

Course Type	Course Code	Name of the Course	L	T	P	Credit
DE	OMED619	Introduction to Composites	3	0	0	3

Prerequisites
Must be enrolled into a B. Tech. program or equivalent and should have completed at least second year of his 4-year program.
Course Objective
1. To grasp the fundamental concepts of composite materials, including their composition, classifications, and unique properties. 2. To learn about the mechanical behavior of composite materials, including stress-strain relationships, failure mechanisms, and how these relate to their microstructure. 3. To understand the various manufacturing processes used to fabricate composite materials, including both primary and secondary processing methods. 4. To learn how to design and analyze simple composite structures, considering factors like material selection, load-bearing capacity, and manufacturing constraints. 5. To explore the diverse applications of composite materials in various industries, such as aerospace, automotive, and construction.
Learning Outcome
1. Students will be able to select appropriate composite materials for specific engineering applications based on their properties and performance requirements. 2. Students will be able to analyze the mechanical behavior of composite materials, including stress, strain, and failure analysis. 3. Students will be able to identify and differentiate between various composite manufacturing processes and their respective advantages and limitations. 4. Students will be able to design simple composite structures, considering factors like material properties, loading conditions, and manufacturing constraints. 5. Students will gain a practical understanding of how composite materials are used in different industries and the challenges and opportunities associated with their use.

Unit No.	Topics to be Covered	No. of Lecture Videos	Video Time (Minutes)	Learning Outcomes
1	Introduction and Terminology of Composites	6	134	Understand basic concepts, terminology, classification, and applications of composite materials.
2	Concept Review: Mechanics Background for Composites	6	146	Revise essential mechanics concepts relevant to composite material behavior.
3	Fibers: Types, Properties, and Applications	6	142	Understand reinforcement fibers, their properties, and selection criteria.
4	Matrix Materials: Polymer, Metal, and Ceramic Matrices	6	122	Understand matrix materials and their role in composite performance.
5	Short Fiber Composites: Fundamentals and Processing	6	142	Understand short fiber composite behavior and processing techniques.
6	Short Fiber Composites (Continued): Property Prediction and Applications	6	134	Predict mechanical properties and evaluate applications of short fiber composites.
7	Orthotropic Lamina: Stress–Strain Relations	6	126	Understand constitutive relations and mechanical behavior of orthotropic lamina.
8	Orthotropic Lamina (Continued): Failure Theories	6	129	Analyze lamina failure using standard composite failure theories.

9	Orthotropic Lamina (Advanced): Thermal and Hygrothermal Effects	6	138	Analyze environmental and thermal effects on composite lamina behavior.
10	Composite Laminates: Classical Laminate Theory	6	129	Understand laminate theory and analyze multilayer composites.
11	Composite Laminates (Continued): Bending and Coupling Effects	6	131	Analyze bending and coupling behavior of composite laminates.
12	Composite Laminates (Advanced): Failure and Design	6	123	Evaluate laminate failure and apply composite design principles.
Total		72	1596	

Textbooks:

1. “Analysis & Performance of Fiber Composites” by Bhagwan D. Agarwal & Lawrence J. Broutman.
2. “Mechanics of Composite Materials”, by Jones, R. M., Mc-Graw Hill.

Reference Books:

1. “Engineering Mechanics of Composite Materials”, by Daniel, I. M. and Ishai, O., Oxford University Press.