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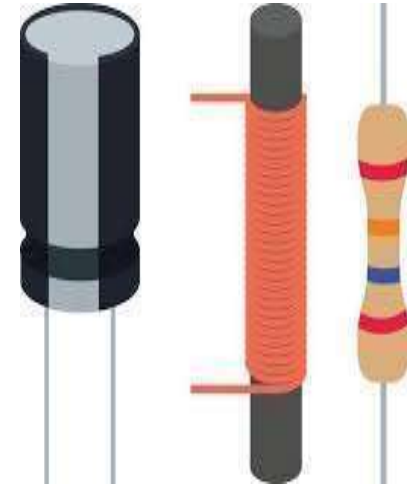
## Department of Artificial Intelligence and Data Science

23EET103-Electric Circuits and  
Electron Devices

I B.Tech. IT/ II SEMESTER

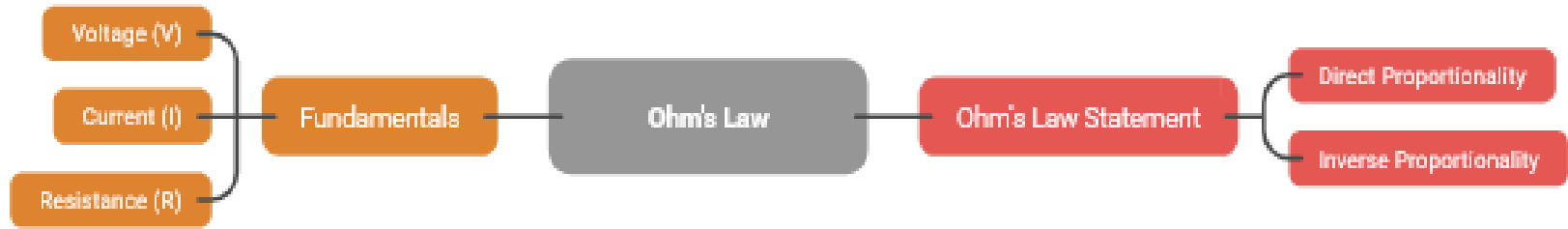
### UNIT I : DC CIRCUITS

#### Topic 4: Series Circuits



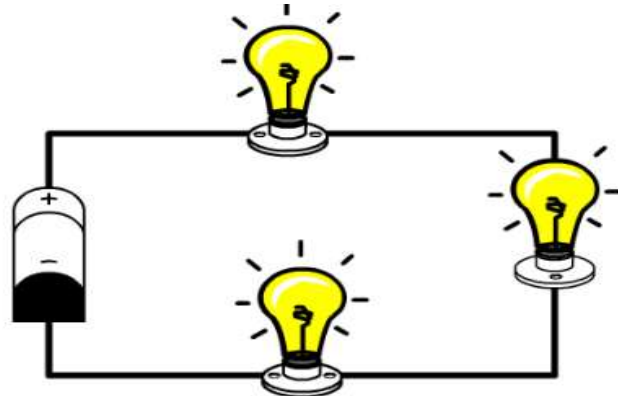
# Recall!!!

## Ohm's Law Fundamentals and Statement



# What is a Series Circuit?

- A **series circuit** is a circuit where **all components are connected one after another in a single path** for current flow.
- ☞ There is **only ONE path** for electricity to travel.



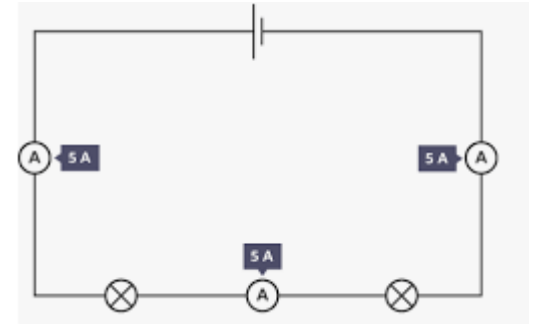
**Series Circuit**

# Key Rule #1: Current

In a series circuit:

- $I_{total} = I_1 = I_2 = I_3$

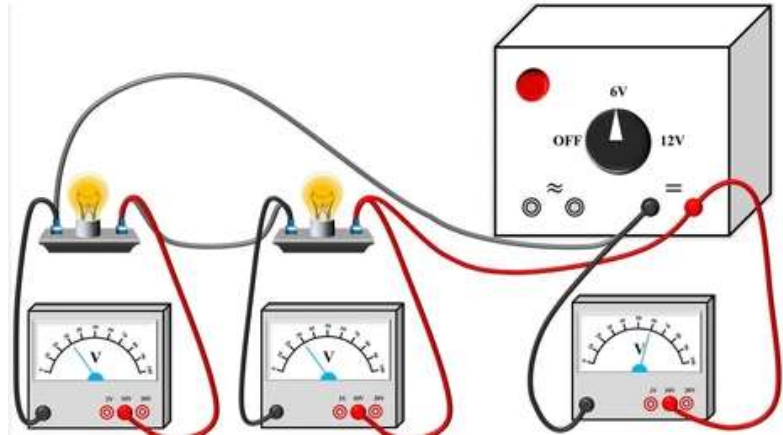
☞ The **same current** flows through all components. **Why?**



Because there is only one path — current has no option to split.

## Key Rule #2: Voltage

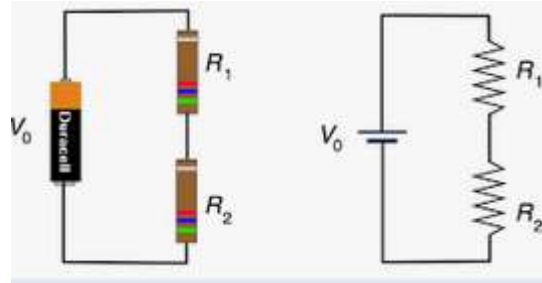
- $V_{\text{total}} = V_1 + V_2 + V_3$



- The supply voltage is **divided** among components.
- Each resistor gets a share of voltage.

# Key Rule #3: Resistance

- $R_{total} = R_1 + R_2 + R_3$



- Total resistance is the **sum** of all resistances.  
 ☞ More resistors in series = **more resistance** = less current.

# Problem 1 (Find Total Resistance)

**Given:**

$$R_1 = 2\Omega, R_2 = 3\Omega, R_3 = 5\Omega$$

**Find:** Total Resistance

**Solution:**

$$R_T = R_1 + R_2 + R_3$$

$$R_T = 2 + 3 + 5 = 10\Omega$$

✓ **Answer: 10Ω**

## Problem 2 (Find Current)

**Given:**

$$V = 20V$$

$$R_1 = 4\Omega, R_2 = 6\Omega$$

**Step 1: Total Resistance**

**Step 2: Ohm's Law**

$$R_T = 4 + 6 = 10\Omega$$

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

$$I = \frac{20}{10} = 2A$$

**=2A everywhere**

## Problem 3 (Voltage Across Each Resistor)

From previous problem:

$$I = 2A$$

**Find  $V_1$  and  $V_2$**

$$V_1 = I \times R_1 = 2 \times 4 = 8V$$

$$V_2 = I \times R_2 = 2 \times 6 = 12V$$

Check:

$$V_T = 8 + 12 = 20V \checkmark$$

## Problem 4 (Three Resistors)

- **Given:**

$$V = 24V$$

$$R_1 = 2\Omega, R_2 = 4\Omega, R_3 = 6\Omega$$

**Step 1:**

$$R_T = 2 + 4 + 6 = 12\Omega$$

**Step 2:**

$$I = \frac{24}{12} = 2A$$

## Continue Problem 4

Find voltage across each resistor:

$$V_1 = 2 \times 2 = 4V$$

$$V_2 = 2 \times 4 = 8V$$

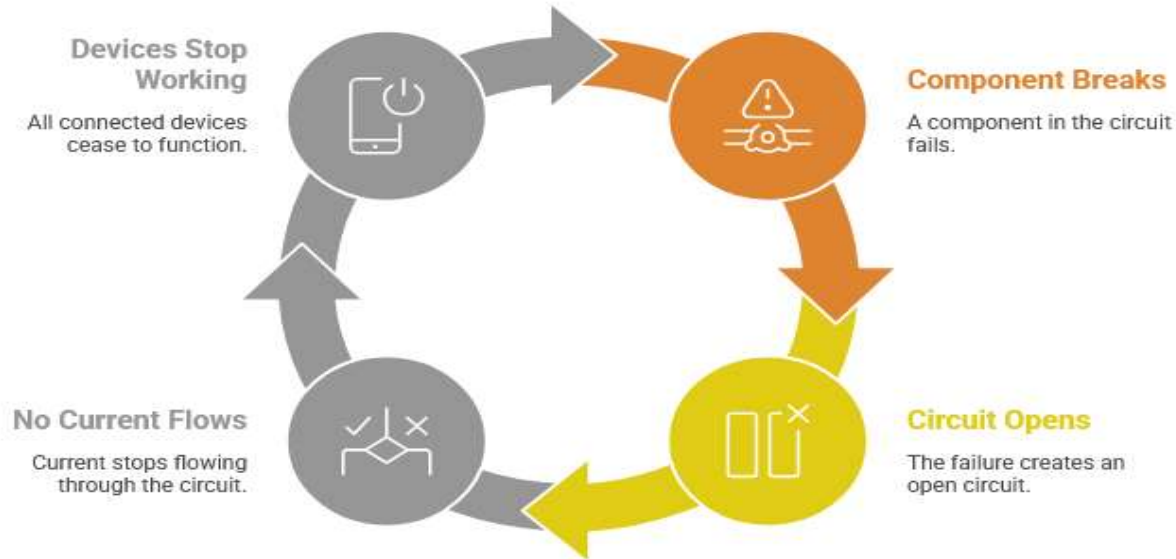
$$V_3 = 2 \times 6 = 12V$$

Check:

$$4 + 8 + 12 = 24V \checkmark$$

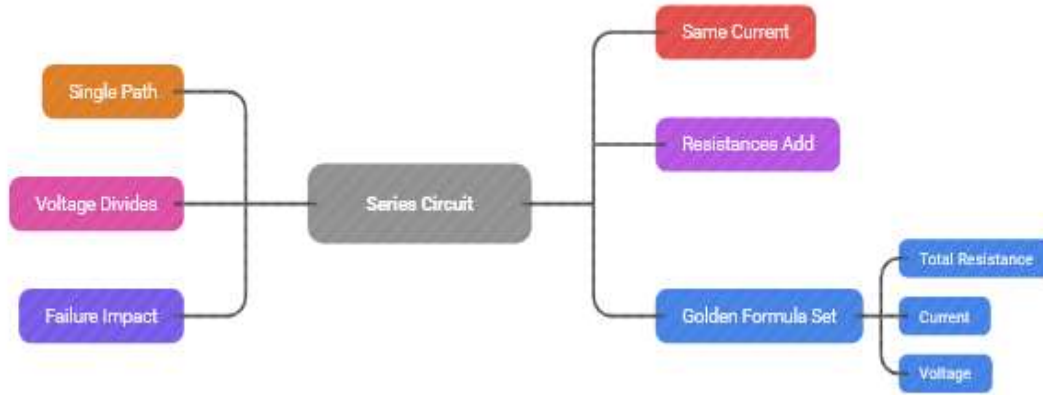
# What Happens if One Resistor Fails?

## Circuit Failure Cycle



# Let's Summarize

## Series Circuit Characteristics and Formulas



## Golden Formula Set

$$R_T = R_1 + R_2 + R_3$$

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

$$V = IR$$

# Conceptual / Thinking

## Series Circuit Behavior

Why does the current remain the same in a series circuit?

In a series circuit, there is only one path for the current to flow. Therefore, the current must be the same at every point in the circuit.

What happens to total resistance if more resistors are added in series?

Adding more resistors in series increases the total resistance of the circuit.

In a series circuit, one bulb fuses. What happens to the other bulbs? Why?

If one bulb fuses, the circuit is broken, and the current stops flowing. Therefore, all the other bulbs will go out.

Because a **series circuit has only one path** for current flow.

More resistance  
→ less current (for the same voltage).

No current  
→ no bulb glows ! ✕





*Thank  
you!*