University of Al-Mustaqbal
College of Science
Department of Medical Physics

Electrical Material

First Stage

Lecture name : Current & Resistance

Lecture number : 6

Name of lecturer

Asst lec. Israa Hussein

What is Electric Current?

1. Meaning of Electric Current

Electric current means the **flow of electric charges** (electrons) inside a wire.

- Charges move when the circuit is **closed**
- Current flows only if there is a **battery or power source**

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2. Direction of Current

- Current flows from **positive (+)** to **negative (–)**
- Electrons move in the opposite direction

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Current:   +  ---->  -
Electrons: -  <----  +
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3. Unit of Current

- Unit: **Ampere (A)**
- Large current → bright bulb
- Small current → dim bulb

Simple Idea of Current Flow

1. Water Flow Analogy

Electric current is like **water flowing in a pipe**:

Electricity	Water
Battery	Water pump
Current	Water flow
Wire	Pipe

2. Closed and Open Circuits

- **Closed circuit** → current flows
- **Open circuit** → no current

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3. Why Current is Important

Current is needed to:

- Light lamps
- Run devices
- Heat wires

What is Resistance?

1. Meaning of Resistance

Resistance is **anything that slows down electric current**.

- High resistance → small current
- Low resistance → large current

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2. Resistor

A resistor is a component used to **control current**.

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3. Unit of Resistance

- Unit: **Ohm (Ω)**

Examples:

- Metal wire → low resistance
- Plastic, rubber → very high resistance

Voltage, Current, and Resistance (Simple Relation)

1. Voltage (Very Simple Idea)

Voltage is the **push** that makes charges move.

- Higher voltage → stronger push
- Lower voltage → weaker push

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2. Simple Relationship (Ohm's Law – Basic Form)

Only one main formula is needed:

V = IR

Meaning:

- Voltage = push
- Current = flow
- Resistance = obstacle

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3. Easy Example (No Math)

- Strong push + small obstacle → big current
- Weak push + big obstacle → small current

Power and Daily Life Examples

1. Electrical Power (Simple Idea)

Power tells us **how fast electrical energy is used**.

- High power → more energy used
- Low power → less energy used

(Formula not required for beginners)

2. Heating Effect

When current flows:

- Wires become warm
- Used in heaters and irons

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3. Safety Note

- Very large current can damage devices
- Fuses and resistors protect circuits

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4. Summary

- Current = flow of charges
- Resistance = opposition to current
- Voltage = push
- Simple rule: more resistance → less current