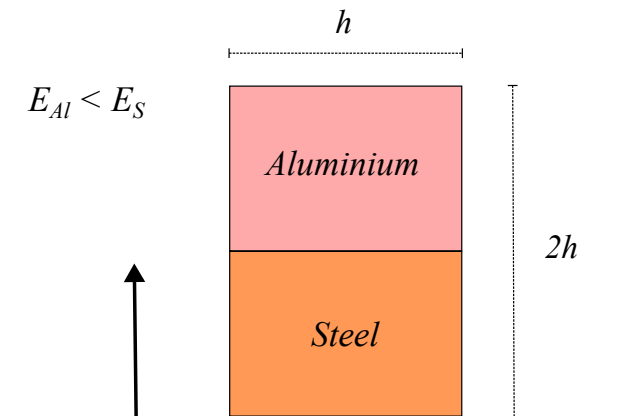


Tutorial 9: Uniform beam bending

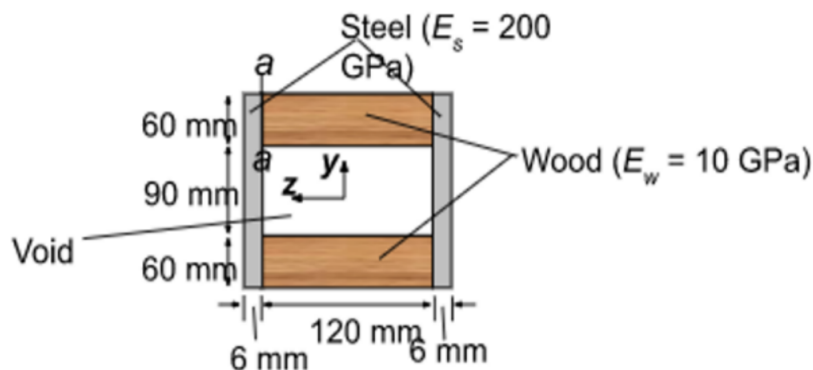
APL 104 - 2023 (Solid Mechanics)

- Q1.** Think of a composite beam having a rectangular cross-section such that one-half of the cross-section (having a square shape) is aluminium while the other half is steel. When such a beam is bent, where will the neutral axis lie in the cross-section (calculated from the bottom line of the cross-section)?



- Q2.** A beam of composite cross-section is subjected to bending moment $M_z = 30\text{kN}$. Find:

- (a) The curvature $\kappa = \frac{1}{R}$ induced in the beam
- (b) Maximum bending stress in wood
- (c) Maximum bending stress in steel



- Q3.** A flat steel bar, 1 inch wide by 0.25 inch thick and 40 inch long, is bent by couples applied at the ends so that the midpoint deflection is 1 inch. Compute the stress in the bar and the magnitude of the applied couples. Use $E = 200\text{GPa}$.

- Q4.** In a laboratory test of a beam loaded by end couples, the longitudinal fibers at layer AB in the figure below are found to increase $60 \times 10^{-3} \text{ mm}$ whereas those at CD decrease $100 \times 10^{-3} \text{ mm}$ in the 200mm-gauge length. Using $E = 70 \text{ GPa}$, determine the flexural stress in the top and bottom fibers.

