

AE 525 Advanced Composite Materials

Course Syllabus

An advanced treatment of the analysis of composite material structures and is designed as a continuation of the concepts presented in AE 428 *Introduction to Composite Materials*. Analysis of the advanced behavior of the three basic structural elements: beams, plates, and shells including instabilities (buckling) and vibrations. Failure and fracture mechanisms of composite structures. Processing techniques used in the fabrication of composite structures and the analysis of the effects of processing on mechanical performance.

- Introduction to Course
- Elements of Anisotropic Mechanics
- Micromechanical Theories of Composites
- Laminated Plate Theory
- Failure Mechanics
 - Macroscopic Failure Modes
 - Failure Theories
 - Fracture Behavior
 - Fracture Mechanics of Orthotropic Materials
- Plate and Beam Theory
 - Solution Techniques
 - Eigenvalue Problems of Plates
 - Transverse Shear Effects
 - Advanced Topics in Plates
- Shell Theory
 - Composite Material Shells
 - Cylindrical Shell Solutions
 - Advanced Topics in Shells
- Hygrothermal Behavior
 - Thermal & Chemical Strains
 - Viscoelastic Behavior of Composite Materials
 - Residual Stresses in Composites Materials
- Manufacturing of Composite Materials

Suggested Texts (no required textbook):

The Behavior of Structures Composed of Composite Materials, J. R. Vinson and R. L. Sierakowski, Martinus Nijhoff Publishers, 2002.

Stress Analysis of Fiber-Reinforced Composite Materials, M. Hyer, DEStech, 2009.