

MSE 404: Engineering Composites

Course description: Basic concepts in design and specifications of engineering composites.

Number of credits: 3

Course Coordinator: W.H. Katie Zhong

Prerequisites by course: MSE 201

Prerequisites by topic:

1. Knowledge of stress/strain, fracture, and fatigue of materials.
2. Understanding of polymer science.
3. Basic understanding of thermodynamics and chemistry.

Postrequisites: None

Textbooks/other required materials:

1. Baker, A., Dutton, S., and Kelly, D. *Composite Materials for Aircraft Structures*. AIAA.

Course objectives:

1. Structures and properties of reinforcing fibers and matrix materials.
2. Mechanics concepts of continuous and failure mechanisms of fiber composites.
3. Composite manufacturing technologies

Topics covered:

1. Structures and properties of reinforcing fibers and matrix materials.
2. The concepts of interface issues.
3. Characteristics of polymer matrix, metal matrix and ceramic matrix composites.
4. Mechanics concepts of continuous and discontinuous fiber composites.
5. Failure mechanisms of fiber composites.
6. Relationships between composite architecture and mechanical properties.
7. Concepts in nondestructive testing (NDT), joining and repairing.
8. Composite manufacturing technologies.

Expected learning outcomes:

1. Know characteristics of primary reinforcement fibers.
2. Know the advantages and disadvantages of design with the primary types of polymeric matrix.
3. Understand basic concepts of interfacial adhesion.
4. Understand advantages and disadvantages of designing with polymer matrix, ceramic matrix and metal matrix composite systems.
5. Understand the rules of mixtures for uniaxial composites.
6. Understand the relationship between composite performance and nature of reinforcing phase for continuous fiber and discontinuous fiber composite systems.
7. Develop a basic understanding of the unique problems involved in

- joining composite structures.
8. Understand basic concepts of NDT for composites.
 9. Basic manufacturing methods for industrial composites.
 10. An ability to design composite components and apply processing methods to meet desired needs.

Class schedule: Three 50-minute lecture sessions per week, for one semester.

Laboratory schedule: None

Contribution to meeting the professional component: Engineering Topics

Relationship of course to student outcomes:
3 strongly supported; 2 supported; 1 minimally supported

Student Outcomes Pre-Fall 2018 (ABET EC2000)														Student Outcomes Fall 2018 forward (ABET EC2019)											
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	1	2	3	4	5	6	7	8	9	10	11
3		2									2	3			3	2				2	3	3	3		

Prepared by: Andrea Butcherite and Dr.W.H. Katie Zhong *Date:* May 30, 2018