

# MSE-466 Composites

**Credit Hours: 2-0**

**Pre-requisites: Nil**

## Course Description

This course provides an overview of the structure, properties, and applications of composite materials. The discussion will consider the needs of society and industry. The students will learn about various properties (such as thermal, rheological, and mechanical), processing and characterization of such materials.

## Course Contents

- Introduction to composite materials. Classification of composite materials.
- Role of Interface in composites. Fibers, whiskers and particulates in composites: Synthesis and properties of glass fibers, carbon fibers, aramid fibers, metallic and ceramic fibers and particulates. Matrixes and interface developments, Manufacturing of PMC's (Polymeric Matrix Composites), MMCs (Metal Matrix Composites) and CMCs (Ceramic Matrix Composites). Mechanics of composites, Factors effecting mechanical properties of composites, rule of mixture, calculations related to rule of mixtures, multiply laminates, Halpin-Tsai equations.
- Composites in aerospace applications

## Weekly Plan

Week	Topics
1	Introduction to composite materials
2	Classification of composite materials
3	Role of Interface in composites. Fibers, whiskers and particulates in composites
4	Synthesis and properties of glass fibers, carbon fibers, aramid fibers, metallic and ceramic fibers and particulates
5	
6	
7	Matrixes and interface developments
8	

<b>9</b>	<b>Mid-Semester Exams</b>
<b>10</b>	Manufacturing of PMC's (Polymeric Matrix Composites), MMCs (Metal Matrix Composites) and CMCs (Ceramic Matrix Composites)
<b>11</b>	
<b>12</b>	
<b>13</b>	Mechanics of composites, Factors effecting mechanical properties of composites, rule of mixture, calculations related to rule of mixtures, multiply laminates, Halpin-Tsai equations.
<b>14</b>	
<b>15</b>	
<b>16</b>	Composites in aerospace applications
<b>17-18</b>	<b>End Semester Exams</b>

### Course Outcomes

At the end of the course, students will be able to:

- Describe general features including physical, chemical, and mechanical properties of composite materials.
- Compare different manufacturing processes used for composite materials considering their advantages, limitations, and suitability for a given situation.
- Analyze different characterization techniques used to evaluate composite materials.
- Assess latest research trends in composite materials.

### Suggested Books

- Introduction to Composite Materials Design by E. J. Barero. 3rd ed. CRC Press (2018)
- Principles of Composite Material Mechanics by R. F. Gibson. 4th ed. CRC Press (2016)
- Smart Polymers and their Applications edited by M. R. Aguilar, J. S. Roman. Woodhead Publishing Limited (2014)
- Composite Materials: Science and Applications by D. D. L. Chung. 2nd ed. Springer (2010)