MAK 413 MECHANICS OF COMPOSITE MATERIALS		Mechanical Engineering Department			
Credit Hours	3	Theory		3	
ECTS	6	Application/Recitat	ion	0	
Year/Term	2024-25 / Summer	Laboratory		0	
<b>Compulsory/Elective</b>	Elective				
Prerequisite(s)	MAK 206 Strength of Materials				
Instructor(s)	Dr. Erdem ACAR Room: 119, E-mail: acar@etu.edu.tr				
Assistant(s)	To be announced				
Class/Laboratory Schedule	Monday 13:30-15:20 (Mavi Amfi) Tuesday 13:30-15:20 (ST03)				
Catalogue Description	Properties and microstructure of high-strength fiber materials (glass, carbon, polymer, ceramic fibers) and matrix materials (polymer, metal, ceramic, and carbon matrices). Specific strength and stiffness of high-performance composites. Rule of mixtures. Stress, strain transformations. Elastic properties of a single orthotropic ply. Laminated plate theory. Failure criteria. Design of composite structures and components.				
Course Learning Outcomes	<ul> <li>The main learning outcomes of this course are:</li> <li>Basic understanding of what a composite material consists of, how it behaves, suitable applications</li> <li>the ability to apply basic principles of mechanics to composite materials</li> <li>the ability to design composite structures subjected to combined loading</li> <li>the ability to assess the effects of long-term loading, including damage generation, delamination fracture and fatigue failure</li> </ul>				
Textbook	"Mechanics of Composite Materials", A. K. Kaw, 2 <sup>nd</sup> Ed. (SI Units), CRC Press, Inc. 2006.				
<b>References and Other</b> <b>Course Material</b>	<ol> <li>R. M. Jones, "Mechanics of Composite Materials," 2nd Edition, Taylor &amp; Francis, Inc., 1999, ISBN: 9781315272986.</li> <li>R. F. Gibson, "Principles of Composite Materials Mechanics," 4th Edition, CRC Press, Inc., 2016, ISBN-13: 978-1-4987-2072-4.</li> </ol>				
Contribution to the	Mathematics and Basic S	ciences	20		
Curriculum (%)	Engineering Topics		50		
	Engineering Design		30		
	General Education		-		
Expected Performance	Performance Measures		Quantity	Contribution	
Measures and Tentative	Midterms		1	35 pts	
Grading	Quizzes		4	15 pts	
	Homework		-	-	
	Class Performance		-	-	
	Projects / Laboratory		-	-	
	Final		1	50 pts	

COURSE OUTLINE				
Week	Topics			
1	INTRODUCTION TO COMPOSITE MATERIALS			
2	MACROMECHANICAL ANALYSIS OF A LAMINA			
3	MACROMECHANICAL ANALYSIS OF A LAMINA			
4	MACROMECHANICAL ANALYSIS OF A LAMINA			
5	MICROMECHANICAL ANALYSIS OF A LAMINA			
6	MICROMECHANICAL ANALYSIS OF A LAMINA			
7	MACROMECHANICAL ANALYSIS OF LAMINATES			
8	MACROMECHANICAL ANALYSIS OF LAMINATES			
9	MACROMECHANICAL ANALYSIS OF LAMINATES			
10	FAULURE ANALYSIS AND DESIGN OF LAMINATES			
11	FAULURE ANALYSIS AND DESIGN OF LAMINATES			
12	FAULURE ANALYSIS AND DESIGN OF LAMINATES			

RELATIONSHIP TO PROGRAM OUTCOMES				
1	An ability to apply knowledge of mathematics, science, and engineering			
2	An ability to design and conduct experiments, as well as to analyze and interpret data			
3	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	Х		
4	An ability to function on multidisciplinary teams			
5	An ability to identify, formulate, and solve engineering problems	Х		
6	An understanding of professional and ethical responsibility			
7	An ability to communicate effectively in English and in Turkish	Х		
8	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context			
9	A recognition of the need for, and an ability to engage in life-long learning			
10	A knowledge of contemporary issues			
11	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	Х		

Prepared by: Dr. Erdem ACAR

**Date:** 12/05/2025