

<b>Course Name</b>						
<b>FUNDAMENTALS OF COMPOSITE MATERIALS</b>						
<b>Code</b>	<b>Semester</b>	<b>Local Credits</b>	<b>ECTS Credits</b>	<b>Course Implementation, Hours/Week</b>		
				<b>Theoretical</b>	<b>Tutorial</b>	<b>Laboratory</b>
MET 442E	8	2	4	2	0	0
<b>Department/Program</b>	Metallurgical and Materials Engineering					
<b>Course Type</b>	Required		<b>Course Language</b>	English		
<b>Course Prerequisites</b>	None					
<b>Course Category by Content, %</b>	<b>Basic Sciences</b>	<b>Engineering Science</b>	<b>Engineering Design</b>	<b>General Education</b>		
		40	60			
<b>Course Description</b>	Constituents and classification of composites. Particulate composites, fiber composites, laminar composites. Micro-and macromechanical behavior of composite materials. Design criteria for composites. Fabrication and properties of composite materials.					
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>1. To provide the concepts of reinforcement of metals, ceramics and polymers by using fiber and/or particulate materials</li> <li>2. To gain ability to design new materials with desired properties</li> <li>3. To provide a better knowledge about the structure-property relationships in materials</li> </ol>					
<b>Course Learning Outcomes</b>	Students who pass the course will be able to: <ol style="list-style-type: none"> <li>1. learn the aim and fundamentals of composite design,</li> <li>2. use the knowledge of materials science and technology,</li> <li>3. learn special manufacturing techniques in addition to the classical techniques,</li> <li>4. learn mechanical behavior of anisotropic materials,</li> <li>5. learn the structure, properties, and importance of fiber and whisker materials</li> </ol>					
<b>Homework &amp; Projects</b>						
<b>Laboratory Work</b>						
<b>Computer Use</b>						
<b>Other Activities</b>						
<b>Assessment Criteria</b>	<b>Activities</b>	<b>Quantity</b>	<b>Effects on Grading, %</b>			
	<b>Midterm Exams</b>	2	40			
	<b>Quizzes</b>	-	-			
	<b>Homework</b>	-	-			
	<b>Projects</b>	-	-			
	<b>Term Paper/Project</b>	-	-			
	<b>Laboratory Work</b>	-	-			
	<b>Other Activities</b>	-	-			
	<b>Final Exam</b>	1	60			

**COURSE PLAN**

Weeks	Topics	Course Outcomes
1	Definition, classification, and characteristics of composites	I-V
2	Fiber composites. Type, form and properties of fibers	I-V
3	Particulate composites. Dispersion hardened alloys	I-IV
4	Design criteria for composites	I-IV
5	Metal matrix composites	II-III
6	Metal matrix composites	II-III
7	Polymer matrix composites MIDTERM EXAM	II-III
8	Polymer matrix composites	II-III
9	Ceramic matrix composites	II-III
10	Micromechanical behavior of a lamina	I-IV
11	Macromechanical behavior of a lamina	I-IV
12	Macromechanical behavior of a lamina	I-IV
13	Macromechanical behavior of a laminate MIDTERM EXAM	I-IV
14	Macromechanical behavior of a laminate	I-IV

**Relationship between the Course and METALLURGICAL AND MATERIALS ENGINEERING Curriculum**

	Program Outcomes	Level of Contribution		
		1	2	3
1	Ability to apply the knowledge of mathematics, science and engineering principles to solve problems in metallurgical and materials engineering (ABET:a)			X
2	Ability to characterize materials using standard and/or self designed experimental methods and to evaluate the results (ABET:b)			
3	Ability to design a system or a process, taking into consideration of the desired specifications, quality, ethics and environment. (ABET:c)	X		
4	Ability to communicate both orally and in the written form and to take part in, and provide leadership of the teams in the elucidation of engineering problems; (ABET:d, g)			
5	Ability to define, formulate and solve engineering problems in the development, production, processing, protection and usage of engineering materials. (ABET:e)			X
6	An understanding of professional and ethical responsibilities(ABET:f)			
7	An understanding of current/contemporary issues and impact of engineering solutions in broad cultural, national and global levels;. (ABET:h, j)			
8	A comprehension of the nature of engineering progress closely linked with the development of new materials and production processes. An ability to engage in life-long learning and a recognition of its necessity (ABET:i)			X
9	Ability to use essential tools and techniques of modern engineering in the development, production, processing, protecting of the existing and new engineering materials. (ABET:k)			X

1: Little, 2. Partial, 3. Full

**Course relationships with major elements of the field and material classes**

		Level of Contribution		
		1	2	3
MAJOR ELEMENT OF THE FIELDS	STRUCTURE			X
	PROPERTIES			X
	DESIGN EXPERIMENT/ANALYSE DATA	X		
	PROCESSING			X
	COST/PERFORMANCE	X		
	QUALITY/ENVIRONMENT			
	DESIGN PROCESS OR PRODUCT			X
MATERIAL CLASSES	METAL		X	
	CERAMICS		X	
	POLYMERS		X	
	COMPOSITES			X

1: Little, 2. Partial, 3. Full

<u>Prepared by</u>	<u>Date</u>	<u>Signature</u>
Assoc. Prof. Dr. M. Reza Nofar	December 2020	