Almustaqbal University
Engineering And Technical Engineering
Computer Techniques Engineering Department
Electrical Engineering Fundamentals
Class :- 1st

Lectuer 1

How to use ammeter, voltmeter and ohmmeter.

By

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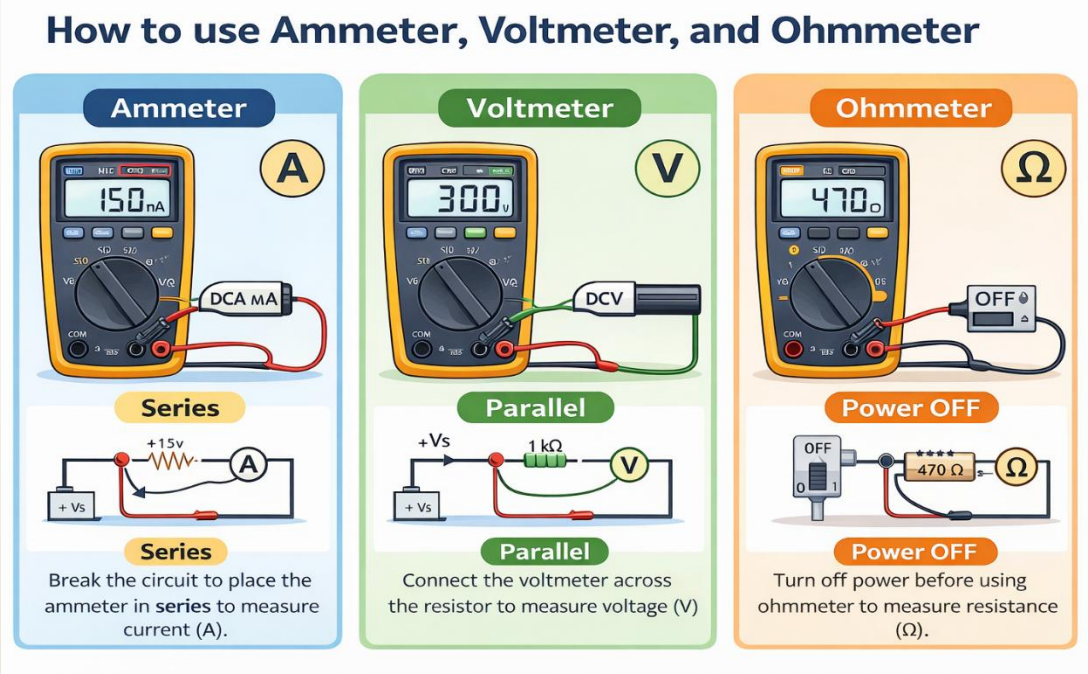
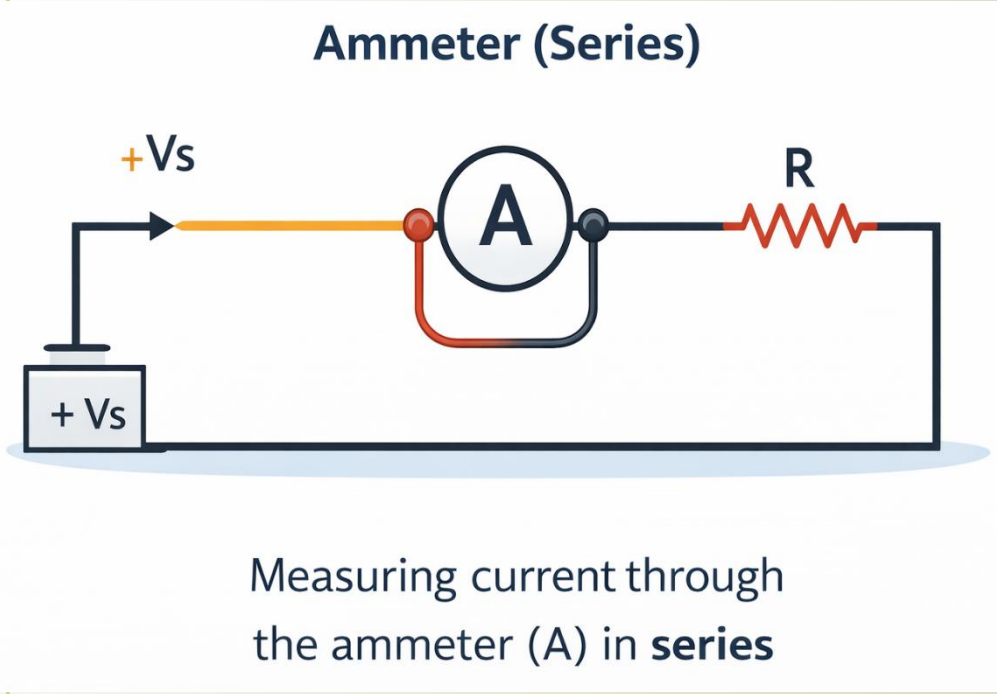
Experiment No. 1 "How to use ammeter, voltmeter and ohmmeter"

This laboratory session is designed to bridge the gap between theoretical concepts and practical implementation. It introduces the fundamental electrical measurement instruments—ammeter, voltmeter, and ohmmeter—and establishes the essential procedures for accurate circuit measurements, reliable analysis, and safe engineering practice.



Experiment No. 1 "How to use ammeter, voltmeter and ohmmeter"

1. **Ammeter — (for measuring current)**
   - **Name:** Ammeter (Ammeter / DMM in Current mode)
   - **Measures:** Electric current **I**
   - **Symbol: A**
   - **Unit:** Ampere (**A**) or milliampere (**mA**)
   - **Connection method: Series** connection within the current path
   - **Why series?** Because the current must pass through the meter in order to be measured.



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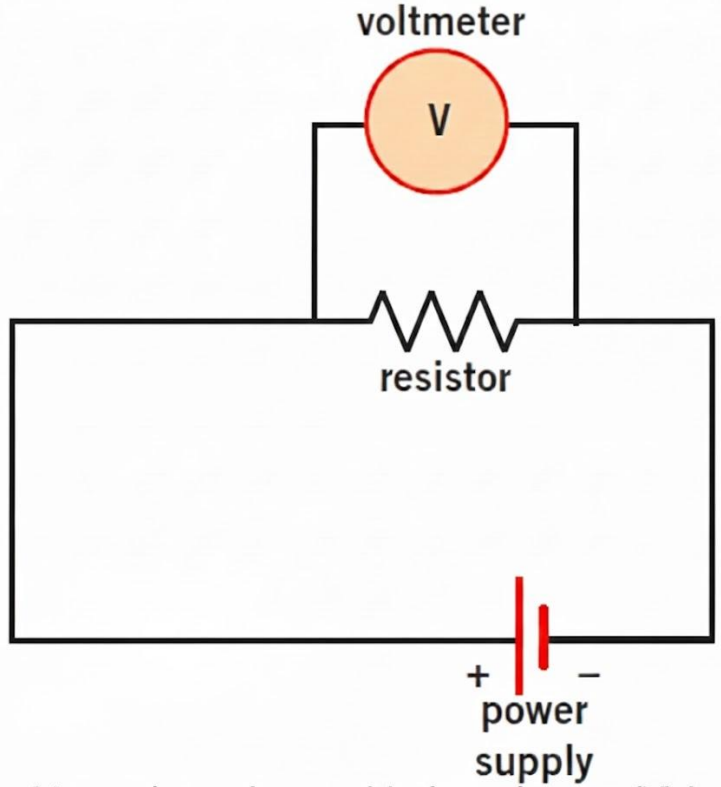
2. **Voltmeter — (for measuring voltage)**
   - **Name:** Voltmeter (Voltmeter / DMM on Voltage mode)
   - **Measures:** Electrical potential difference (voltage) V
   - **Symbol:** V
   - **Unit:** Volt (V)
   - **Connection method: Parallel** across the component / across the two points where the voltage is to be measured
   - **Parallel** Because a voltmeter measures the potential difference between two points



Measuring voltage with the voltmeer (V) in parallel across two points

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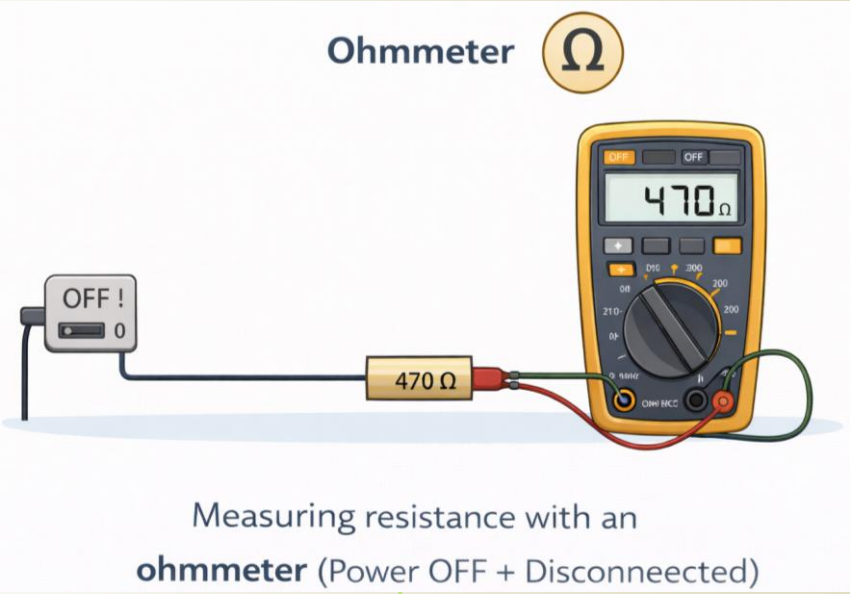
3. Ohmmeter — (for measuring resistance)

- **Name**: Ohmmeter (Ohmmeter / DMM on Resistance mode)
- **Measures**: Electrical resistance R
- **Symbol**: Ω (Omega)
- **Unit**: Ohm (Ω) *(sometimes kΩ, MΩ)*
- **Connection method**: Connect across the resistor
- **Essential condition before measuring**: Power OFF / disconnect the circuit from the supply
- **Power OFF** Because an ohmmeter measures resistance by applying a small internal voltage/current from its own battery; an external power source can cause incorrect readings and may damage the meter.



Measuring resistance with an **ohmmeter** (Power OFF + Disconneected)

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Brief review of fundamental units and symbols :-

1. International System of units:-

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Luminous intensity	candela	cd

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Brief review of fundamental units and symbols :-

2. Abbreviation in multiples and sub-multiples :-

Symbol	Prefix	Multiplying factor
T	Tera	10^{12}
G	Giga	10^{9}
M	Mega (or Meg)	10^{6}
K	Kilo	10^{3}
d	Deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	Micro	10^{-6}
n	Nano	10^{-9}
p	Pico	10^{-12}

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Instrument	Measures (quantity)	Quantity symbol	SI unit (name)	Unit symbol	Device symbol (schematic)	Correct connection
Ammeter	Current	I	ampere	A	Ⓐ	Series (insert into the current path)
Voltmeter	Voltage (potential difference)	V	volt	V	Ⓥ	Parallel (across the component / 2 nodes)
Ohmmeter	Resistance	R	ohm	Ω	Ⓞ / Ω	Across the component (with power removed)

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Ohm's Law

Ohm's Law describes the relationship between voltage, current, and resistance for ohmic elements (such as many resistors) and is given by:

$$V = IR$$

$$I = \frac{V}{R}$$

$$R = \frac{V}{I}$$