

SAMPLE

CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA

COLLEGE OF ENGINEERING

COURSE OUTLINE

ABET Unit Classification	
Course Title: Mechanics of Composite Materials	
Math	Course No: ME423
Basic Science	Date of Outline Preparation: 11/02
Hum & Soc. Sci.	Prepared by: H. Rejali
Engr. Science (2.5)	Date of Last Revision:
Engr. Design (1.5)	Revised by:
Other	

I. Catalog Description

ME 423 Mechanics of Composite Materials (4)

Introduction to various types of composite materials, micromechanics of composite materials, anisotropic elasticity and laminate theory, orthotropic elasticity tensor, analysis of plates made of composite materials under inplane and bending moments, honeycomb core sandwich plates strength and failure theories, Design of fiber-reinforced composite plates..

II. Required Background or Experience

C- or better in ME 315 and 319.

III. Expected Outcomes

An understanding of:

- The behavior of anisotropic materials, specifically fiber reinforced composites (FRC's). [5]
- The relationship between the mechanical properties of a composite and those of its constituents. [5]
- The methods of design and analysis of stresses and deformations of composite members under load. [5]
- The failure theories used in composite materials. [5]
- The applications of FRC's in industry. [5]
- Further development of students' research and writing skills. [3]

*Numbers in brackets refer to objectives of the Mechanical Engineering Department.

Text and Readings

Text: Mechanics of Composite Materials; A.K. Kaw, CRC Press

- Reference:
- The Behavior of Structures Composed of Composite Materials, J. R. Vinson and R. L. Sierakowski, Martinus Nijhoff Publishers, 1986.
 - Composites Design by S. W. Tsai, Think Composites, 1987.
 - Fiber Reinforced Composites, P.K. Mallick, Marcel Dekker, 1993.
 - Engineering Mechanics of Composite Material, Daniel & Ishai, Oxford 1994.
 - Experimental Characteristics of Advanced Composite Materials, Carisson and Pipes, Prentice Hall, 1987.
 - Experimental Mechanics of Fiber Reinforced Composites, Whitney, Daniel and Pipes, SESA, 1982.

Various other composite materials texts

V. Minimum Student Materials

Assigned text, notepaper, scientific calculator.

VI. Minimum College Facilities

Classroom, blackboard, overhead projector, slide projector, composite samples.

VII. Course Outline

1. Types of composite materials
2. Classification of composite materials
3. Manufacturing of composite materials
4. Relationship between the properties of composites and those of their constituents
5. Anisotropic behavior
6. Orthotropic elasticity
7. Laminate theory
8. Inplane loading of composite material plates
9. Anisotropic strength and failure theories.
10. Laminate strength and failure analysis.
11. Design considerations and simplified design methods.

VIII. Instructional Methods

- 1) Lectures will include class demonstrations using actual tests and also visual aids
- 2) Homework assignments
- 3) A research paper on some aspect (student's choice) of composite materials.
- 4) A visit to a local company involved in the manufacture of composite materials.
- 5) Guest lecturer providing insight to the manufacture and use of composites in industry.

IX. Evaluation of Outcomes

Outcomes will be evaluated by:
Submittal of homework problems
Examinations
A comprehensive final examinations
Submittal of the research paper

X. Professional Component Contribution

This course introduces the students to the practices involved in the analysis and design of fiber reinforced composites. The student will also become familiar with the applications of composites in industry. Furthermore research and report writing capabilities of the student will be enhanced.

XI. Relationship to Program Objective

The relationship of the course objectives for this course to the Mechanical Engineering Department program objectives is documented in Section III, Expected Outcomes.