

# Experimental Mechanics of Fiber-reinforced Composite Materials

January 21-23, 1985

The Westin Hotel, Renaissance Center, Detroit, MI

Presented for the sixth time, this popular three-day seminar reviews state-of-the-art composite test methods from an applied-mechanics point of view. The methods, to be discussed in detail, are considered by the instructors to be the most currently viable approaches based on theoretical evaluation and personal experience. The instructors are the authors of the SEM monograph *Experimental Mechanics of Fiber Reinforced Composite Materials* upon which this seminar is based.

## Instructors

James M. Whitney—Materials Research Engineer in the Materials Laboratory of Wright-Patterson Air Force Base, OH.

R. Byron Pipes—Professor of Mechanical and Aerospace Engineering at the University of Delaware in Newark, DE.

Isaac M. Daniel—Professor of Mechanics and Director of the Experimental Stress Analysis Laboratory in the Department of Mechanical Engineering of the Illinois Institute of Technology.

## Computer Programs

COMPCAL—a unique computer program that combines micro-mechanics and lamination theory in an exceptionally user-friendly manner. It is designed for use with either Apple II or IBM microcomputers.

CYCLAN (Cylinder Analysis)—a microcomputer program for analysis of composite cylinders. It is currently available for use with Apple II microcomputers and will, in the near future, be available for IBM microcomputers as well.

Both the COMPCAL and CYCLAN programs are available to seminar attendees for a special price. They may be purchased prior to or upon conclusion of the seminar.

## Registration

The seminar registration fee includes all hand-out materials, the monograph *Experimental Mechanics of Fiber Reinforced Composite Materials*, lunch and coffee breaks. (It does not include dinner or hotel reservations.) Attendance is limited to 30 persons. For information on seminar and hotel registration, and the COMPCAL and CYCLAN computer programs, contact: SEM (formerly SESA), 14 Fairfield Drive, Brookfield Center, CT 06805; (203) 775-6373.

## Course Outline

### 1. Course Introduction

Introduction to Mechanics of Composites I

(a) Introduction to anisotropic elasticity

(b) Micromechanics

(c) Lamination theory

### 2. Computational Demonstration

Micromechanics (Orthotropic Constituents)

(a) Elastic constants for a transversely isotropic material

(b) Expansional strains for a transversely isotropic material

(c) Transport properties for a transversely isotropic material

Laminate Analysis (Symmetric Laminates)

(a) Effective elastic constants for in-plane loading

(b) Effective elastic constants for bending

(c) Effective expansional strains

(d) Effective transport properties

### 3. Introduction to Mechanics of Composites II

(a) Theory of laminated cylinders

(b) Strength theories

(c) Notch strength

(d) Edge effects

### 4. Test Methods I

(a) Tension

(b) Compression

(c) Flexure

(d) Off-axis tension

(e) Shear tests

(f) Notch strength

### 5. Test Methods II

(a) Interlaminar fracture of composites

(b) Statistical aspects of failure

(c) Environmental effects of testing

### 6. Experimental Strain Analysis I

(a) Strain gages

(b) Moire methods

(c) Birefringent coatings

(d) Holographic techniques

### 7. Experimental Strain Analysis II

(a) Anisotropic photoelasticity

(b) Biaxial testing

(c) Nondestructive testing