Mechanical Engineering Dept. Department

Syllabus
ME 409: Design & Manufacturing of CS (3-0-3)

Course Catalog Description:

This course provides basic competency in the design and manufacture of fiber-reinforced polymer composite structures. It will provide knowledge and understanding of the key aspects of composites design and various methods of composites manufacture. In addition, the course will introduce micromechanics, mechanical performance, durability, repair, recycling and applications of composites.

Course Pre-requisites:

- ME 322: Manufacturing Processes
- ME 323: Manufacturing Lab

Course Objectives:

1. To provide knowledge and understanding of the key aspects of composites design and various methods of composites manufacture
2. To introduce micromechanics, mechanical performance, durability, repair, recycling and applications of composites

Course Learning Outcomes:

CLO1. to gain knowledge of the available types of ceramic, polymer and metal fibers and types of polymeric matrices for establishing design criteria in composite materials.

CLO2. to derive and use equations for the upper and lower bounds of the elastic modulus of a composite lamina.

CLO3. to determine the stiffness of an anisotropic lamina along arbitrary directions using the concept of coordinate transformation.

CLO4. to understand the deformation and failure mechanisms in a composite lamina and laminate.

CLO5. to develop and use design equations for the stiffness and strength variation in composites as functions of constituent properties and amounts.

CLO6. to understand how to use composites as substitute materials in design to meet several competing requirements when monolithic components cannot.

CLO7. to understand various degradation processes associated with composite materials and their implications for long service life.

Learning Resources:

- None

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Final Exam	15	40.0%
Midterm Exam	8	30.0%
HW and project	None	30.0%

Lecture Weekly Schedule:

Week#	Topics
1	Introduction
2	Composite Materials
3	Composite Materials (Continue)
4	Composite Materials (Continue)
5	Manufacturing/Processing
6	Mechanics
7	Mechanics (Continue)
8	Mechanics (Continue)
9	Mechanics (Continue)
10	Mechanics (Continue)
11	Mechanics (Continue)
12	Mechanics (Continue)
13	Performance
14	Design
15	Polymer Nanocomposites