Homework #3

AERSP 597F students: the extra problem noted below.

Laminate Stiffness.

Problem 7.4 (Gibson)

Determine the stiffness matrix (A, B, D) for a [+45/-45] antisymmetric laminate. Use 0.25 mm thick unidirectional AS/3501 graphite/epoxy plies.

Problem 7.7 (Gibson)

A [-60/0/60] laminate and a [0/45/90] laminate both consist of 1.0 mm thick plies having the following properties: $E_1 = 181$ GPa, $E_2 = 10.3$ GPa, $G_{12} = 7.17$ GPa, $v_{12} = 0.28$. Plot the $A_{ij}$ for both laminates as a function of the orientation in order to determine which, if any, of the laminates is quasi-isotropic.

Laminate coefficient of thermal expansion.

AERSP 597F: Problem 7.12 (Gibson)

An antisymmetric angle ply $[+\theta/-\theta]$ laminate is to be made of graphite/epoxy and designed to have a laminate coefficient of thermal expansion, $\alpha_x$, as close to zero as possible. Determine the ply orientation $\theta$ needed to meet this requirement. Use the lamina properties given in the book.

Laminate failure.

Problem 7.17 (Gibson)

A [0/90/0]s laminate consisting of AS/3501 graphite/epoxy laminae is subjected to uniaxial loading along the x direction. Use the Maximum Strain Criterion to find the loads corresponding to first ply failure and ultimate laminate failure; then plot the load-strain curve up to failure. Compare the results to those of Example 7.10.