Introduction
The goal of this lab is to utilize strain gauges to make measurements and calculations regarding a cantilever beam made of an unknown metal. You will apply a known force to a cantilever beam and use changes in resistance to calculate Young’s modulus of the material.

Objectives
• Gain experience with strain gauges;
• Understand the relationship between stress, strain, and change in resistance;
• Use the change in resistance with applied stress to calculate the Young’s modulus for an unknown material.

Equipment Provided
• Cantilever beam with solid mount and pre-mounted strain gauges;
• Appropriate weights for adding a load;
• Linear distance measurement tools;
• Circuit components as necessary;
• Computer with appropriate software.

References
• Textbook, class notes, web sites.

Procedure
1) Anchor the cantilever base to a table.
2) Measure the strain gauge resistances using the Fluke 8846A.
   \[ R_{\text{compression}} \quad \Omega \quad R_{\text{tension}} \quad \Omega \]
3) Apply load(s).
4) Measure dimensions of the cantilever arm.
5) Calculate the modulus of elasticity of the cantilever arm material.

To Turn In
Write a short summary (one-page double spaced maximum) with a description of your methods, results, and observations about this lab. Staple your summary sheet to this page and turn it in.
\[ \sigma = \text{STRESS} \]
\[ E = \text{STRAIN} \]
\[ E = \text{YOUNG'S MODULUS} \quad E = \frac{\sigma}{\varepsilon} \]

\[ M = \text{MOMENT} = F \times \ell \]
\[ I = \text{CENTROIDAL MOMENT OF INERTIA} = \frac{1}{12} Wt^2 \]
\[ y = \text{DISTANCE FROM NEUTRAL AXIS TO SURFACE} = \frac{\text{thickness}}{2} \]

\[ \sigma = \frac{My}{I} \]
\[ \varepsilon = \frac{1}{G} \frac{\Delta R}{R} \quad \text{WHERE} \quad G = \text{GAUGE FACTOR} \]
\[ R \approx 120 \Delta R \]