

MSE/ME 4793 Composite Materials & Processes (Elective)

Catalog Description: MSE/ME 4793 Composite Materials & Processes (3-0-3)
Prerequisites: CHEM 1310 General Chemistry I and PHYS 2212 Introduction to Physics II
Crosslisted with AE, CEE, CHBE, ME, and, MSE.
Basic principles of selection and design of composite materials and their manufacturing and testing. Cost factors. Laboratory exercises on manufacturing and tests.

Textbook: P. K. Mallick, *Fiber-reinforced Composites: Materials, Manufacturing, and Designs*, 2nd Edition, Marcel Dekker, 1993.
Lab manual. Additional readings from instructors as necessary.

Topics Covered:

1. Materials:
 - a) Reinforcements: glass, carbon, metal, organic and inorganic.
 - b) Matrices: thermoset, thermoplastic, carbon, ceramics and metal.
2. Processing:
 - a) Interface modification, reinforcement forms, manufacturing preforms, and prepregging.
 - b) Continuous processes: Filament winding and pultrusion.
 - c) Batch processes: Autoclave and matched-die/RTM.
 - d) Thermoplastic processes.
3. Testing:
 - a) Density/voids
 - b) C-scan
 - c) Mechanical
4. Performance
5. Economics:
 - a) Process modeling, cost modeling and case studies.

Course Outcomes:

Outcome 1: The student will develop a knowledge of the manufacturing of composite materials.

- 1.1 The student will be introduced to the various composite components e.g. reinforcement and matrices.
- 1.2 The student will employ principles of material selection and design for composite materials.
- 1.3 The student will demonstrate basic knowledge on the various composite processing techniques.

Outcome 2: The student will develop a working knowledge of the various testing and performance protocols for composite materials.

- 2.1 The student will demonstrate the ability to test the as synthesized composite materials.
- 2.2 The student will demonstrate the ability to assess the performance of the composites.

Outcome 3: The student will develop an understanding of the economics of composite materials.

- 3.1 The student will demonstrate an ability to determine material cost through modeling and case studies.

Correlation between Course Outcomes and Student Outcomes:

MSE/ME 4758											
	Mechanical Engineering Student Outcomes										
Course Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Outcome 1.1	X										X
Course Outcome 1.2	X		X								X
Course Outcome 1.3	X		X								X
Course Outcome 2.1	X				X						X
Course Outcome 2.2	X		X		X						X
Course Outcome 3.1	X	X	X						X	X	X

GWV School of Mechanical Engineering Student Outcomes:

- (a) an ability to apply knowledge of mathematics, science and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

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