

An Autonomous Institution
Coimbatore-35

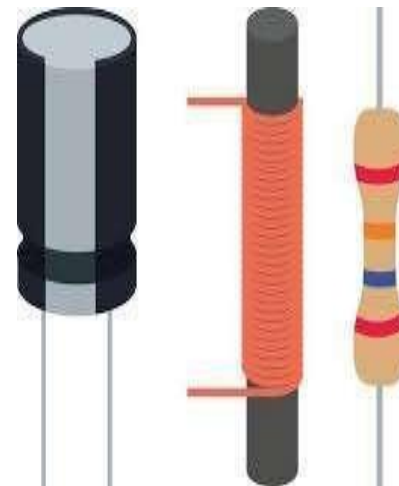
Department of Artificial Intelligence and Data Science

23EET103-Electric Circuits and
Electron Devices

I B.Tech. AIDS / II SEMESTER

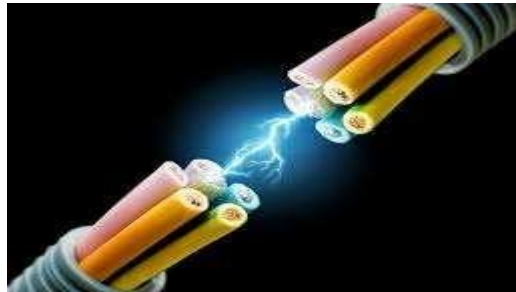
UNIT I : DC CIRCUITS

Topic 1 : Voltage, Current, Power and Energy



TOPIC OUTLINE

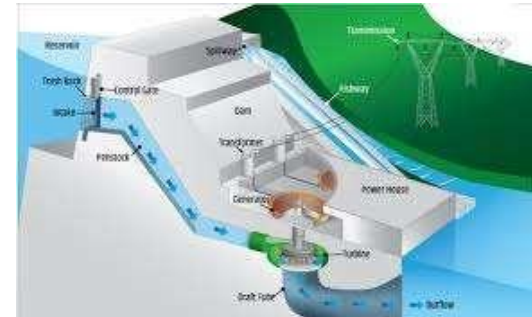
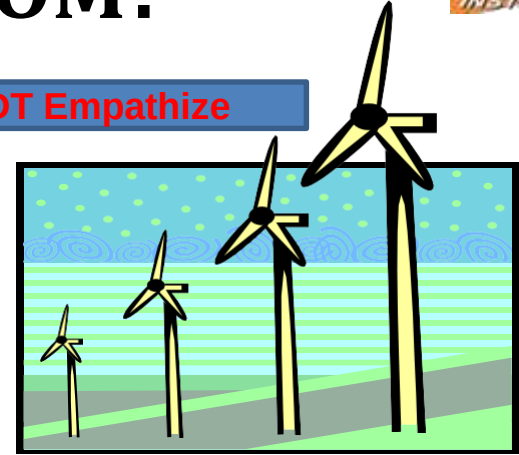
- Electricity?
- Voltage, Current, Resistance
- Nature of Current



ELECTRICITY COMES FROM?

DT Empathize

- We buy it from **Power Plants – Eg. Hydro**
- We can generate it ourselves
 - **Diesel** or **gasoline** generators
 - Generated in our **Car**
 - Generated by home **Solar or wind power**
- We can get it from **Batteries**
- Sometimes we get it when we **don't want** it
 - **Lightning**

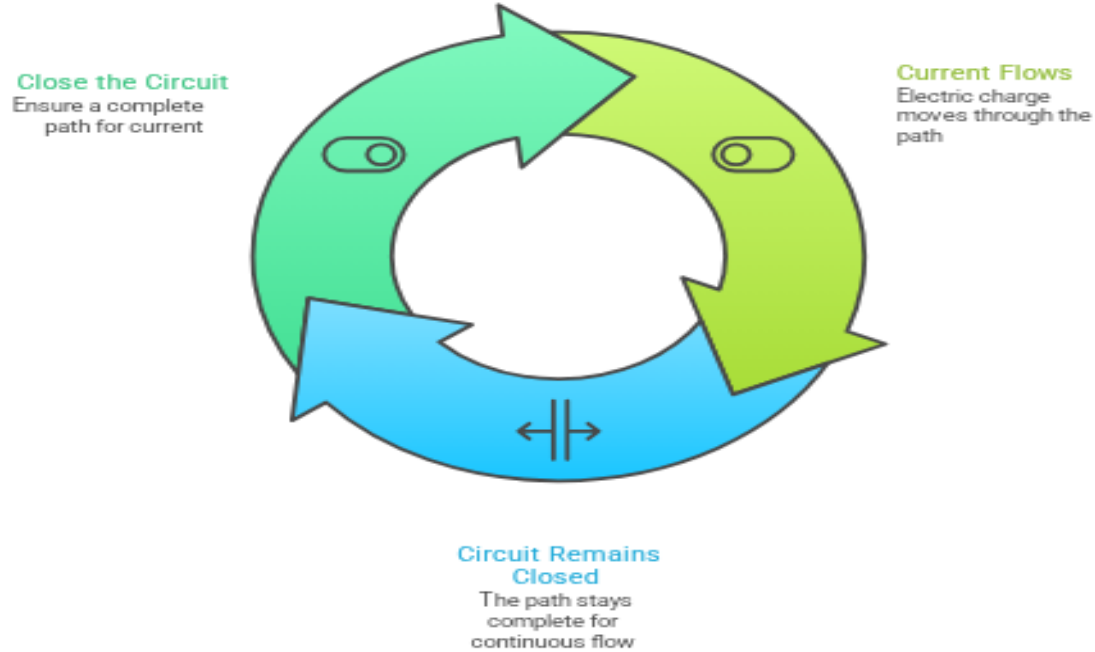


What is an Electric Circuit?

An **electric circuit** is a **closed conducting path** through which electric current flows.

☞ For current to flow, the circuit **must be closed**.

Electric Circuit Current Flow Cycle



Basic Components of an Electric Circuit

Source of Energy

Battery (DC)

AC supply / Generator

Conductor

Copper wires

Provides path for current

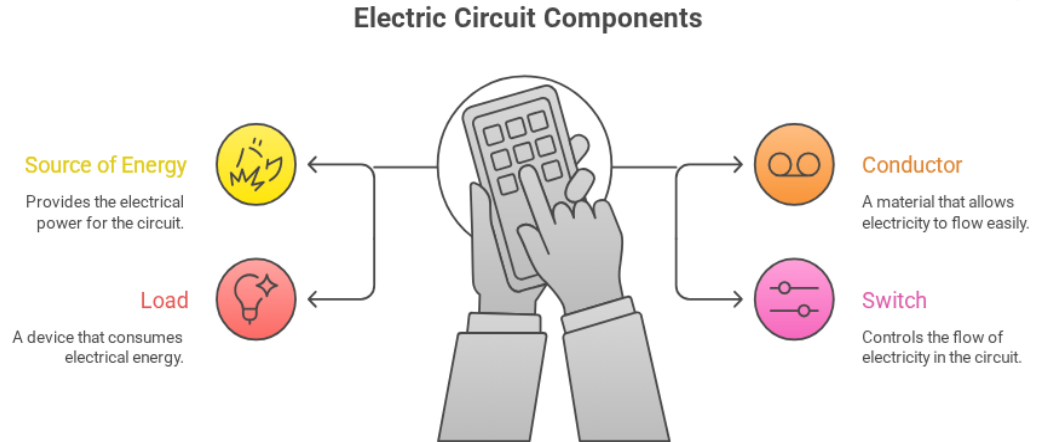
Load

Bulb, resistor, motor

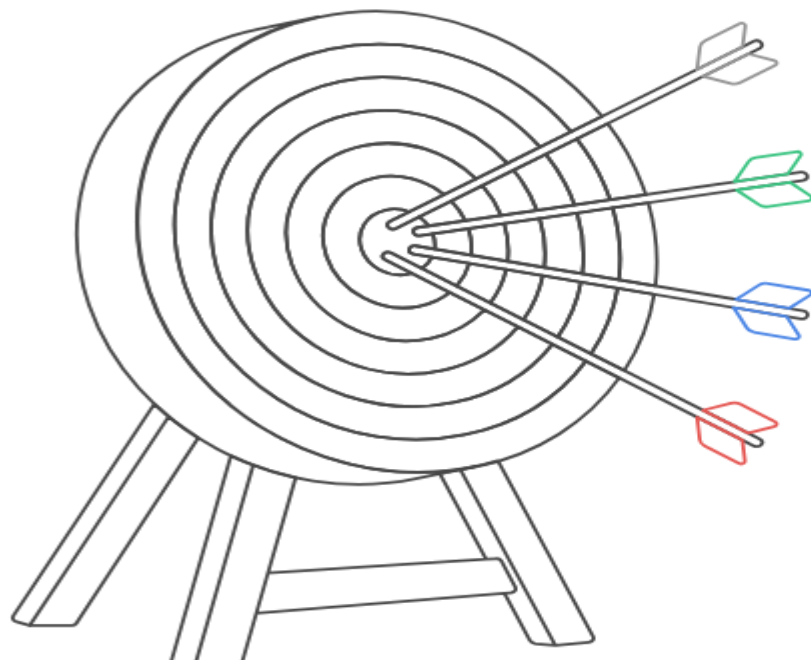
Uses electrical energy

Switch

Opens or closes the circuit



Types of Electric Circuits



Electric Circuit

Basic flow of electricity



Open Circuit

Broken path, no current flow



Closed Circuit

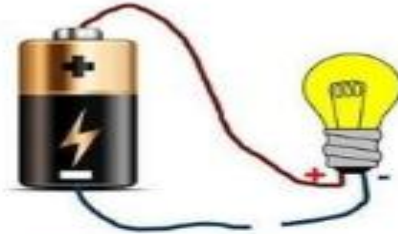
Complete path, current flows



Short Circuit

Low resistance, excessive current

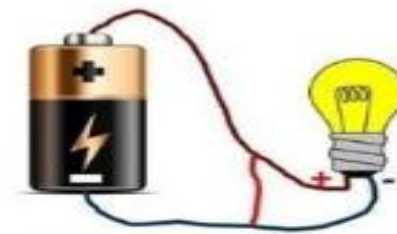
Types of Electric Circuits



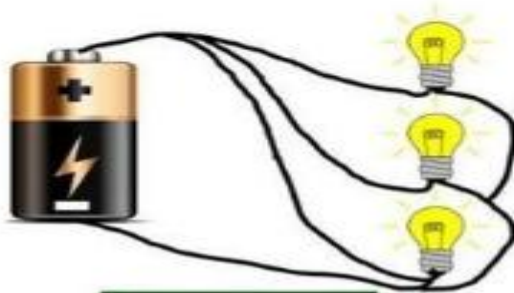
Open Circuit



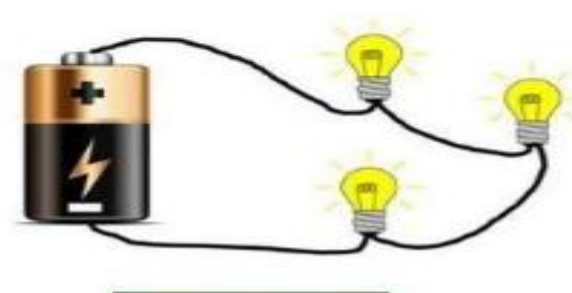
Close Circuit



Short Circuit

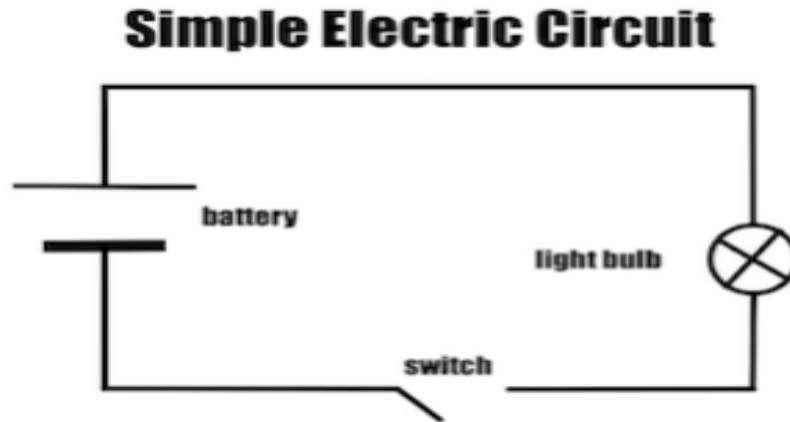


Parallel Circuit

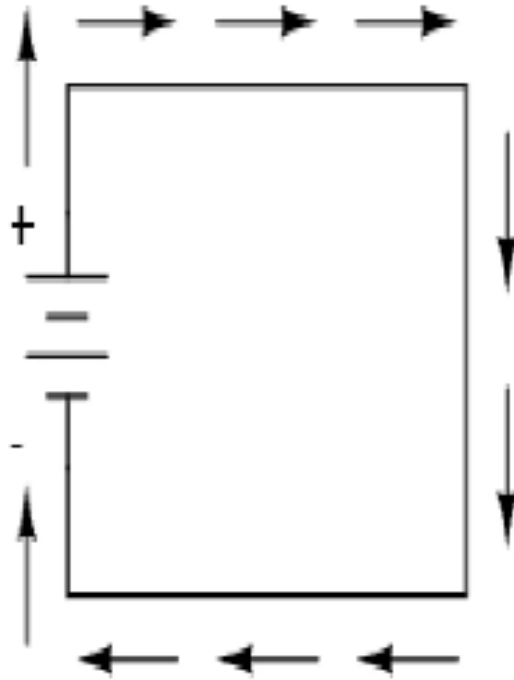


Series Circuit

SIMPLE ELECTRIC CIRCUIT



Conventional flow notation

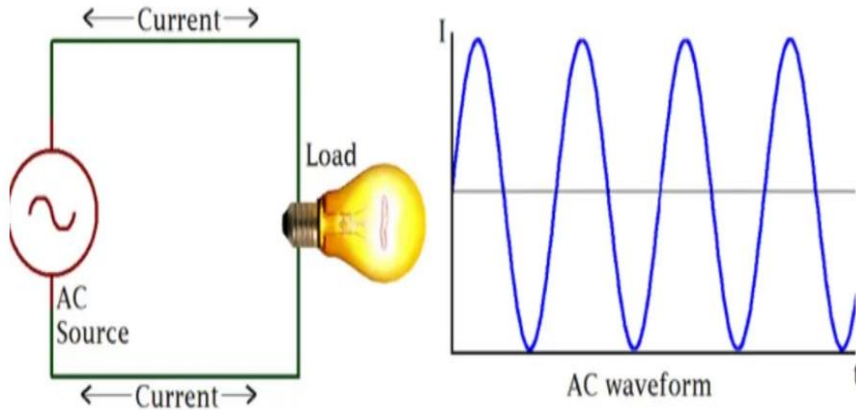


Electric charge moves from the positive (surplus) side of the battery to the negative (deficiency) side.

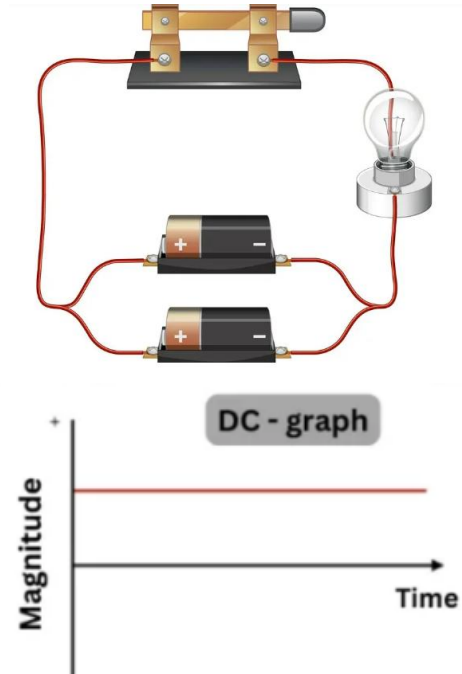
Types of Electric Current

DT - DEFINE

1.AC Current



2.DC Current

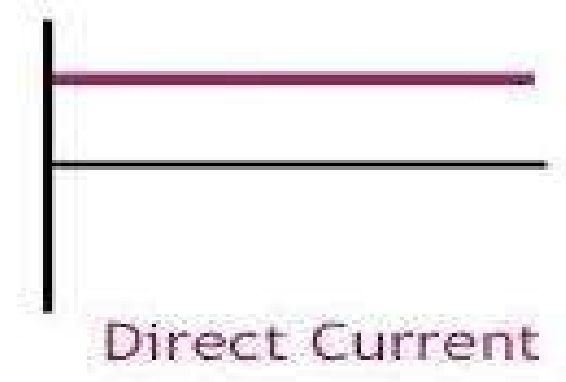


NATURE OF CURRENT

- Most power generated is **Alternating Current (AC)** power where the current and voltage varies Sinusoidal with time
- **Direct Current (DC)** power doesn't vary with time
- Most consumer products use both **AC and DC**

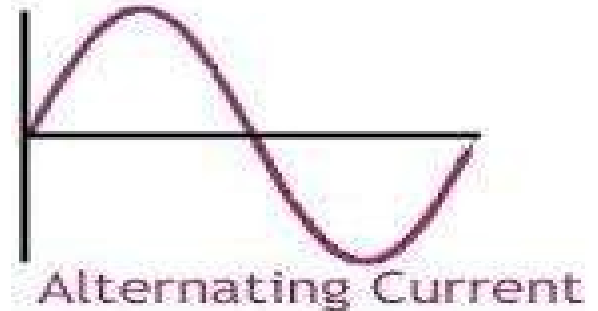
a. DC CURRENT

- DC current is used to **power electronics**
- DC current is easier to **store** (batteries)
- DC current is used in **mobile applications**
- **Inverters** convert **DC** to **AC**



b. AC CURRENT

- AC current is easier to distribute
 - Higher voltage and smaller current yields same power distributed
 - Transformers make it easy to change voltage levels so smaller wire can used
- AC is used for most machinery, lights and appliances
- Power supplies convert AC to DC



VOLTAGE (V)

- It is the **push or pressure** behind current flow through a circuit, and is measured in **(V) volts**.
- **Quantitative** expression of the **potential difference** in charge between two points in an electrical field.



CURRENT (I)

- Current refers to the **quantity/volume** of electrical **flow**. Measured in Amps (A)
- **Flow of Electrons**



RESISTANCE (R)

- Resistance to the flow of the current. Measured in Ω Ohms
- It **opposes an Electric Current**



CHART

Quantity	Symbol	Unit of Measurement	Unit Abbreviation
Current	I	Ampere ("Amp")	A
Voltage	E <i>or</i> V	Volt	V
Resistance	R	Ohm	Ω

Power

Electric power is the rate at which electrical energy is transferred or converted, measured in watts (Joules per second), calculated by multiplying voltage (V) by current (I) ($P=VI$)

ELECTRIC POWER

$$P = VI$$

$$P = \frac{V^2}{R} \quad P = I^2 R$$

ENERGY

Energy Transfer in Circuits

The energy carried by an electric current is related to the charge and voltage.

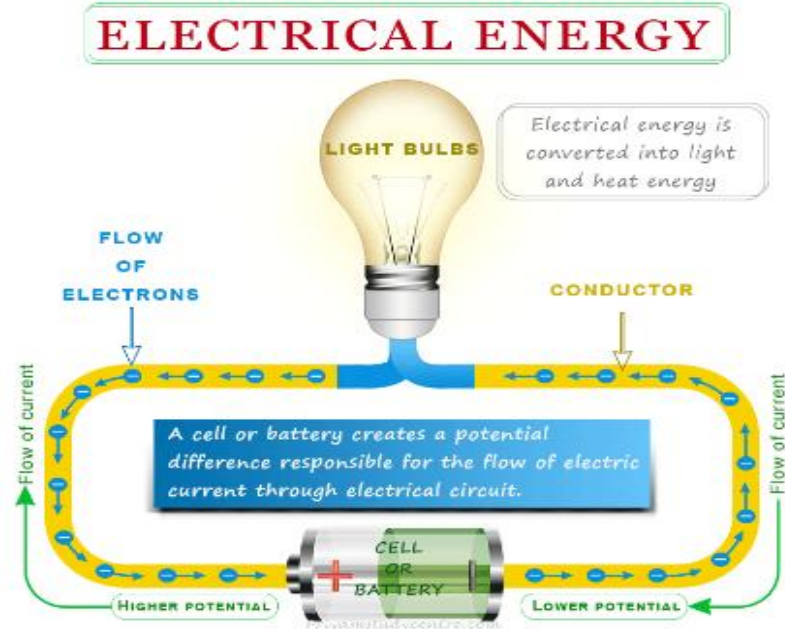
$$E = QV$$



E = Energy in Joules (J)

Q = Charge in coulombs (C)

V = Voltage in volts (V)



QUIZ???

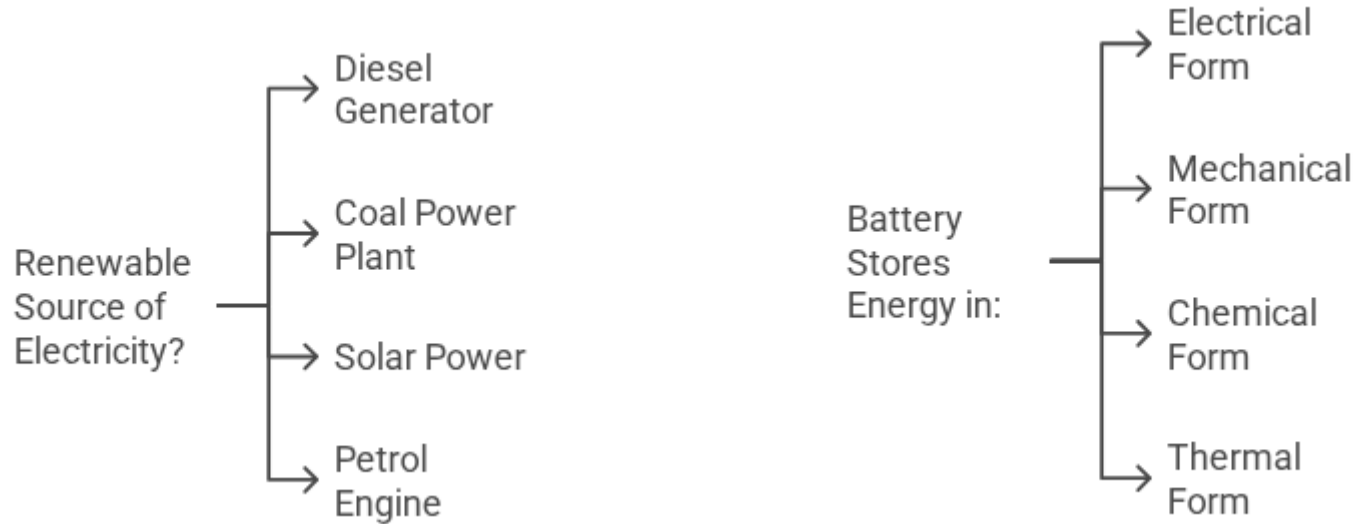
Renewable
Source of
Electricity?

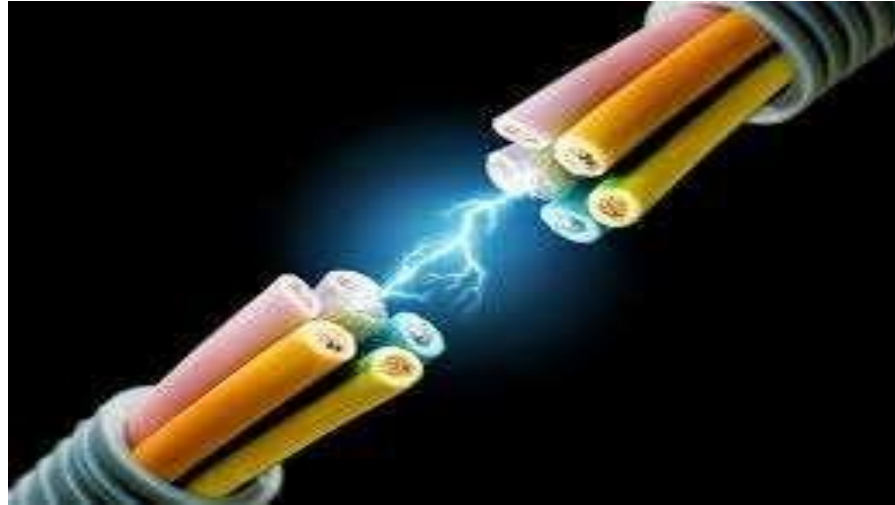


Battery
Stores
Energy in:



ANSWERS





...THANK YOU