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# TERM PROJECT

## MECH-530

### Progress Report 1

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OVERVIEW: This progress report features the output of a Python script in iPython Notebook. The input interface is in the form of a laminate plybook template in a .xlsx worksheet with a choice of 5 fiber/matrix combinations whose material properties are also contained within that worksheet. In this template each ply is given an orientation and a quantity.

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In [4]: run mech530_main.py
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The laminate is given by the following plybook where the highest ply number '14' indicates the top layer, while the first ply number '1' indicates the bottom layer.

Unique Ply #,	Fiber/Matrix,	Orientation, (degrees)	Thickness (mm)
14	AS/H3501	90	0.125
13	AS/H3501	90	0.125
12	AS/H3501	40	0.125
11	AS/H3501	-40	0.125
10	AS/H3501	20	0.125
9	AS/H3501	-20	0.125
8	AS/H3501	0	0.125
7	AS/H3501	0	0.125
6	AS/H3501	-20	0.125
5	AS/H3501	20	0.125
4	AS/H3501	-40	0.125
3	AS/H3501	40	0.125
2	AS/H3501	90	0.125
1	AS/H3501	90	0.125

#### PLIES AND THICKNESSES

- Total number of plies in the laminate: 14
- Total thickness of laminate is: 1.750 mm
- There is no core in the laminate ( $Z_c = 0$  mm)
- Laminate contains 1 Fiber/Matrix combination. The material properties for this combination shall be listed below.

RESIN/MATRIX 1 of 1: For AS/H3501, the given material properties are:

-Stiffness and Strength:

$E_x = 138.0$  GPa,  $E_y = 8.96$  GPa,  $E_s = 7.10$  GPa and  $\nu_{x-y} = 0.30$

$X_t = 1447$  MPa,  $X_c = 1447$  MPa,  $Y_t = 51.7$  MPa,  $Y_c = 206$  MPa and  $S_c = 93$  MPa.

-The 'on-axis' matrices are given by the following:

$S_{on} =$   
$$\begin{bmatrix} 7.246e-03 & -2.174e-03 & 0.0 \\ -2.174e-03 & 1.116e-01 & 0.0 \\ 0.0 & 0.0 & 1.408e-01 \end{bmatrix} [1/GPa]$$

$Q_{on} =$   
$$\begin{bmatrix} 1.388e+02 & 2.704e+00 & 0.0 \\ 2.704e+00 & 9.013e+00 & 0.0 \\ 0.0 & 0.0 & 7.100e+00 \end{bmatrix} [GPa]$$