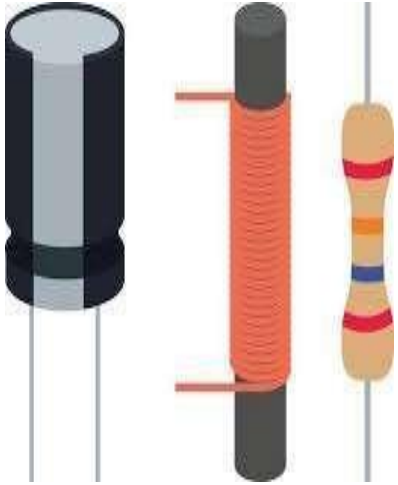
SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

Department of Artificial Intelligence and Data Science



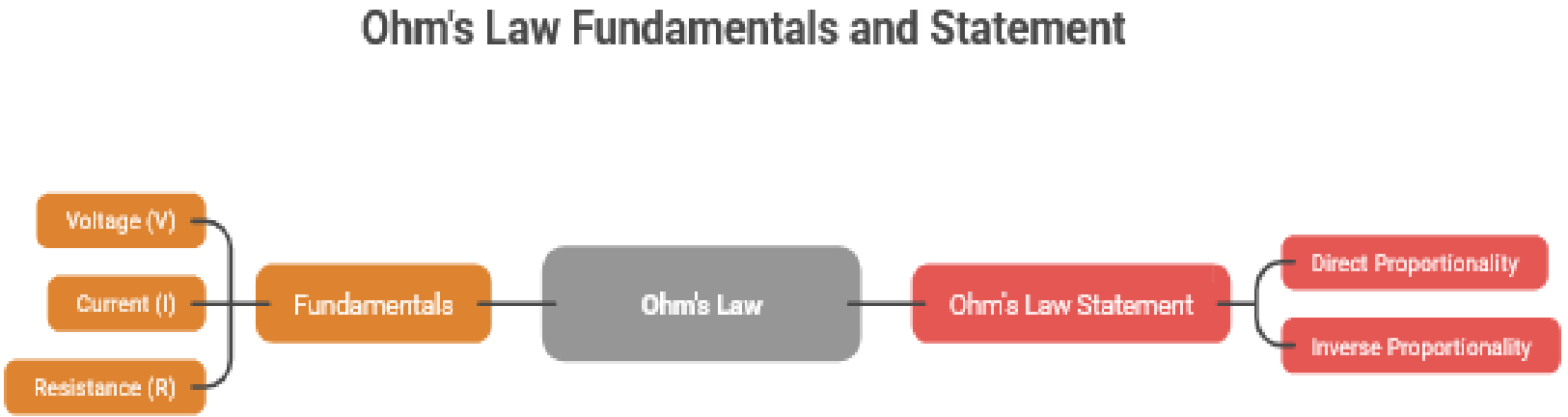
23EET103-Electric Circuits and Electron Devices

I B.Tech. AIDS/ II SEMESTER

UNIT I : DC CIRCUITS

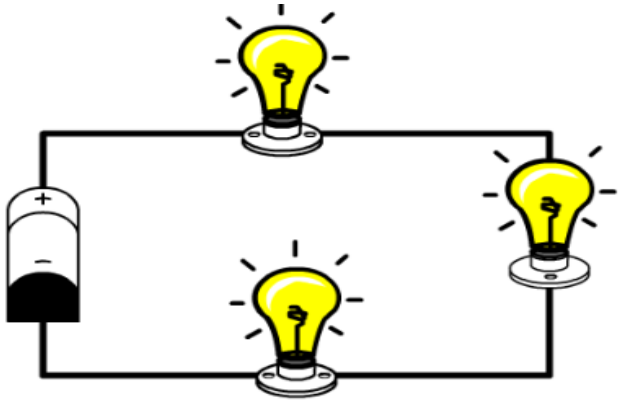
Topic 4: Serial Circuits

Recall!!!


Ohm's Law Fundamentals and Statement
Voltage (V)
Current (I)
Resistance (R)
Fundamentals
Ohm's Law
Ohm's Law Statement
Direct Proportionality
Inverse Proportionality

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.



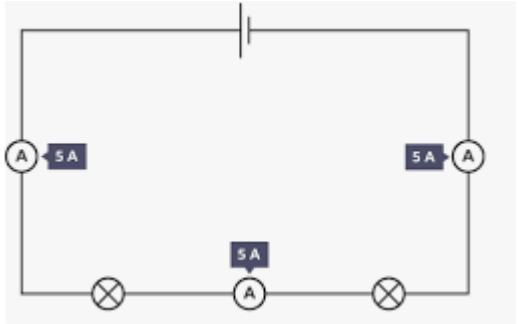
Series Circuit

Key Rule #1: Current

In a series circuit:

- I total=I1=I2=I3

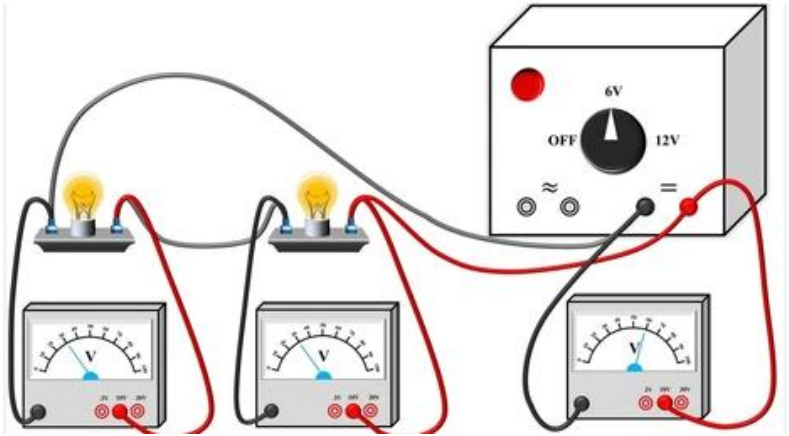
👉 The **same current** flows through all components. **Why?**



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

Key Rule #2: Voltage

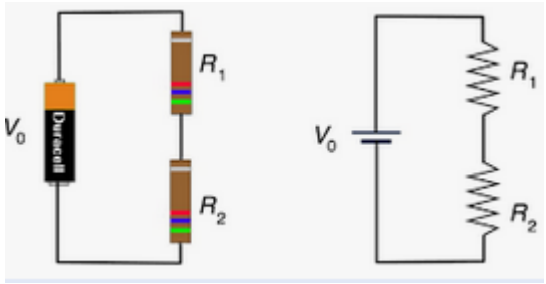
- V total=V1+V2+V3



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

Key Rule #3: Resistance

- Rtotal=R1+R2+R3



- 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 = 2Ω, R_2 = 4Ω, R_3 = 6Ω

Step 1:

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

Step 2:

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

Continue Problem 4

Find voltage across each resistor:

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

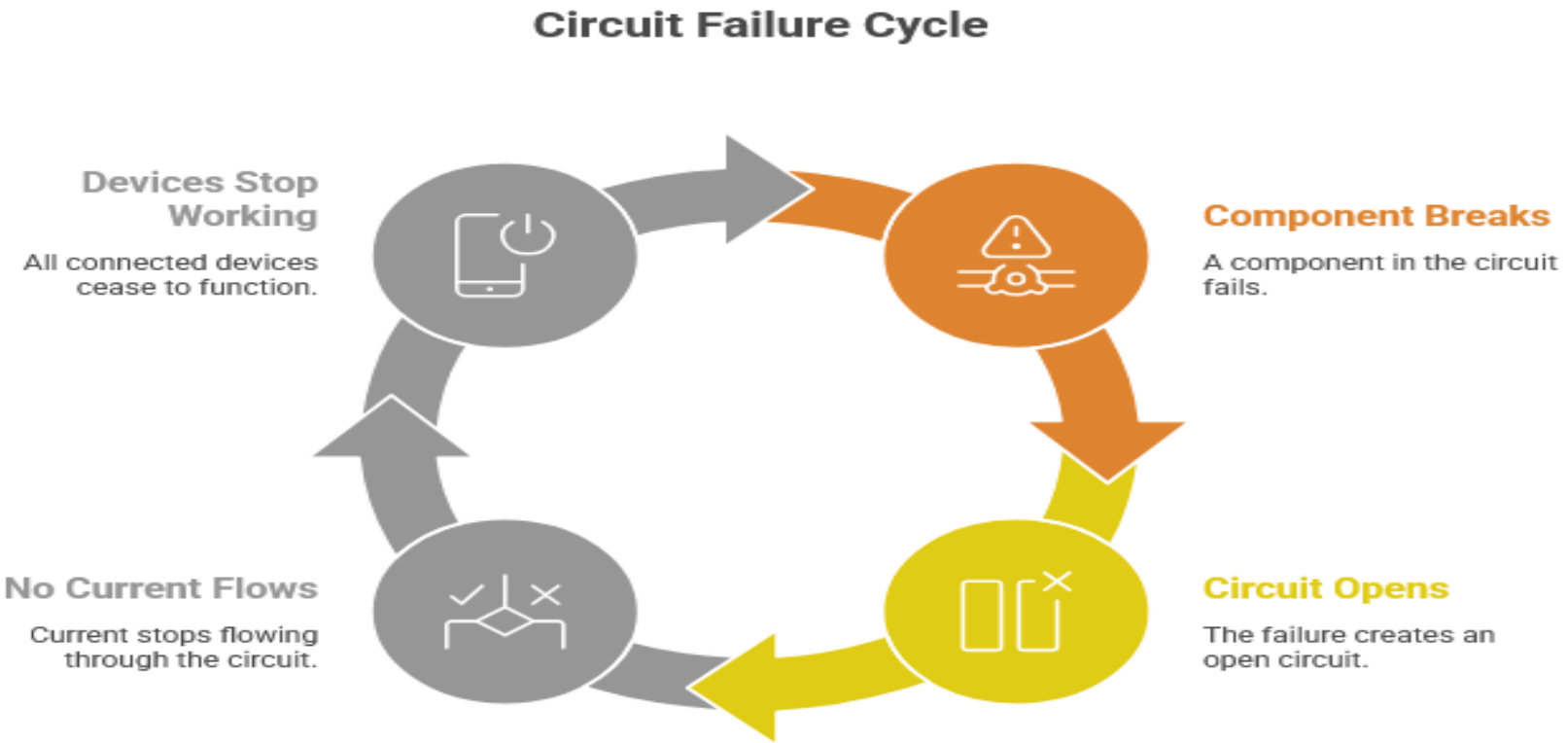
$$V_2 = 2 \times 4 = 8V$$

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

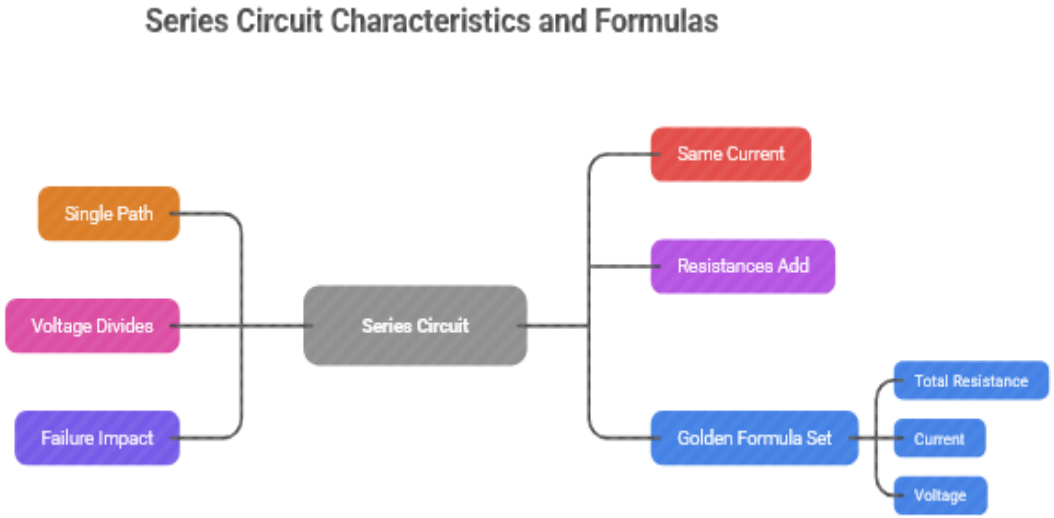
Check:

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

What Happens if One Resistor Fails?



Let's Summarize



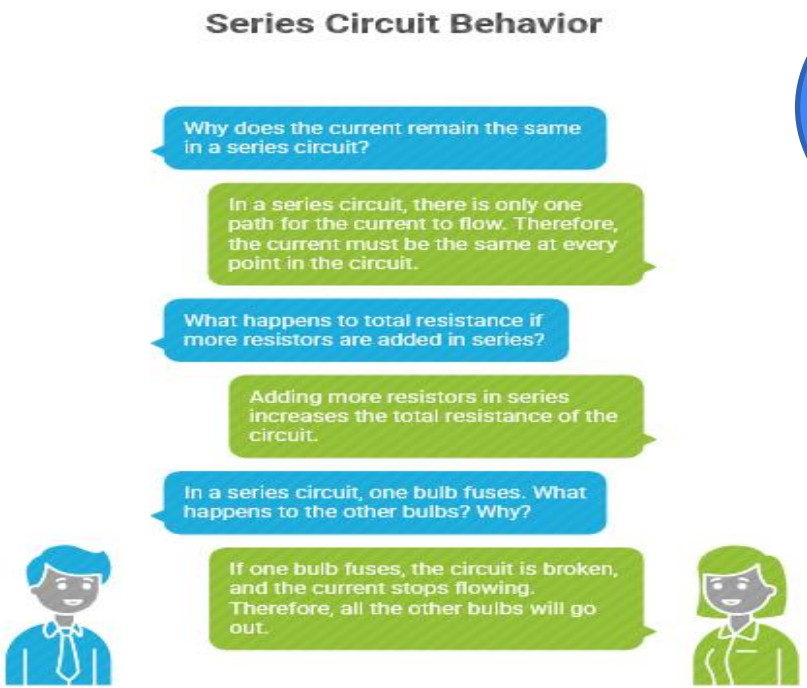
Golden Formula Set

$$R_T = R_1 + R_2 + R_3$$

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

$$V = IR$$

Conceptual / Thinking



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

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

No current → no bulb glows 💡❌

REFERENCES

- https://www.britannica.com/technology/series-circuit
- https://www.electronicshub.org/series-circuit
- https://www.geeksforgeeks.org/physics/series-circuit-formula
- https://electricalworkbook.com/series-circuit

Thank you!