UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Sekolah Pendidikan
Profesional dan
Pendidikan Berterusan
(SPACE)

JABATAN KEJURUTERAAN ELEKTRIK
PUSAT PENGAJIAN DIPLOMA (PPD), SPACE
UNIVERSITI TEKNOLOGI MALAYSIA
KUALA LUMPUR

DDWE 1711 ELECTRICAL ENGINEERING LABORATORY 1

(CIRCUIT THEORY 1)

EXPERIMENT 1

SERIES CIRCUITS

EXPERIMENT 1 : SERIES CIRCUITS

OBJECTIVES:

After performing this experiment, you will be able to:

1. Use Ohm's law to find the current and voltages in a series circuit.
2. Apply Kirchhoffs voltage law to a series circuit.
3. Apply the voltage divider rule to series circuit.
4. Design a voltage divider to meet a specific voltage output.

APPARATUS:

1. Analog Multimeter
2. DC Voltage Source
3. Variable Resistor

COMPONENTS:

1. Resistors: 1 kΩ (1 unit), 3.3 kΩ (1 unit), 6.8 kΩ (1 unit)

PART A : OHM'S LAW, KIRCHHOFF'S VOLTAGE LAW AND VOLTAGE DIVIDER RULE

Procedures:

1. Obtain the resistors listed in Table 1.
2. Measure each resistor using analog multimeter. Record the value in the same table.
3. Connect all resistors in series. Measure the total resistance of the series connection. Record the measured value in Table 1.
4. Calculate the total resistance of the series connection. Show your calculation in the answer sheet.
5. Complete the series circuit by adding a 15 volt DC source. Connect the ammeter in series with the resistors to measure the current in the circuit
6. Draw the circuit (in step 5) in the answer sheet
7. Turn ON the power supply.
8. Read the measured value of current. Record the value in the answer sheet.
9. Calculate the current in the circuit using Ohm's law and the measured value of resistors. Show your calculation in the answer sheet.
10. Measure the voltage drop across each resistor using analog multimeter. Record the value in Table 2.

11. Using the value obtained in step 9, calculate the voltage drop across each resistor using Ohm's law and the measured value of resistors. Record the value in Table 2.
12. Using the values obtained in step 11, show the calculation to prove the Kirchhoffs voltage law in the answer sheet.
13. Referring to the circuit in Figure 1.1 of the answer sheet, calculate the voltage drop across each measured resistor using the voltage divider rule. Record the values in Table 2.

PART B: DESIGN A VOLTAGE DIVIDER CIRCUIT

Procedures:

1. Connect the circuit shown in Figure 1.2 with the variable resistor, R_L in series.

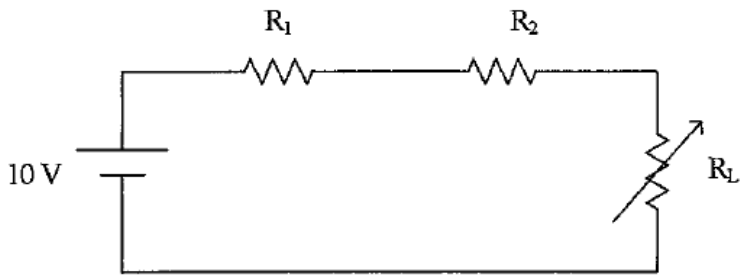
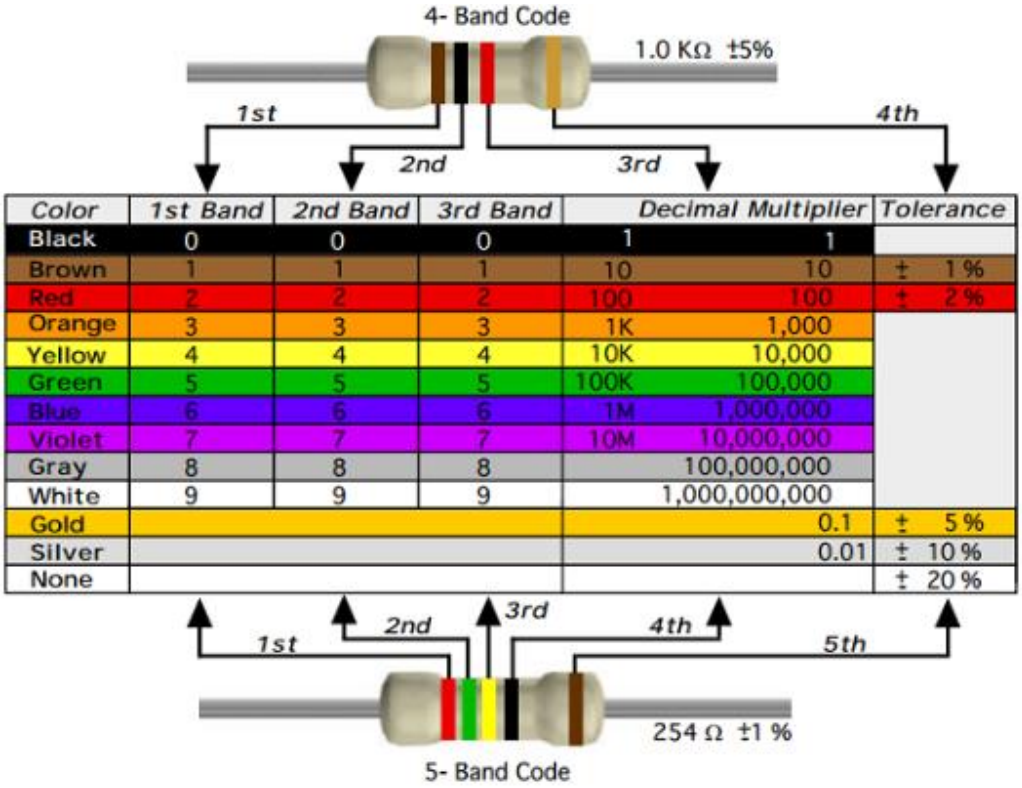


Figure 1.2

2. Connect the analog multimeter across the variable resistor, R_L. Adjust the setting of variable resistor to obtain a voltage drop of 5 V across it. Record the adjusted value in the answer sheet.
3. Using the voltage divider rule on the measured resistance value, calculate the expected value of variable resistor setting, to obtain the voltage drop of 5 V.

RESISTOR COLOUR CODE



Color	1st Band	2nd Band	3rd Band	Decimal Multiplier	Tolerance
Black	0	0	0	1	
Brown	1	1	1	10	± 1%
Red	2	2	2	100	± 2%
Orange	3	3	3	1K	1,000
Yellow	4	4	4	10K	10,000
Green	5	5	5	100K	100,000
Blue	6	6	6	1M	1,000,000
Violet	7	7	7	10M	10,000,000
Gray	8	8	8		100,000,000
White	9	9	9		1,000,000,000
Gold				0.1	± 5%
Silver				0.01	± 10%
None					± 20%

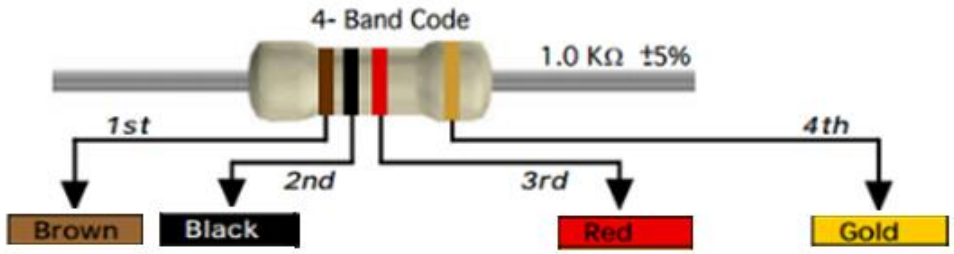
Surface-Mount

Surface-Mount (SMD) resistors use a similar system. Resistance is indicated by a 3-digit code like 104, sometimes followed by a letter. Rare, precision resistors have 4 digits (3+multiplier).

104	1st Digit	2nd Digit	3rd Digit (rare)	Multiplier	(10 with 4 zeros) = 100k Ω
	1	0		4	

- 0 Ω resistors (marked "0") are used instead of wire links to simplify robotic assembly.
- Resistors less than 100Ω use a 0 multiplier to mean "x 1" so "100" = 10Ω, "470" = 47Ω

Example;



1st digit = 1
2nd digit = 0
3rd digit = 100 or 10^2 (multiplier)
4th digit = ±5% (Tolerance)
Resistor value = 10 x 100 Ω ±5% = 1000 Ω ±5%
Tolerance value = 1000 x 5% = 50 Ω
Resistor value range = (1000 - 50) between (1000 + 50) = 950 Ω between 1050 Ω