AAE 59000
Design of Composite Materials and Structures

Instructor: Dianyun Zhang

Prerequisite: AAE 352: Structural Analysis I

Course Description: The goal of this course is to equip students with the fundamental principles and knowledge for designing structural parts made from fiber-reinforced composite materials. Students will develop computer codes for predicting composite properties, designing composite parts, and predicting the part performance under specified loading and environmental conditions. The course begins with a brief introduction of composite materials including their constituent properties, applications, advantages and limitations, and manufacturing techniques. The theory of elasticity of anisotropic solids, micromechanics, and the Classical Lamination Plate Theory (CLPT) will be introduced, followed by the discussion of the failure behavior, vibration and buckling, and hygrothermal effects. Design of skin-stiffened and sandwich structures will also be discussed. The course concludes with a discussion on the consideration of manufacturing-induced defects for composites design.

Topics:
- Module 1: Introduction to Composite Materials and Basic Concepts
- Module 2: Design of Composite Materials: Microstructure
- Module 3: Design of Composite Laminates
- Module 4: Design of Composite Beams
- Module 5: Design of Skin-Stiffened Structures
- Module 6: Design of Sandwich Structures
- Module 7: Hygrothermal Effects and Manufacturing-Induced Defects
- Module 8: Composite Design Process & Design Guidelines

Assignments & Grading:

Course Components	Weight
Homework (~ 10 sets)	40%
Midterm Exam (take home)	30%
Final Project (presentation & report)	30%