Spring 2002    AERSP 497F / 597F

ADVANCED COMPOSITE STRUCTURES

MWF 12:20 – 1:10  217 Hammond
Schedule No.     901431

Goals
To survey and critically examine topics related to the design, analysis, and
testing of advanced composite structures for aerospace vehicles. Key general
topics include structural design issues, mechanics of laminated structures, and
energy methods.

To prepare students for advanced study in areas such as aeroelasticity, elastic
tailoring, and controlled structures.

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            153D Hammond            863-0103
            Office Hours:        TBD

Text    Gibson, Ronald F., Principles of Composite Material Mechanics,

Prerequisites  EMCH 471 (Engineering composite materials)
                AERSP 302 (Aerospace structures II)

Topical Outline

Introduction       Kinds of composite structures; behaviors of interest; design issues
                  Materials selection and design

Review            Fiber and matrix materials; lamina micromechanics
                  Orthotropic and transversely-isotropic materials
                  Ply failure criteria; hygrothermal effects
                  Material property characterization
                  Classical lamination theory (A, B, D matrices)

Laminated Plates  Rectangular plates with different boundary conditions
                  Static response, elastic stability, natural vibration and damping
                  Point stress analysis
                  Energy methods and finite element analysis

Reinforced Shells  Reinforced skins; sandwich structures
                  Transverse shear and normal deformation, higher-order theories
                  Static response, elastic stability, natural vibration and damping
                  Behavior of circular cylinders

Thin-Walled       Beams; cylindrical bending; closed section beams
Composite Beams   Elastic tailoring; non-classical effects
                  Static response, elastic stability, natural vibration and damping

Special Topics     Manufacturing considerations; joining; impact tolerance; structural integrity;
                  inspection; repair; controlled structures; damping.

Grading
Problems 35%  Project 20%  Participation 5%
Midterm 20%  Final Exam 20%