

Alanya Alaaddin Keykubat University | Rafet Kayış Faculty of Engineering
 Mechanical Engineering Department
 2023-2024 Spring Semester
SYLLABUS

Code/Name	SEC 304.4 / Mechanics of Fiber-Reinforced Composites
Type	Compulsory Elective (CE)
Credit/ECTS	6/6
Hour per Week	4 (2+2+0)
Level/Year	Undergraduate/3
Semester	Spring
Classroom	204
Content	Fiber-reinforced composites. Composite manufacturing techniques. Macromechanical behavior of a lamina; Stress strain relations for a lamina. Micromechanical behavior of a lamina. Macromechanical behavior of a laminate; Laminate constitutive equations. Lamina and laminate strength analysis. Beams, columns, rods of composite materials. Buckling of laminated plates. Strength and failure theories. Manufacturing and testing of laminated elements.
Prerequisites	
Textbooks	<i>Primary</i> Mechanics of Composite Materials, Autar K. Kaw, CRC Press (Taylor&Francis), 2006. <i>Supplementary</i> Mechanics of Composite Materials (Robert M. Jones, (Taylor&Francis), 1999.
Objectives	<ul style="list-style-type: none"> To gain some general, experimental and theoretical knowledges about the mechanical behaviors of composites materials to students To develop the ability of them to solve problems in the field of mechanics of composite structures, especially laminated composites.
Course Outcomes	In this course you will be able to: C01 Define composite materials and their application areas C02 Calculate the mechanical properties of composites theoretically C03 Determine the mechanical properties of composites C04 Calculate and discuss the stresses occurred in laminated composites C05 Define the failure characteristics of composite materials C06 Design simple composite structures by using main failure criteria

Weekly Schedule of Topics

W	Topic
1	General information of composites: Introduction and classification of composites.
2	General information of composites-continue: Reinforcements and matrix material.
3	Macromechanical behavior of a lamina, stress strain relations, orthotropic properties in plane-stress.
4	Micromechanical analysis of lamina, models for longitudinal modulus, transverse modulus, shear modulus, and Poisson's ratio.
5	Laminate Analysis: Introduction, deformation (Extension & Bending), force and moment resultants.
6	Laminate Analysis – continue: A, B, and D matrices, Laminate Code.

7	Laminate Analysis – continue: Hygrothermal behavior, special laminates (symmetric, balanced, quasi-isotropic), Introduction to Classical Lamination Theory
8	Laminate Analysis – continue: Stresses within the plies, computer programs for A, B, and D matrices.
9	Design and analysis of a sample composite structure.
10	Design and analysis of a sample composite structure with software.
11	Static strength of laminates: Introduction, fiber properties.
12	Failure criteria for laminated composites
13	Failure analysis of laminated composites with software.
14	Presentation of student projects.

Contribution to Program Outcomes*

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	3	2	3	3	2	3	2	3
CO2	3	3	2	3	2	3	3	2	3	2	3
CO3	3	3	2	3	2	3	3	2	3	2	3
CO4	3	3	2	3	2	3	3	2	3	2	3
CO5	3	3	2	3	2	3	3	2	3	2	3
CO6	3	3	2	3	2	3	3	2	3	2	3

* Contribution Level | 0: None | 1: Very Low | 2: Low | 3: Medium | 4: High | 5: Very High

Special Conditions • Students work in groups for project and presentations.

Requirements

Evaluation	Midterm Exam	50%
	Homeworks	20%
	<u>Final Exam</u>	30%
	Total	100%

Rubric

Course Policy

1. You must attend at least 70% of the sessions including add-drop period.
2. Be in the class on time.
3. English should always be used to communicate with one another.
4. Mobile phone should be switched off and put away during the class.
5. You cannot talk to your friends during class no matter what the subject is.

Cheating & Plagiarism

- Copying or letting someone to copy your work on exams, assignments, or reports is cheating.
- Cutting and pasting text, figures and tables from the web sources or any other electronic source is plagiarism.
- The consequence of academic dishonesty is to receive a grade of **F** for the course.

Instructor

Name/Surname	Sefa YILDIRIM	Email	sefa.yildirim@alanya.edu.tr
Room	233	Office Hours	Wednesday: 13:00 – 14:00 Wednesday: 15:15 – 16:15

Prepared by Sefa YILDIRIM on Feb. 15, 2024