

EELE 354 LAB ASSIGNMENT 2:
ELECTRIC HEATER - POWER MEASUREMENTS
AND CONSIDERATIONS

LAB OVERVIEW:

In this lab, students will simulate the operation of a resistive electric heater. These types of heaters convert electrical energy into heat by driving current through a resistive heating element (resistor). Because the resistor opposes current flow, work must be performed to overcome this resistance. This results in the heating of the resistor, with the heat then transferring to the surrounding environment.

OBJECTIVES:

The objectives of the second laboratory are:

- To have the students construct a simple resistive electric circuit and connect it to a power supply.
- To have the students take electrical measurements on this circuit using the laboratory testing and measurement equipment.
- To have the students compare the measurements to predicted (calculated) values.
- To have students analyze and comment on these comparisons and to predict the expected circuit operation under slightly different conditions.

PRE-LAB ASSIGNMENT:

In the space provided on page 2, draw the schematic diagram (circuit diagram) of a resistive electric heater, containing a single resistor as a heating element, and powered by a single-phase 120 V AC power supply. In the schematic, show the connections of a power analyzer (wattmeter) across the resistor. Additionally, show the instrumentation for measuring the voltage across the load (resistor) and current through the load. Assuming resistance values of $R = 25, 50, 100\Omega$, calculate the current driven through the resistor as well as the power dissipated. Record these calculated values in the table on page 2.

Draw schematic diagram here:

Record calculated values of current and power, and measured values of voltage, current, and power in the table below:

$R(\Omega)$	$I_{calc} (A)$	$P_{calc} (W)$	$V_{meas} (V)$	$I_{meas} (A)$	$P_{meas} (W)$	$P_{meter} (W)$
25						
50						
100						

LAB EXPERIMENT:

- **Prior to assembling the circuit, have your circuit diagram (pre-lab assignment) approved by your instructor.**
- Once your instructor has approved, assemble the circuit using the bench power supply and one of the load resistors.
- **Prior to energizing your circuit, have your lab instructor approve your circuit, and only then energize it in his presence.**
- Observe the measurements on the voltmeter, ammeter, and wattmeter and fill in the appropriate readings into the table. There are two columns for power measurements. The first column, P_{meas} is to be calculated using the voltage and current readings, V_{meas} and I_{meas} . The second column, P_{meter} corresponds to the reading from the wattmeter.
- Repeat the recording of measurements for the other resistor values.
- Once all data is collected, de-energize the circuit.
- Return any lab equipment and measurement devices to their appropriate place and ensure your lab bench is clean and organized.

LAB QUESTIONS:

1. Comment on the comparison of the calculated current & power, the measured current & power using the voltmeter and ammeter, and the measured power using the wattmeter. Note any discrepancies between the values and hypothesize why the discrepancies occurred:

Name and initial of lab partners:

Lab Partner 1: _____

Lab Partner 2: _____

Lab Partner 3: _____