

AE-316: Materials for automobile components

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

Objectives: This course aims to introduce the students with composites used for automobile components, types of composite material, constituents material used for composites and failure theories for composites

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		Contact Hours
Unit-1	Introduction to Composites: Introduction and Concept, Historical Development, materials used for manufacturing automobile components, Concept of Composite Materials, Material Properties Improved by Forming, a Composite Material & Its engineering potential, materials	8
Unit-2	Basic Definitions and Classification of Composites: Definitions, Types of Composites, Classification Based on Matrix Material: Organic Matrix Composites Polymer Matrix Composites (PMC), Carbon Matrix Composites Or Carbon Carbon Composites, Metal Matrix Composites (MMC), Ceramic Matrix Composites (CMC); Classification Based on Reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites	6
Unit-3	Advantages of Composites Materials: Comparison with Metals, Advantages & Limitations of Composites	6
Unit-4	Manufacturing: 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.	8
Unit-5	Comparison of Failure Theories Design Concepts: Design Issues Typical Structural Component Design Process Laminate Analysis/Design Software Composite Codes & Standards Manufacturing Processes Processing of Composite Materials Overall Considerations, Autoclave Curing, Other Manufacturing Processes Fiber-only Performs, Combined Fiber-Matrix Perform. Manufacturing Techniques: Tooling and Specialty Materials, Release Agents, Peel Plies, Release Films and Fabrics, Bleeder and Breather Plies, Bagging Films	8
Unit-6	Special Topics : Testing of Composites (ENGN4511) Mechanical Testing of Composites, Tensile Testing, Compressive Testing, Intra- 84 Laminar Shear Testing, InterLaminar Shear Testing, Fracture Testing Etc Environmental Effects on Composites Micromechanics of Laminae Engineering Applications General Engineering Applications of FRP Composites Applications Related to Aerospace, Automobile, Bridge and Other Civil Engineering Structures, Case Studies	6
Total		42

Reference Books:

1	Adanced Composite Materials for Automotive Applications : Structural Integrity and Crashworthiness/Ahmed Elmarakbi / John Wiley & Sons, 2013 / 111853526X, 9781118535264
2	Mechanics of Fibrous Composites / Carl T. Herakovich / Wiley, 1997 / 0471106364, 9780471106364

Course Outcomes

CO1	To understand Historical Development, Concept of Composite Materials
CO2	To understand different types of composites.
CO3	To understand composite and its comparison to metals.
CO4	To understand mechanics in composites, its constituents role in design.
CO5	To understand theories of failure and design concept for composite manufacturing.
CO6	To understand Mechanical Testing of Composites.

CO-PO/PSOMatrix

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