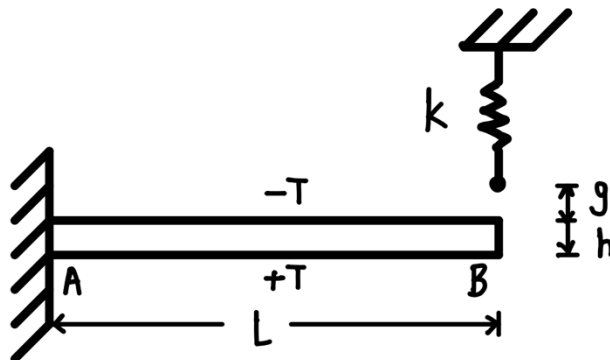


ME 202 Strength of Materials Spring 2023 Tutorial 7
Thursday 02 March 2023

In each case, α is the coefficient of thermal expansion (CTE) of the beam material, L is the length of the beam, and $h \times h$ is its square cross-section.

1. Obtain the deflection curve of a simply supported beam whose temperature at the top surface is raised by T_1 , and that at the bottom surface by T_2 .
2. In an electronic assembly, a component which can be modeled as a beam is fixed into a wall at one end and held against a rigid stopper at the other end. The operating conditions are such that the temperature at the top surface is lowered by T and that at the bottom surface is raised by T . The component material is such that it will fail if the normal stress reaches the critical value S_c . Find the maximum safe operating temperature T for the component.
3. Consider the arrangement shown below where the gap between the beam and the elastic stopper (spring stiffness k) is $g \ll L$. Find the temperature $T = T_0$ which just closes the gap. Find the compression in the spring if the applied $T = 2 T_0$.



4. Obtain the steady state temperature profile in a hollow cylinder where T_a is the temperature at the inner radius a , and T_b the temperature at the outer radius b .
5. In 2D cylindrical polar coordinates, write down the modified Hooke's Law which accounts for thermal expansion of an isotropic solid.