Circuits Lab
ENGR 1181
Lab 3
Circuits in the Real World

All engineering fields employ electronic circuits – electric cars, biomedical devices, computers, traffic controls, sensors, electronic displays, and cell phones.
Today's Learning Objectives

- After today's class, students will be able to:
  - Recognize and assemble series and parallel circuits.
  - Construct electric circuits using a breadboard.
  - Develop techniques to measure voltage, current and resistance are measured.
  - Calculate the equivalent resistance of electric circuits.
  - Demonstrate the proper circuit configuration for a given scenario.
Circuits Lab Setup

- Banana Plug Wires: 1 Black and 1 Red
- DMM
- +5 Volt Power Module
- Breadboard (Pre-Wired)
- Circuit Components
Breadboard Layout

+5 Volts Power

Ground

+5 Volt Switch Box

DMM Probe Wires
Breadboard Layout

The back of a breadboard showing the metal connections correlating to the alignment on the front work surface.
Task 1 – Measure Resistance Values

1. Insert 100 Ohm, 200 Ohm and 300 Ohm Resistors as shown (across the gap).

2. Connect the DMM as shown.

3. Set DMM on the Ohms scale.

4. Connect the DMM Probe Wires to measure the values of all three resistors.

5. Record the measured values in the Excel Worksheet.
Task 2 – Measure the Voltage across the 100 Ohm Resistor

Breadboard Connections

Schematic Diagram:

Close-up View:
Connecting the Resistors

CIRCUIT SCHEMATICS

No Connection

R1 alone

R1 in series with R2

[R2 in parallel with R3] in series with R1
Tips for Success

To avoid common problems, be sure that ...

1. the power strip is on and plugged in.
2. all wires are connected.
3. the LED is placed with proper polarity.
4. the circuit is connected to the main 5V power source.
5. all wires and resistors are exactly aligned.
6. measured values for resistances are used in equations.
7. the 200W resistor is in series with the LED.
Important Takeaways

Using Ohm's Law and Kirchhoff's Laws you can measure and calculate resistance, voltage, current and power consumed in any electrical circuit.
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Extra Slides for Circuits Lab

The following slides are available for instructors to explain Tasks 3 through 6 setups and measurements as needed.
Task 3 – The Series Circuit
Task 4 – The Parallel Circuit
Task 5 – The Series-Parallel Circuit
Task 6 – The LED Circuit

![LED Circuit Diagram]

- $V_T$: Voltage at the top
- $V_R$: Voltage across resistor $R$
- $V_{LED}$: Voltage across the LED
- $I$: Current through the circuit
- $R$: Resistance of the resistor

![LED Circuit Photo]