East West University
Department of Computer Science and Engineering

Course: CSE109 Electrical Circuits
Expt No.: 1
Title: Introduction to Circuit Elements and Variables

Objectives:

1. To get familiar with circuit variables (voltage and current) and circuit elements (voltage source and resistance).
2. To learn how to measure dc voltage across a circuit element using a voltmeter.
3. To learn how to measure dc current through a circuit element using an ammeter.
4. To learn how to measure resistance of a resistor using a multimeter.
5. To verify Ohm's Law.

Theory:

There are two types of elements in an electric circuit – active elements and passive elements. An active element supplies energy. A voltage source or a battery is an active element. The emf of a battery is measured using the unit volt (V). A passive element absorbs energy. A resistor is a passive element. The resistance of a resistor is measured using the unit Ohm (Ω).

There are two fundamental circuit variables – current through a circuit element and voltage across a circuit element. The current through a circuit element is measured using the unit Ampere (A) and the voltage across a circuit element is measure using the unit Volt (V).

A simple electric circuit is shown in Figure 1. The emf of the battery is E Volt and the resistance of the resistor is R Ω. The current drawn from the battery and the current passing through the resistor are same and is I A. The voltage drop across the resistor is V Volt. The voltage drop across the resistor is exactly equal to the emf of the battery, that is, $E = V$.

The Ohm's Law states that $V = IR$. If we plot V vs. I (taking I as independent variable), we have a straight line passing through the origin and the slop of the line is R.

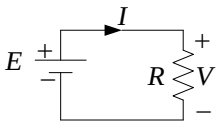

Figure 1: A simple electric circuit.

An ammeter is used to measure current and a voltmeter is used to measure voltage. As shown in Figure 2, an ammeter is connected in series with an element, current through which is to be measured. A voltmeter is connected in parallel with an element, voltage across which is to be measured. If you connect an ammeter in parallel with an element, the meter will be damaged. If you connect a voltmeter in series with an element, it will not give you correct result. So, **make sure that an ammeter is not connected in parallel and a voltmeter is not connected in series**.

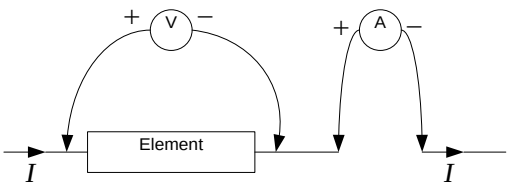

Figure 2. Connection of ammeter and voltmeter.

Circuit Diagram:

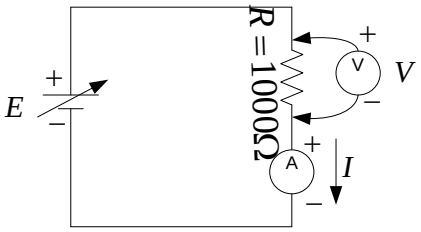

Figure 3. Circuit for experiment.

Pre-Lab Report Question:

1. Theoretically calculate the values of I for the circuit of Figure 3 for E = 5, 6, 7, 8, 9, 10 V and R = 1000Ω.

Equipments and Components Needed:

1. DC power supply
2. DC ammeter
3. DC voltmeter
4. Multimeter
5. Resistor 1000Ω
6. Breadboard
7. Connecting wires

Lab Procedure:

1. Measure the resistance of the resistor supplied using a multimeter and record it in Table 1.
2. Construct the circuit of Figure 3. Set the value of E at 5, 6, 7, 8, 9, and 10 volts and measure the corresponding V and I and record them in Table 1.
3. Have the datasheet signed by your instructor.

Table 1. Experimental Datasheet.

Observation number	Set Value of E (V)	Measured Value of V (V)	Measured Value of I (mA)	Measured Value of R (Ω)
1	5			
2	6			
3	7			
4	8			
5	9			
6	10			

Post-Lab Report Questions:

1. Theoretically calculate the values of I using measured values of V and R. Compare the theoretical values with the measured values and comment on any discrepancy.
2. Theoretically calculate the values of R from the measured values of V and I using Ohm's law. Compare the calculated and measure values of R and comment on any discrepancy.
3. Compare the set value of E and the measured value of V and comment on any discrepancy.
4. Plot V vs. I (taking I as independent variable) and fit a straight-line passing through the origin. From the plot determine the resistance of the supplied resistor using Ohm's law. Compare this value with the measured value and comment on any discrepancy.
5. Discuss how voltage or current is measured using a multi-range meter.