SNS COLLEGE OF TECHNOLOGY

Saravanampatti, Coimbatore – 641 035

Approved by AICTE, Recognized by UGC & Affiliated to Anna University, Chennai

Department of Electronics and Communication Engineering

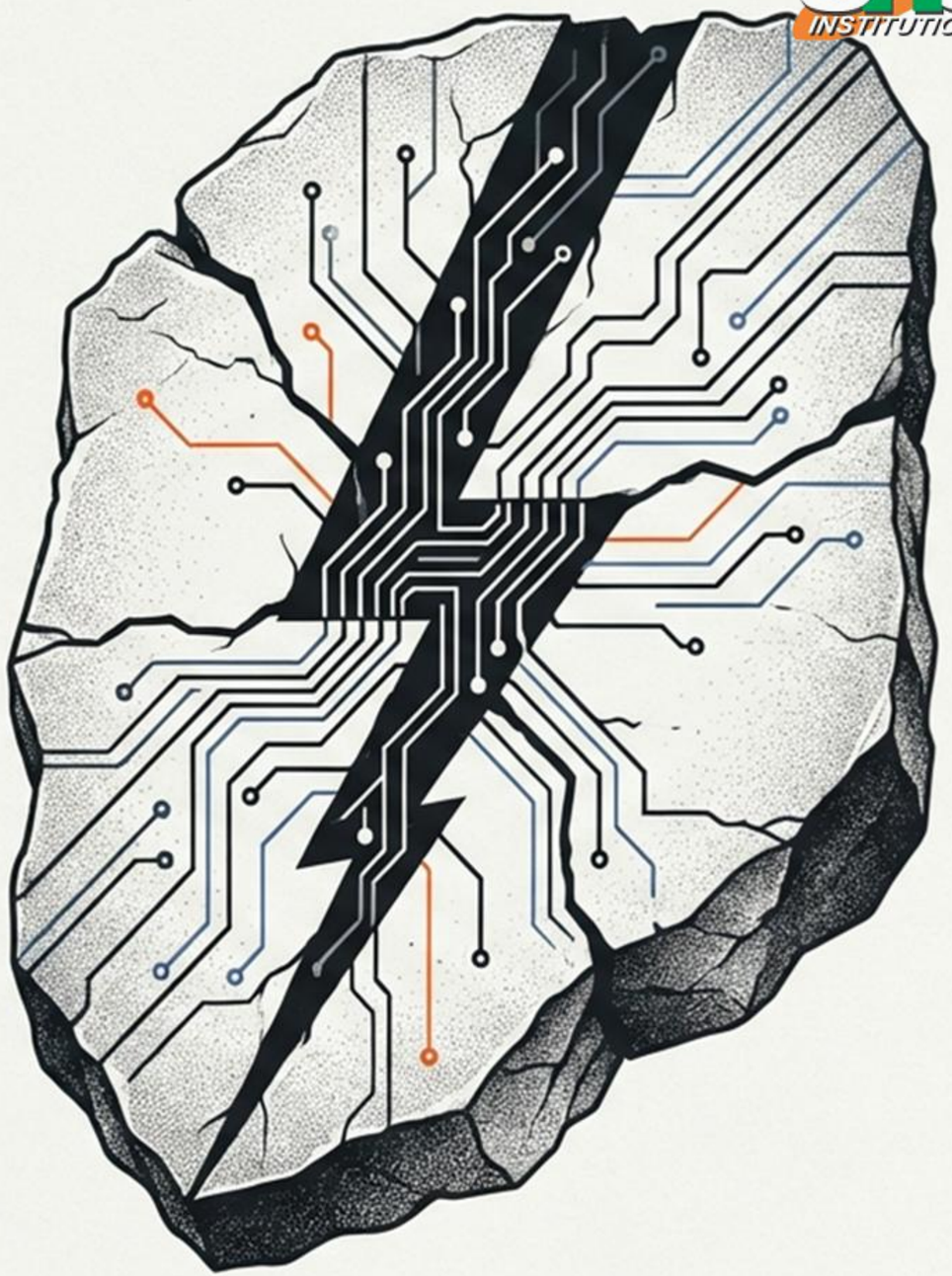
23EET103 – Electric Circuits and Electron Devices

I YEAR /II SEMESTER

UNIT -1 – Voltage and Current

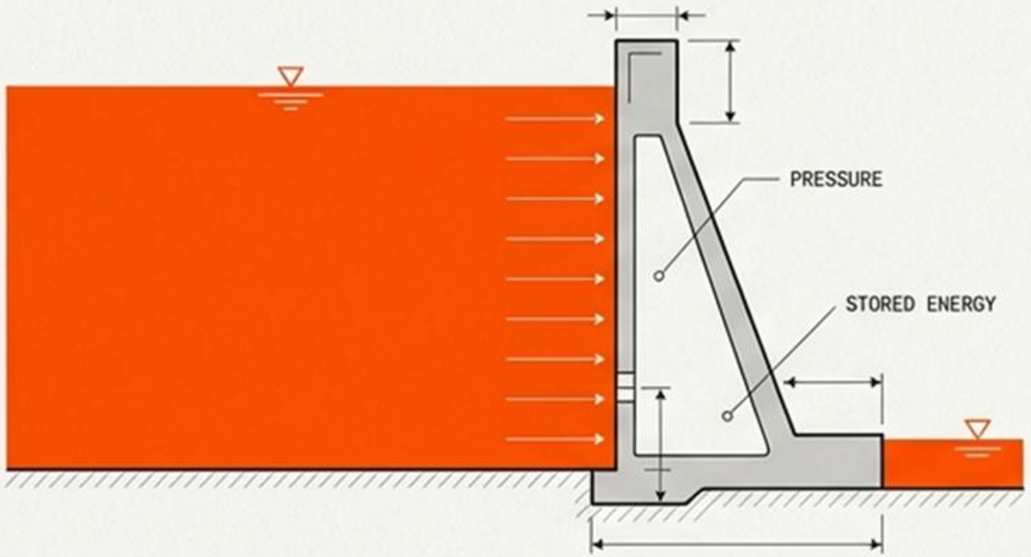
THE PHYSICS OF FLOW

Electricity is energy in motion. To control it, we must first understand the distinction between the force that pushes and the charge that flows. This deck deconstructs the mechanics of V (Voltage) and I (Current).



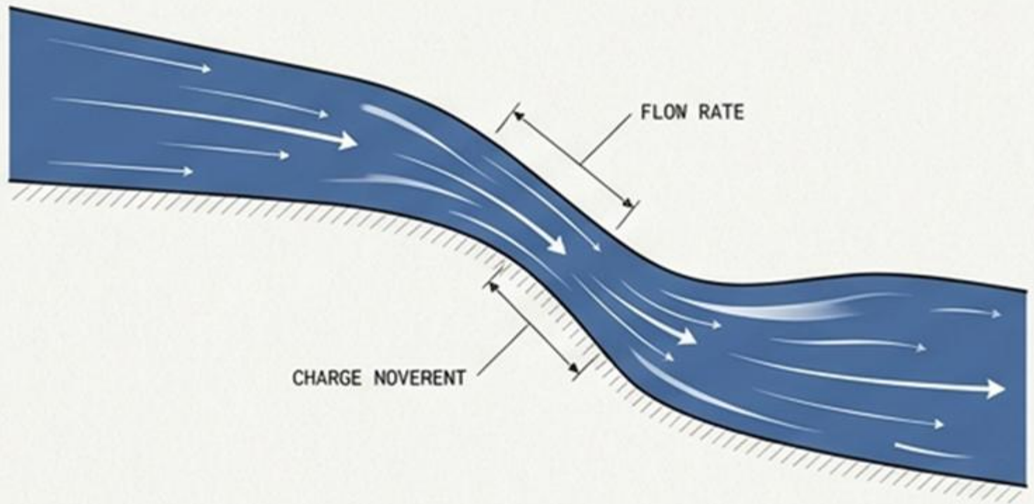
THE PUSH VS. THE FLOW

THE POTENTIAL (VOLTAGE)



The Invisible Force.
A state of tension and readiness.
Defined by Pressure.

THE ACTION (CURRENT)



The Physical Result.
The act of movement.
Defined by Rate.

Voltage is the desire to move. Current is the movement itself.
One can exist without the other, but work requires both.

ELECTRIC VOLTAGE (V): THE DRIVER

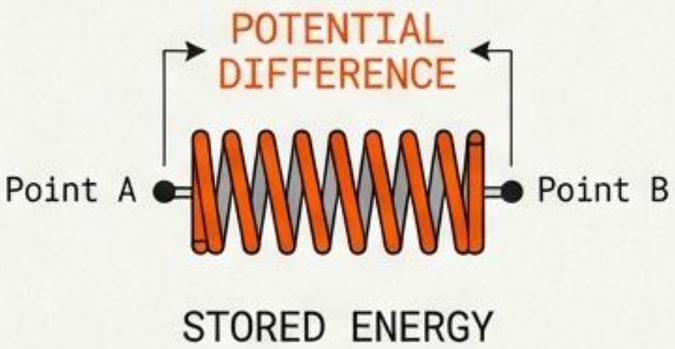
Voltage is the Electrical Potential Difference between two specific points.
It is the work required to move energy.

The Push (Volts)

Work Done (Joules)

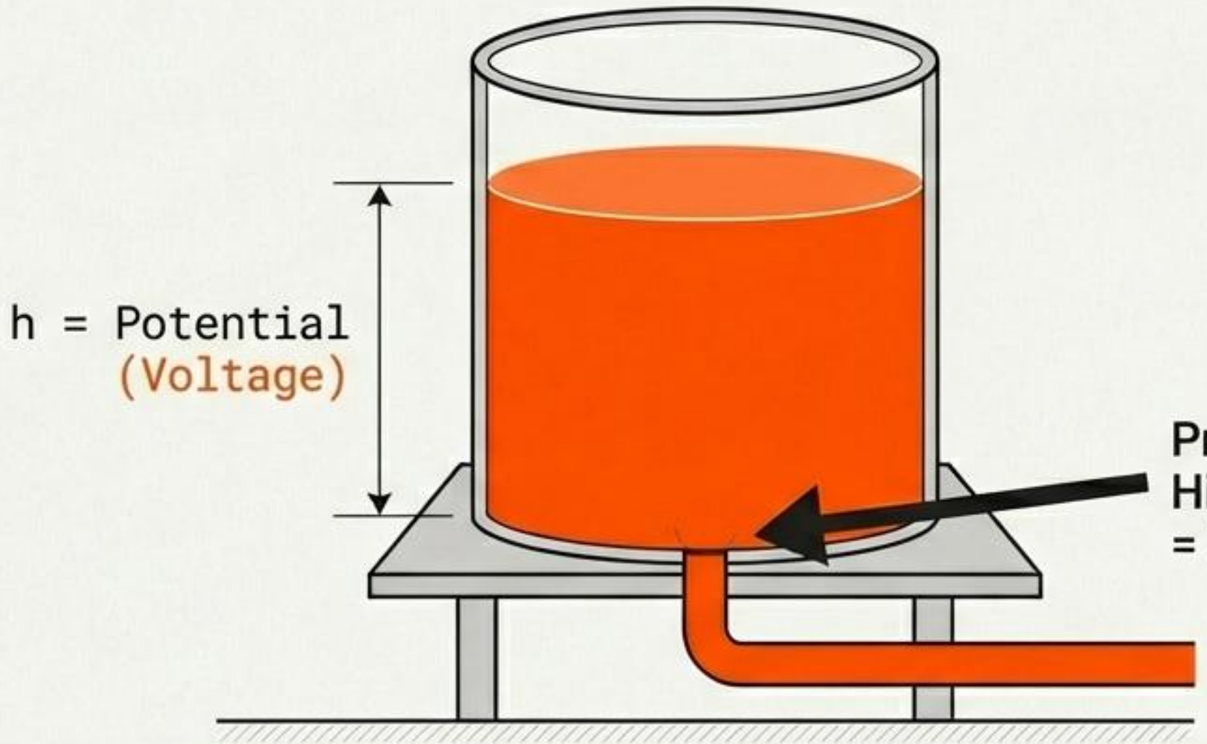
$$V = W/Q$$

Unit Charge (Coulombs)



DEFINING THE UNIT: THE VOLT

1 Volt = 1 Joule of work per 1 Coulomb of charge.



Pressure point.
Higher tank = More pressure
= More Voltage.

Voltage is not the water itself;
it is the pressure pushing the water.

ELECTRIC CURRENT (I): THE FLOW

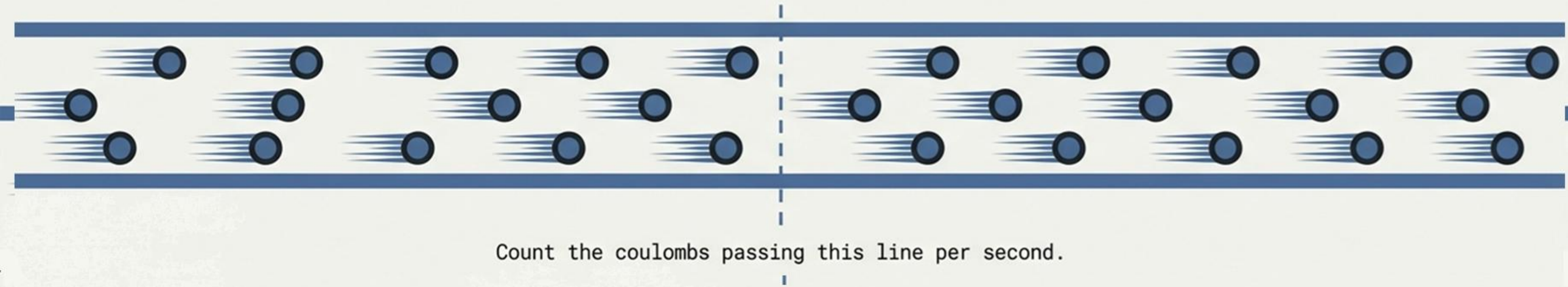
Current is the Rate of Flow at which electric charge passes a specific point in a circuit.

Current (Amperes)

$$I = Q / t$$

Time (Seconds)

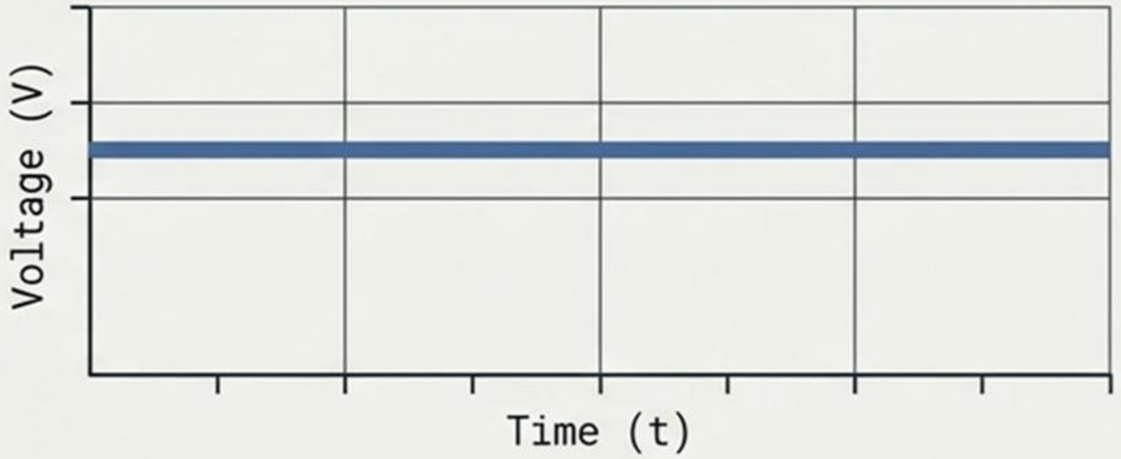
Total Charge (Coulombs)



MODES OF TRANSPORT: DC VS. AC

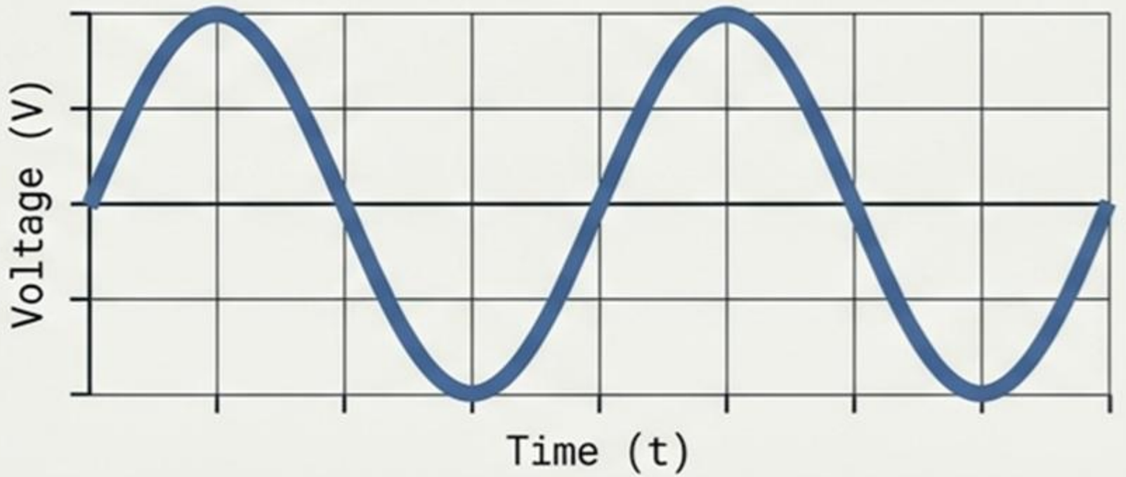
DIRECT CURRENT (DC)

Voltage and current remain constant.
(e.g., Batteries)

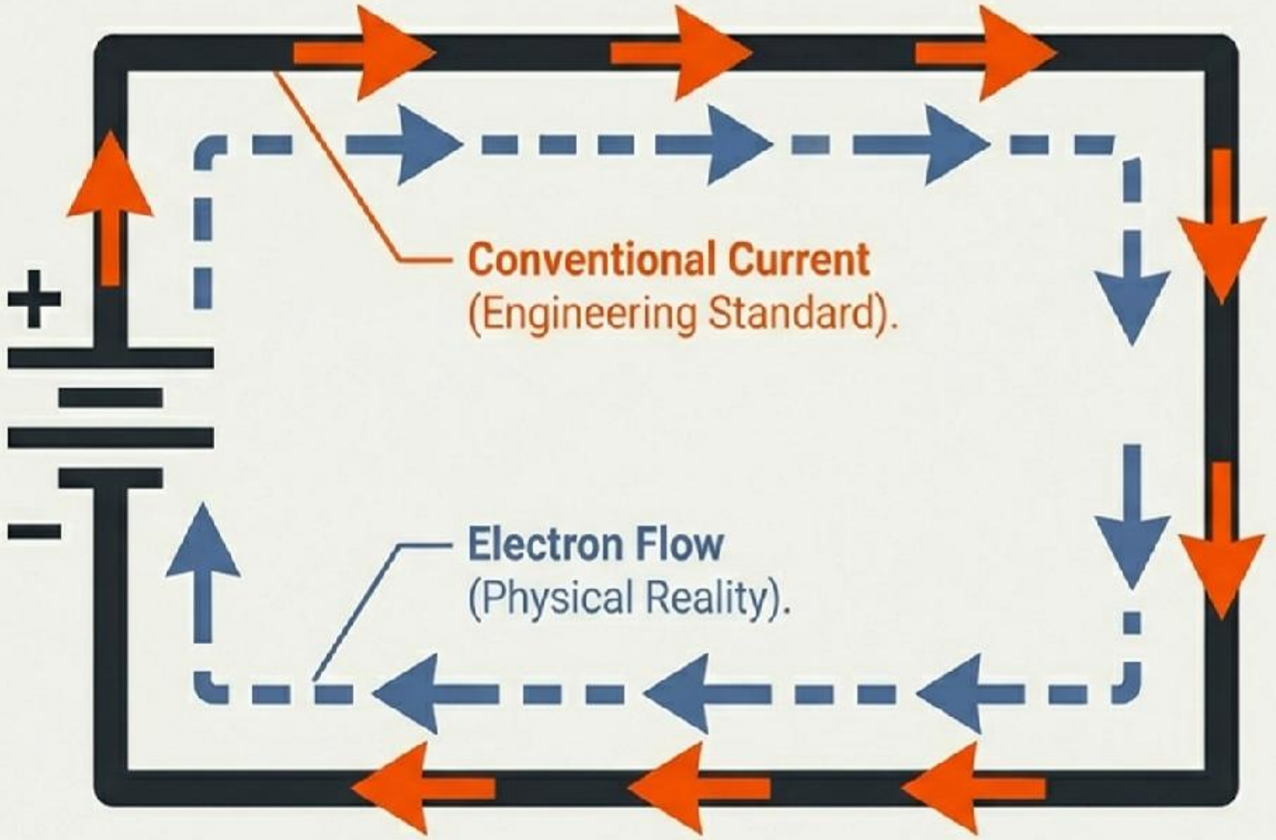


ALTERNATING CURRENT (AC)

Voltage and current periodically reverse direction.
(e.g., Wall Outlets)



THE DIRECTION PARADOX



Historically, current was defined before the discovery of the electron.

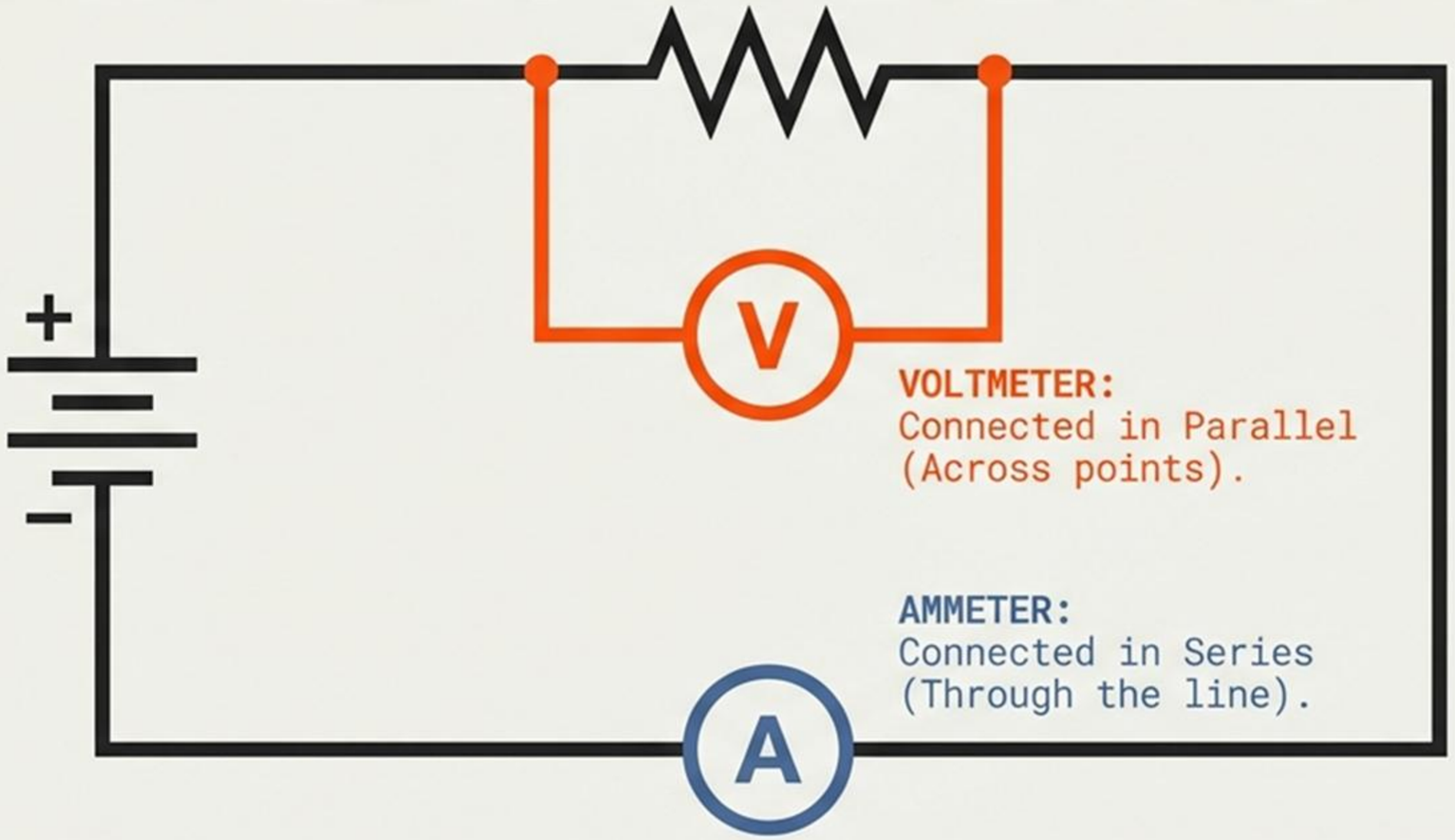
In engineering and schematics, we use Conventional Current (+ to -).

In physics and atomic analysis, we acknowledge Electron Flow (- to +).

FUNDAMENTAL DIFFERENCES

FEATURE	VOLTAGE (V)	CURRENT (I)
Basic Concept	Potential Difference (Pressure)	Rate of Flow (Movement)
Causality	The CAUSE	The EFFECT
Unit	Volts (V)	Amperes (A)
Measurement	Across (Parallel)	Through (Series)

THE TOOLKIT: MEASURING THE INVISIBLE



VOLTMETER:
Connected in Parallel
(Across points).

AMMETER:
Connected in Series
(Through the line).

SUMMARY OF FUNDAMENTALS

VOLTAGE (V)

The Push.

V = W / Q

Volts

CURRENT (I)

The Flow.

I = Q / t

Amps

REFERENCES

- https://www.electrical4u.com/voltage-or-electric-potential-difference/
- https://www.allaboutcircuits.com/textbook/direct-current/chpt-1/voltage-current/
- https://nptel.ac.in/courses/108106172

THANK YOU