COMSATS UNIVERSITY ISLAMABAD

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

COURSE NAME	CPE122-LINEAR CIRCUIT ANALYSIS
LAB NO.	1
TITLE	INTRODUCTION TO LAB EQUIPMENTS & COLOR CODING OF RESISTORS.
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PART 01:

INTRODUCTION TO LAB EQUIPMENTS

Main objectives:

The objective of this lab is to know what is an oscilloscope, DC power supply and a function generator and how to use these lab instruments properly.

Instruments:

Oscilloscope, DC power supply, & Function generator.

Oscilloscope:

An oscilloscope is a device frequently utilized to visualize and examine the waveforms of electronic signals. These signals are represented as a graph, where the vertical axis (y-axis) indicates voltage (V), and the horizontal axis (x-axis) shows time (t). This enables the observation of various signal properties, including amplitude, frequency, time period, voltage, and other defining characteristics.

Functions:

- It is used measure frequency & amplitude
- It is used to find time and voltage of the signal
- It is also used to measure Duty Cycle
- It also tells us about AC and DC current

Function Generator:

A Function generator is used to output various types of electronic signals over a wide range of frequencies.

It can generate wide range of waveforms which includes

- Sine waves
- Square waves
- Arbitrary waveforms

DC Power Supply:

A DC power supply is a device that transforms AC current from a standard outlet into a consistent DC current. Electronic devices like cell phones, cameras, and music players operate on DC power. Many computers and televisions utilize an internal power supply that converts AC voltage into DC voltage, providing power to the different components of the device.

PART 02:

COLOR CODING OF RESISTORS

Main Objective:

- To find the value of a resistor and its tolerance by color coding
- To measure the value of resistor by Digital Multimeter (DMM)

Apparatus:

- Various Resistors
- Digital Multimeter (DMM)

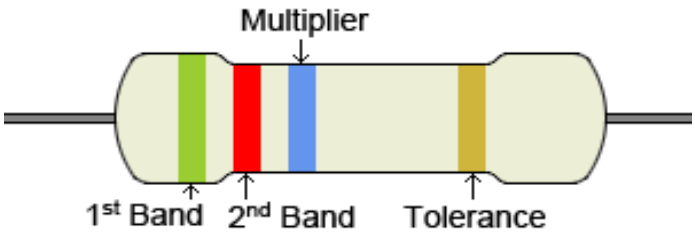
Explanation:

Resistors feature colored bands that indicate their resistance values. These color bands on the resistor's body provide the specific resistance value. There are three types of resistors: 6-band, 5-band, and 4-band resistors.

For a 4-band resistor, the first two bands indicate the first two digits of the resistor’s value, the third band is the multiplier, and the fourth band represents the tolerance.

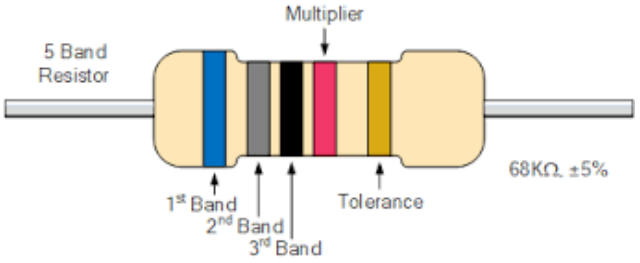
For a 5-band resistor, the first three bands represent the first three digits of the resistor’s value, the fourth band serves as the multiplier, and the fifth band indicates the tolerance.

4-BAND RESISTOR



4 Band Resistor Color Code				
Color	1. Band	2. Band	3. Band Multiplier	4. Band Tolerance
black	-	0	1	-
brown	1	1	10	+/- 1%
red	2	2	100	+/- 2%
orange	3	3	1'000	-
yellow	4	4	10'000	-
green	5	5	100'000	-
blue	6	6	1'000'000	-
purple	7	7	-	-
grey	8	8	-	-

5-BAND RESISTOR



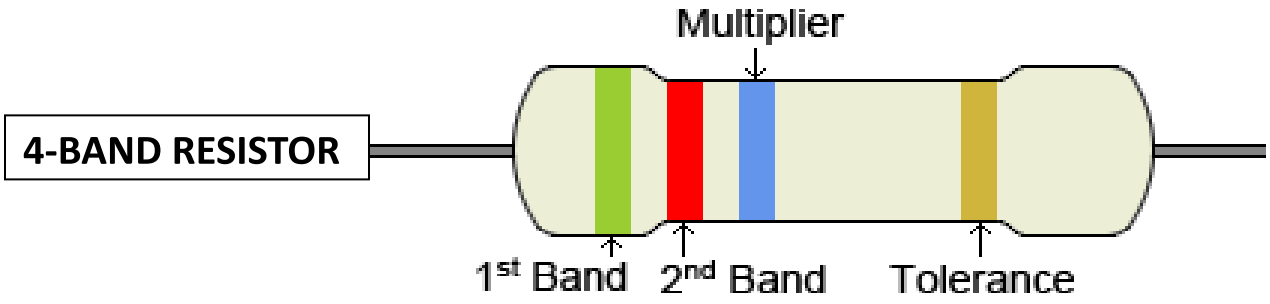
Color	Color	1st Band	2nd Band	3rd Band	4th Band Multiplier	5th Band Tolerance
Black		0	0	0	x1Ω	
Brown		1	1	1	x10Ω	±1%
Red		2	2	2	x100Ω	±2%
Orange		3	3	3	x1kΩ	
Yellow		4	4	4	x10kΩ	
Green		5	5	5	x100kΩ	±0.5%
Blue		6	6	6	x1MΩ	±0.25%
Violet		7	7	7	x10MΩ	±0.10%
Grey		8	8	8	x100MΩ	±0.05%

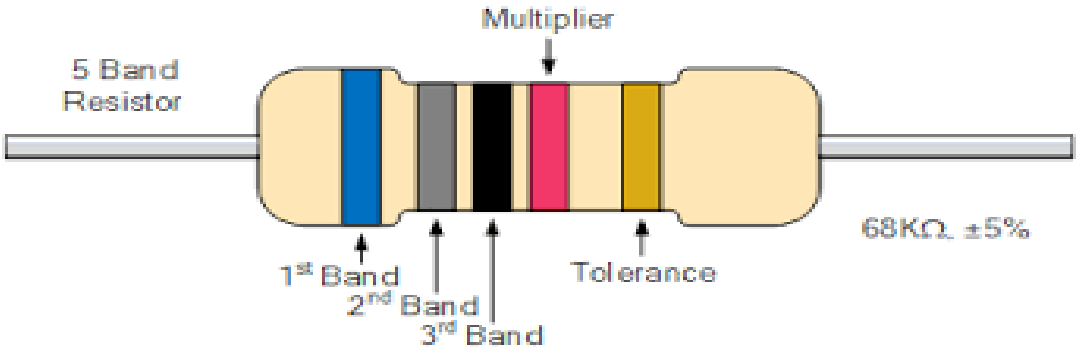
TASK #01:

PROCEDURE

- Hold the resistor in a way that the tolerance band (gold, silver/none) is on the right and the colored band are on left.
- Identify the color of the bands from left to right, and note down the numbers.
- (For 4-band resistor) The first two bands represent the first two digits of the resistor's value.
- Note the value of the third band which is the multiplier, and multiply it with the number obtained from the first two bands.
- The last band will either be gold, silver or none and it is the tolerance of the resistor.

DIAGRAM





EXPERIMENT

No.	Resistance value using color codes(Ω)	Tolerance (%)	Range(Ω)	Value of resistance measured by DMM	Error (%)
1	10000Ω	± 5%	9500Ω-10500Ω	9810Ω	1.9%
2	10Ω	± 5%	9.5Ω-10.5Ω	10.2Ω	1.9%
3	27000Ω	± 5%	28350Ω-25650Ω	27200Ω	0.74%
4	3300Ω	± 5%	3465Ω-3135 Ω	3300Ω	0%
5	1500Ω	± 5%	1575Ω-1425Ω	1490Ω	0.6%

ANALYSIS / Results :

SOURCES OF ERROR

INSTRUMENTAL ERROR

- Improper connection of wires

- Improper connection of DMM prongs
- Improper range chosen on DMM

- **OBSERVATIONAL ERROR**

- Improper notation of colors
- Improper reading of DMM

CONCLUSION

In conclusion, color coding provides a quick way to estimate resistor values but a Digital Multimeter (DMM) is necessary for precise measurements and to determine other electrical quantities like current and voltage.