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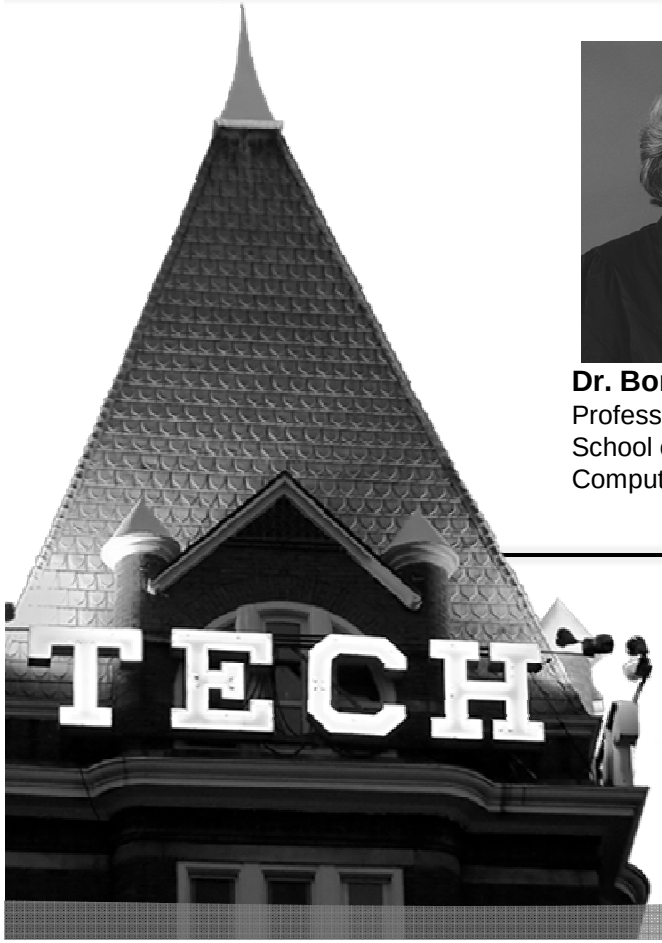

Linear Circuits

Dr. Bonnie Ferri
Professor and Associate Chair
School of Electrical and
Computer Engineering

An introduction to linear electric circuit elements and a study of circuits containing such devices.

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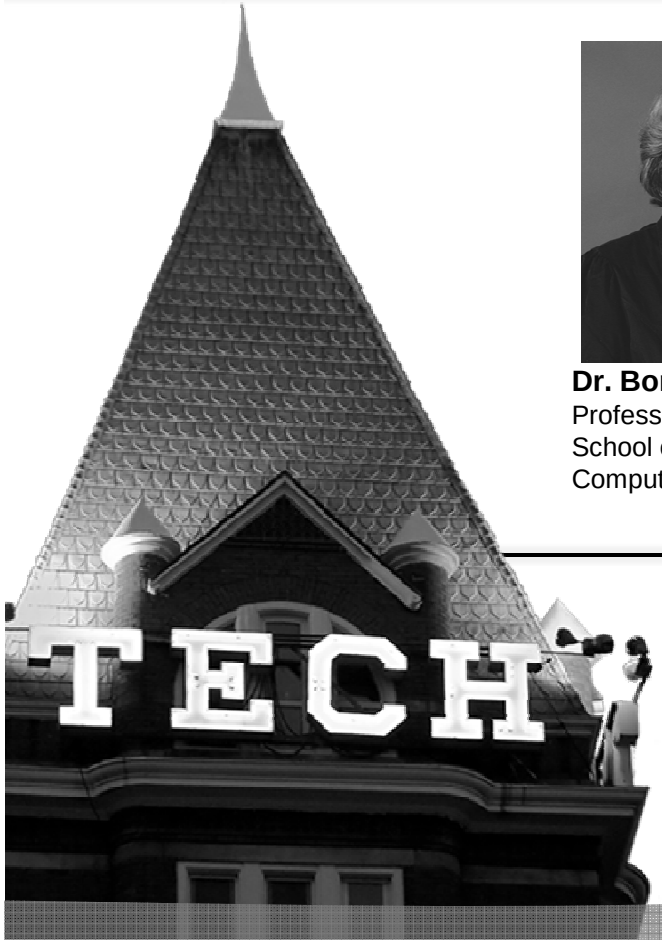


Application: Wheatstone Bridge

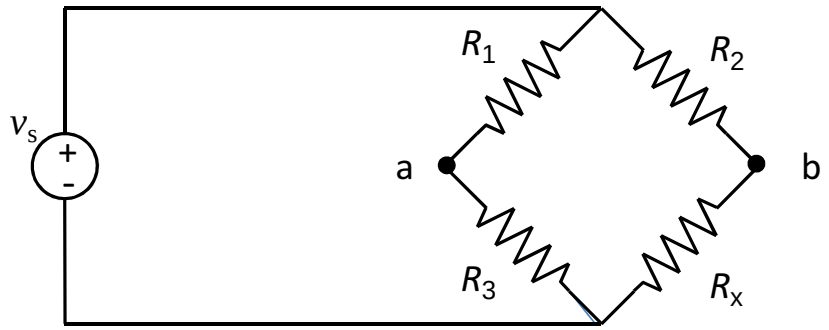
Dr. Bonnie Ferri
Professor and Associate Chair
School of Electrical and
Computer Engineering

An Wheatstone Bridge used in a sensor.

Module 2: Resistive Circuits

- Resistance
- Kirchhoff's Laws
- Resistors
- Superposition
- Systematic Solution Methods
- Maximum Power Transfer
- Applications: Sensors

Wheatstone Bridge



Balance R_2 and R_3 so $v_a = v_b$ and apply the voltage divider law

$$\frac{\boldsymbol{R_3}}{\boldsymbol{R_1 + R_3}}\boldsymbol{v_s} = \frac{\boldsymbol{R_x}}{\boldsymbol{R_2 + R_x}}\boldsymbol{v_s}$$

Cancel the v_s . Similarly

$$\frac{\boldsymbol{R_1}}{\boldsymbol{R_1 + R_3}} = \frac{\boldsymbol{R_2}}{\boldsymbol{R_2 + R_x}}$$

Divide both sides of these last equations to get $\dfrac{\boldsymbol{R_3}}{\boldsymbol{R_1}} = \dfrac{\boldsymbol{R_x}}{\boldsymbol{R_2}}$

Measure v_a - v_b

Lab Demo: Wheatstone Bridge

Summary

- Wheatstone bridge is used to detect small changes in resistance
- Four strain gauges in a Wheatstone configuration removes thermal effect

Credits

Thanks to Sterling Skinner for building the flexible beam experimental platform and Dr. Aldo Ferri for expertise on that system (both of the George W. Woodruff School of Mechanical Engineering at Georgia Tech).

Thanks to Marion Crowder (School of Electrical and Computer Engineering at Georgia Tech) for video-taping the experiment

DMM used in experiment is manufactured by Fluke Corporation