	3	3	2	2
CO5	2	3	3	2	1	1	0	1	2	0	2	2	2	2	2
CO6	2	2	2	3	1	1	0	0	0	0	0	3	3	1	1