PROGRAM
FOR
ACCELERATION
IN
CAREERS
OF
ENGINEERING

SIMPLE CIRCUIT ANALYSIS LAB

OBJECTIVES:

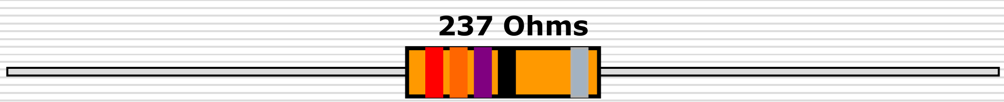
1. Learn to Interpret Resistor Color Coding
2. Mathematical Modeling and Analysis of Simple Circuits
3. Creation of Simple Circuits Using:
   - *Circuit Bread Boards*
   - *Discrete Electrical Components*
4. Simple Circuit Measurement and Analysis via:
   - *Ohm-Meters*
   - *Volt-Meters*
   - *Amp-Meters*

Resistor Color Coding

4 – Band Code:

COLOR	1st BAND	2nd BAND	3rd BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1	
Brown	1	1	1	10	+/- 1%
Red	2	2	2	100	+/- 2%
Orange	3	3	3	1K	
Yellow	4	4	4	10K	
Green	5	5	5	100K	+/- 0.5%
Blue	6	6	6	1M	+/- 0.25%
Violet	7	7	7	10M	+/- 0.10%
Grey	8	8	8		+/- 0.05%
White	9	9	9		
Gold				0.1	+/- 5%
Silver				0.01	+/- 10%

5 – Band Code:



Reading Resistor Color Coding

1. Turn Resistor so that the gold, silver or lone stripe is at the right end of the resistor. If the resistor has only three stripes, all three should be on the left side.
2. Look at the color of the first two stripes on the left end. Using the previous table, this determines the first two digits of the resistor value.
3. Look at the third stripe from the left. This determines the Multiplier of the resistor, as defined in the previous table.
4. Multiply the two digit number obtained from step two by the number from step 3 (the Multiplier). This is the value of the resistor in Ohms.
5. The stripe all of the way to the right indicates the accuracy or tolerance of the resistor (e.g., a gold stripe means the value of the resistor may vary by 5% from the reflected resistor value).

Resistor Color Coding Problems

1)  = __________ +/- ______

2)  = __________ +/- ______

3)  = __________ +/- ______

4)  = __________ +/- ______

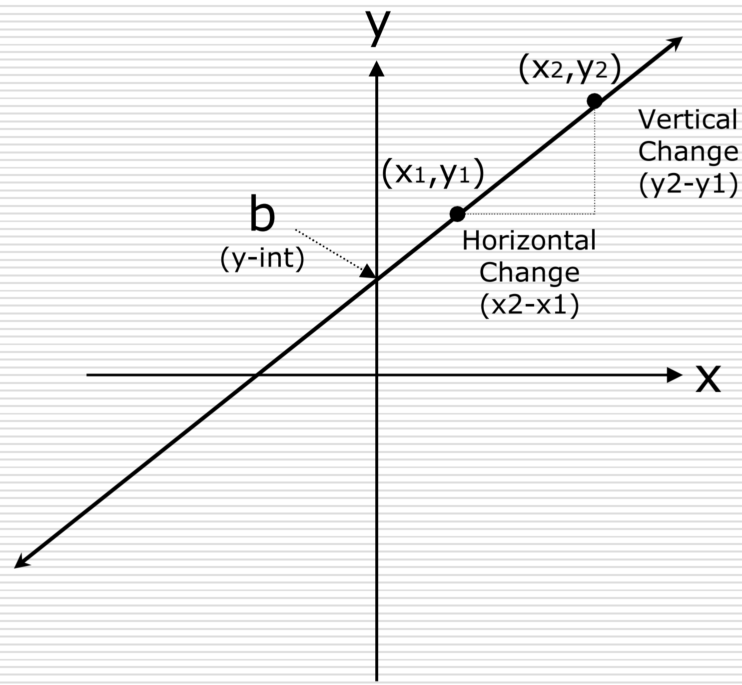
5)  = __________ +/- ______

6)  = __________ +/- ______

Linear Algebra: Review

Slope-Intercept Form of a Line:

$$\mathbf{y = f(x) = mx + b}$$



Where **m** and **b** are constants such that:

m: is defined as the slope of the line:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

and

b: is defined as the y–intercept of the line.

Ohm’s Law: *is* a Linear Relationship

Slope-Intercept Form of a Line:

$$y = f(x) = mx + b$$

Ohm’s Law:

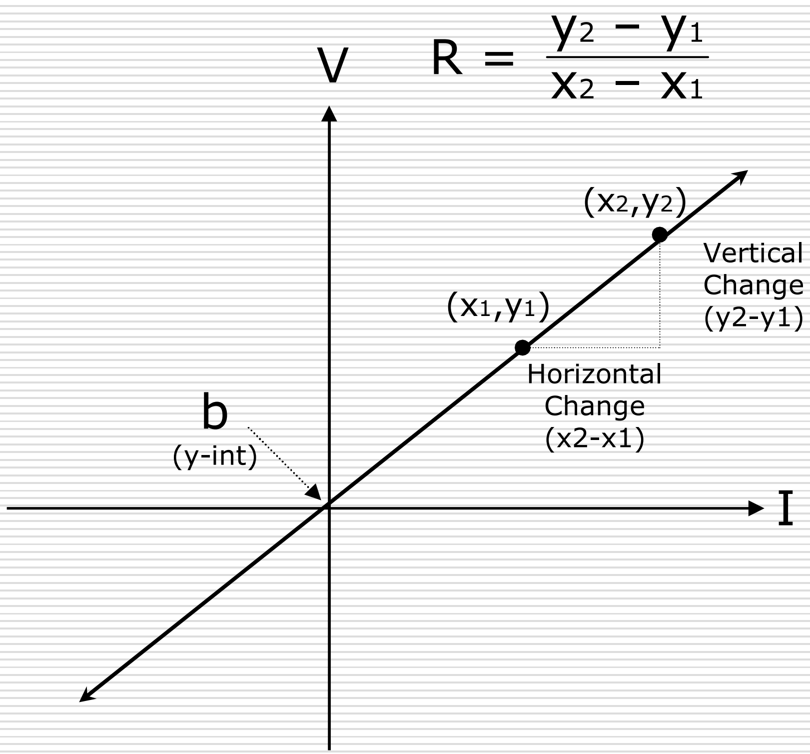
$$V = RI + 0$$
$$= IR$$

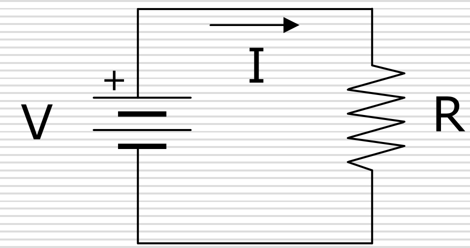
Where:

R: the Resistance, is the slope

and

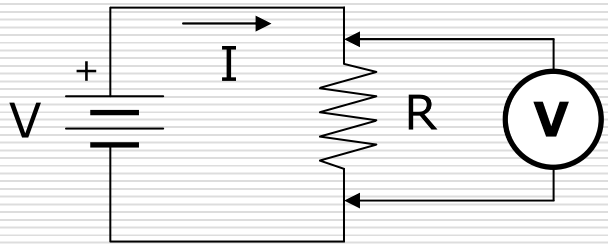
b: the y–intercept, is zero (0).



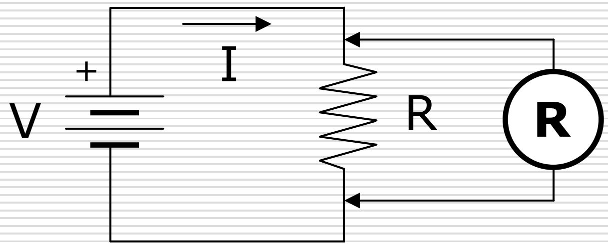


Simple Circuit Measurement

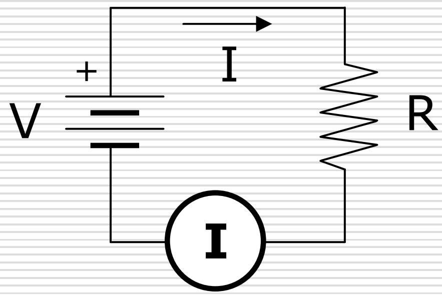
Measuring Voltage:



Measuring Resistance:



Measuring Current:



Simple Circuit Lab Exercise

Given an unknown Resistor:

- Create a Simple Circuit.
- Apply a voltage of 4V to the circuit and record the associated current through it. Do the same for 6Volts.
- Plot the Voltage-Current relationship obtained from your measurements.
- Determine the Resistor value through the application of Ohm’s Law.
- Determine the Resistor value by removing the tape and interpreting the resistor coding.
- Determine the Resistor value through the use of the Ohm-Meter.

Question 1: Are all three Resistor determinations the same? If not can you explain why?

Question 2: Can you determine other current readings that would occur through the Resistor through the application of other Voltage values without configuring the circuit?