SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

Course Name: 19EIT101 & Circuit Analysis

I Year : II Semester

Unit I –DC AND AC CIRCUITS ANALYSIS

Topic : Ohm's Law

Ohm's Law

•Ohm's law is one of the fundamental laws in physics that governs electrical and electronic circuits. Ohm's law is known to be the relation between voltage and current.

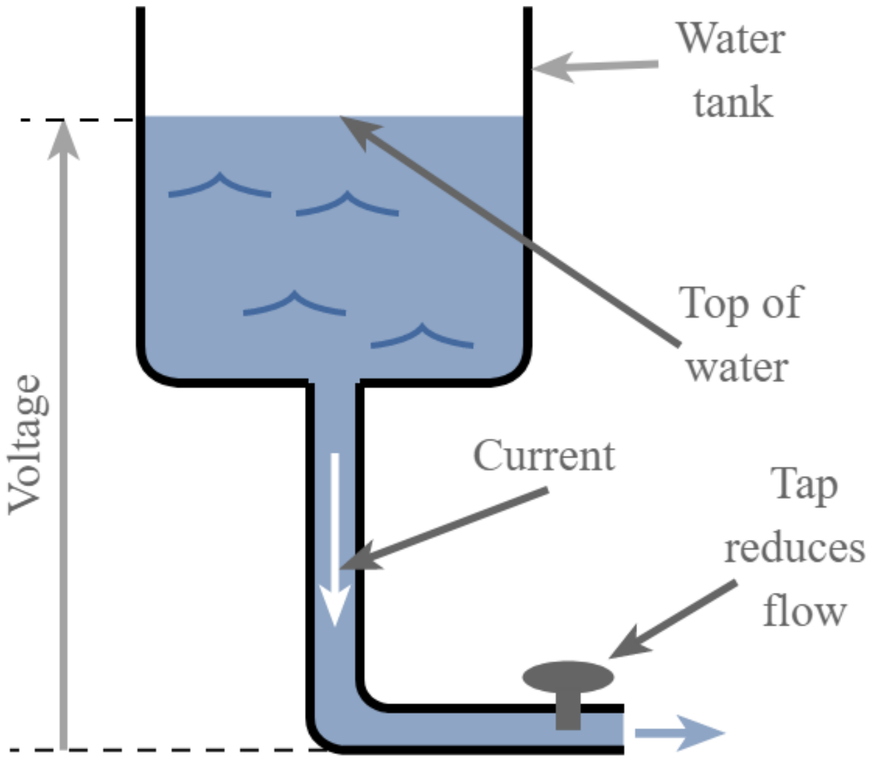
•**Statement:**

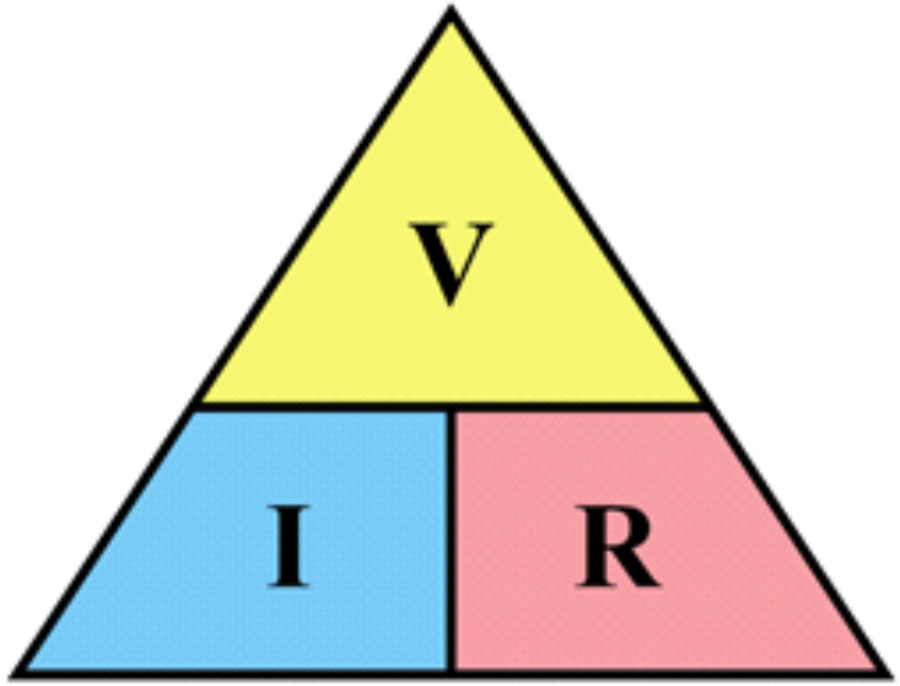
- Ohm's law states that the **current** flowing in a circuit is **directly proportional** to the applied **potential difference** and **inversely proportional** to the **resistance** in the circuit.
- If I is the current flowing through a conducting wire and V is the potential difference across the ends of the conducting wire, then according to Ohm's law (At constant temperature):

$$V \propto I$$

$$V = IR$$

Ohm's Law


Water
tank
Top of
water
Voltage
Current
Tap
reduces
flow


V
I
R

Ohm’s Law – Factors Affecting Resistance

- When temperature and other physical conditions remain unchanged, then from Ohm’s law, the resistance of a conductor remains constant.

1. Resistance depends on the temperature.
2. Resistance depends on the length of the conductor.
3. Resistance depends on the area of the cross-section of the conductor.
4. Resistance depends on the nature of the material.

$$R = \rho \frac{L}{A}$$

Ohm's Law Matrix table

Known Values	Resistance	Current	Voltage	Power
Current & Resistance	–	–	$V = IR$	$P = I^2R$
Voltage & Current	$R = V/I$	–	–	$P = V \times I$
Power & Current	$R = P/ I^2$	–	$V = P/ I$	–
Voltage & Resistance	–	$I = V/ R$	–	$P = V^2/R$
Power & Resistance	–	$I = \sqrt{P}/R$	$V = \sqrt{P} \times R$	–
Voltage & Power	$R = V^2/ P$	$I = P/ V$	–	–