DAY 1
-ELECTRICITY BASICS-

➢ WHAT IS THE VOLTAGE ?

Voltage (or electric tension) is the difference in electric potential between two points in an electric circuit. It is measured in **volts (V)** and indicates the "pressure" that pushes electrons to flow through a conductor, like a wire.

➢ WHAT IS THE CURRENT?

Electric current is the flow of electrons (or electric charges) through a conductor, like a copper wire. It is measured in **amperes (A)** and shows how many electrons pass through a point in a given amount of time.

➢ WHAT IS THE RESISTENCE?

Electrical resistance is a property of a material that opposes the flow of electric current. It is measured in ohms (Ω) and shows how difficult it is for electrons to move through that material.

$$U = I \times R \qquad I = \frac{U}{R} \qquad R = \frac{U}{I}$$

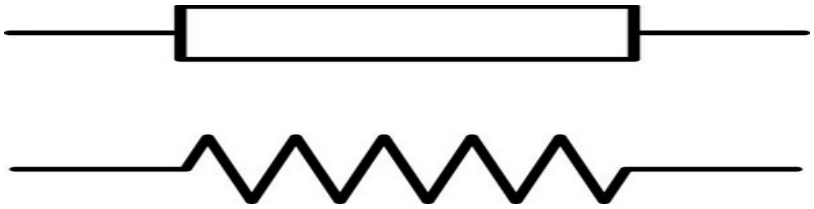
DAY 2

-ELECTRICAL SYMBOLS & TOOLS-

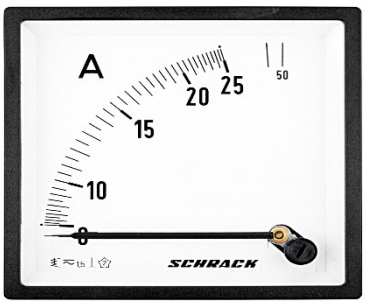
- **E**LECTRICAL SYMBOLS
  1. **VOLTAGE**

  2. **AMPERES**

  3. **RESISTENCES**



- **TOOLS**
  1. **AMMETER**



  2. **VOLTMETER**

3.OHMMETER

DAY 3
-ELECTRICAL SAFETY-

➢ ELECTRICAL SAFETY

⚠ Electrical Safety Rules

1. **Always turn off the power** before working on any electrical circuit.
2. **Use proper tools** with insulated handles.
3. **Avoid water** – never work with electricity in wet or damp areas.
4. **Follow lockout/tagout procedures** to make sure circuits stay off.
5. **Never touch exposed wires** or connections with bare hands.

🧤 PPE – Personal Protective Equipment

- **Insulated gloves** – protect hands from electric shock.
- **Safety goggles** – protect eyes from sparks or debris.
- **Flame-resistant clothing** – reduces injury from arc flashes.
- **Insulated boots** – protect against grounding through feet.

⚡ Circuit Breakers

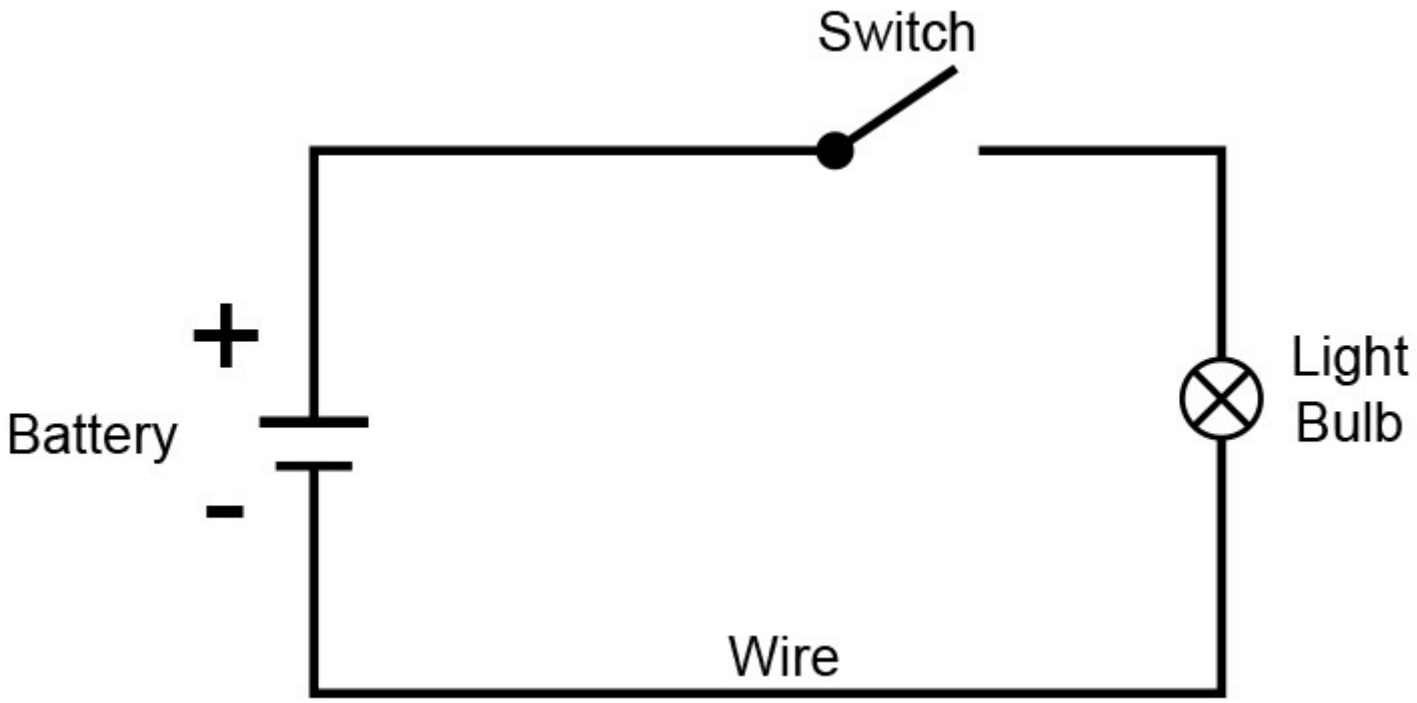
- **Automatically shut off** the power when there's an overload or short circuit.
- Protect **equipment and people** from electrical fires or shocks.
- Must be properly **rated** for the circuit they protect.

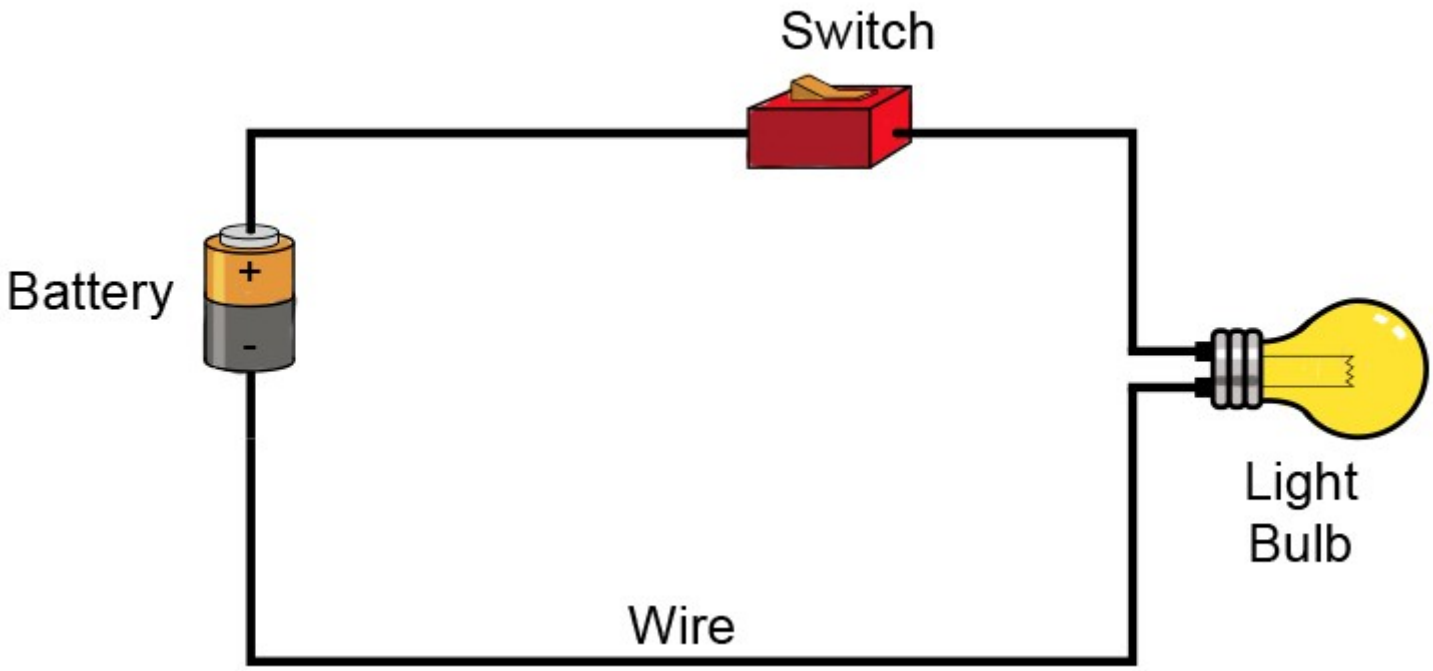
🔌 Insulation

- Covers wires to **prevent contact** with live electricity.
- Made of **rubber, plastic, or other non-conductive materials**.
- Damaged insulation should be **repaired or replaced immediately**.

DAY 4

-BASIC CIRCUIT DIAGRAMS-





DAY 5
-CABLE TYPES &CONNECTIONS-

🔌 Electric Cables – What They Are and What They're Made Of

Electric cables are used to carry electrical current from a source (like an outlet or breaker panel) to a device or appliance (lamp, socket, switch, etc.).

📦 Main Components of an Electric Cable:Conductor

The inner wire through which electricity flows.

Usually made of copper (excellent conductor) or aluminum.

Inner Insulation

Covers each conductor individually.

Made from plastic (PVC, rubber, etc.) to prevent shocks and short circuits.

Outer Sheath

Covers the whole cable for mechanical protection and resistance to external factors (like water, oil, or temperature changes).

🔧 Common Types of Electrical Cables:

NYM Cable – used in residential buildings, inside walls, for sockets and switches.

FY / MYF Cable – flexible wire, great for switchboards or mobile connections.

Armored Cable – used in industrial settings or underground installations, with added protection.

⚠ Important Tips:

Always choose a cable with the correct cross-section (e.g., 1.5 mm² for lighting, 2.5 mm² for sockets).

Don’t overload a cable – it may overheat and cause fire hazards.

🔗 Types of Electrical Connections

Electrical connections are how wires or cables are joined to each other or to devices like outlets, switches, or circuit breakers. A proper connection ensures safety, functionality, and long-lasting performance.

🔧 1. Mechanical Connections (Screw Terminals)

Made using screws and clamps.

Common in breaker panels, switches, and outlets.

Advantage: easy to reconnect or change later.

Example: screw terminals, wire connectors.

🧯 2. Crimp Connections

Use crimp terminals and a crimping tool.

Widely used in automotive and industrial systems.

Provide a secure, vibration-resistant connection.

🔥 3. Soldered Connections

Made using solder wire (tin) and a soldering iron.

Ideal for electronics or delicate circuits.

Offer good electrical conductivity, but not easy to undo.

🖇️ 4. Quick Connectors (e.g., Wago-type clamps)

No tools required – just insert the wire.

Can be reused.

Very popular in clean, fast home installations.

🛠️ 5. Twist Connections (not recommended without protection)

Wires are twisted together and insulated with tape.

Not recommended unless temporary.

Can cause overheating or poor contact if done improperly.

DAY 7
-SOCKETS AND PLUGS-

🔌 Electrical Sockets and Plugs

These are devices used to connect electrical equipment to the power supply.

Plug: The male part that connects into a socket. It has pins.

Socket (Outlet): The female part mounted on a wall or surface, into which plugs are inserted.

Types by Region:

Type A/B: North America, Japan

Type C/E/F: Europe

Type G: UK, Ireland, some Asian and African countries

Type I: Australia, New Zealand, China

Voltage & Frequency:

Varies by country—typically 110-120V (Americas) or 220-240V (Europe/Asia).

Frequency is usually 50Hz or 60Hz.

🔌 ELECTRICAL PLUGS

A plug is the male connector that inserts into an electrical socket (or outlet) to draw power for an appliance or device. It has prongs or pins that match the design of the socket.

🛠️ Parts of a Plug

Pins/Prongs: Conduct electricity from the socket.

Plug Body: Plastic or rubber housing that insulates the pins.

Cable Grip: Secures the wire entering the plug.

Wiring Terminals (Inside): Where live, neutral, and earth wires are connected.

DAY 8
-ELECTRICAL PANELS-

⚡ ELECTRICAL PANEL BASICS

An electrical panel (also called a distribution board) distributes electricity throughout a building and protects the wiring and devices via protective devices.

🔌 1. MCB – Miniature Circuit Breaker

Purpose: Protects against overload and short circuit.

How it works: Trips (shuts off power) when current exceeds the rated limit.

Resettable: Yes, via a switch.

Use: Replaces older fuse systems; more reliable and convenient.

Common Ratings:

6A – for lights

16A – for sockets

32A – for air conditioners, geysers, etc.

⚠ 2. RCD – Residual Current Device (also called RCCB)

Purpose: Protects against electric shock and leakage current.

How it works: Detects imbalance between live and neutral current (leak to earth), and trips within milliseconds.Resettable: Yes.

Use: Critical in bathrooms, kitchens, outdoor circuits.

Sensitivity Ratings:

30mA: Personal protection (standard for homes)

100mA/300mA: Fire protection or higher-risk industrial use

🔥 3. Fuses

Purpose: Old-school protection against overloads and short circuits.

How it works: Thin wire melts when too much current flows, breaking the circuit.

Resettable: No – must be replaced.

Use: Still found in some appliances, older panels, or as backup protection.

🧰 BONUS: RCBO

Combines MCB + RCD in one device — saves space and gives full protection.

DAY 9

-POWER COMSUMTION-

🔌 4. Standby or “Phantom” Power Use

Devices like:

TVs

Game consoles

Phone/laptop chargers left plugged in

...can consume 5–20W/hour even when "off."

👉 Solution: Use power strips with switches to cut them off when not in use.

DAY 10
-BASIC FAULT DETECTION-

🔧 Common Types of Faults

Open Circuit – A break in the circuit stops current flow.

Short Circuit – Unintended connection between two points causes excessive current.

Ground Fault – Current flows directly to ground unexpectedly.

Overload – Too much current drawn by the load.

🛠️ Basic Fault Detection Steps

Visual Inspection

Burnt components, loose wires, discoloration, or smoke.

Use a Multimeter

Continuity Test: Checks for open circuits.

Voltage Test: Ensures voltage is present where expected.

Current Test: Helps detect overload or short circuits.

Resistance Test: Can show if components are damaged.

Check Fuses/Breakers

Tripped breakers or blown fuses indicate overload or shorts.

Isolate Sections

Compare with Circuit Diagram

Helps detect wiring errors or unexpected behavi

⚠ **Safety Tip:**

Always power off the circuit before inspecting or testing (unless you're doing a live voltage test with proper precautions).

Day 11

-SMART HOME BASICS-

🏠 What Is a Smart Home?

A smart home uses internet-connected devices to allow remote monitoring and control of systems like lighting, heating, security, and appliances—usually through a smartphone app or voice assistant.

🧠 Key Components of a Smart Home

1. Smart Hub / Controller

Acts as the brain of your system.

Examples: Amazon Echo (Alexa), Google Nest Hub, Apple HomePod (Siri), or dedicated hubs like Samsung SmartThings.

2. Smart Devices

These connect to your hub or directly to your Wi-Fi:

Smart Lights: Philips Hue, LIFX.

Smart Plugs: Control regular devices remotely.

Smart Thermostats: Nest, Ecobee.

Smart Locks: August, Yale.

Smart Cameras: Ring, Arlo.

Sensors: Door/window, motion, temperature, humidity.

Smart Appliances: Fridges, ovens, washing machines, etc.

3. Connectivity

Wi-Fi: Most common, works with your router.Bluetooth: Short-range control.

Zigbee/Z-Wave: Low-power mesh networks used by manysmart devices.

Thread: A newer mesh network backed by Apple and Google.

🎛️ How It Works

You can control and automate devices through:Apps: e.g., Google Home, Apple Home, SmartThings.

Voice Commands: via Alexa, Google Assistant, Siri.

Automation: "If this, then that" (e.g., turn on lights at sunset).

🔒 Security Tips

Change default passwords.

Use a secure Wi-Fi network.

Regularly update firmware.

Consider devices with two-factor authentication.

📱 Example Use Case

You say "Good Night" to Alexa →

Lights turn off, thermostat adjusts to sleep temp, doors lock, and cameras turn on.

DAY 12

-RENEWABLE ENERGY-

🌍 What Is Renewable Energy?

Renewable energy comes from natural sources that are replenished constantly, unlike fossil fuels which are finite.

🔋 Main Types of Renewable Energy

1. ☀️ Solar Energy

Source: Sunlight.

How it works: Solar panels (photovoltaic cells) convert sunlight into electricity.

Used for: Powering homes, water heaters, streetlights, etc.

2. 💨 Wind Energy

Source: Wind.

How it works: Wind turbines spin generators to create electricity.

Used for: Large-scale power generation (wind farms), or individual turbines for homes.

3. 💧 Hydropower (Hydroelectric Energy)

Source: Moving water (rivers/dams).

How it works: Flowing water spins turbines.

Used for: Consistent electricity generation, especially in mountainous or river-rich areas.

4. Geothermal Energy

Source: Heat from within the Earth.

How it works: Steam or hot water from underground is used to turn turbines.

Used for: Heating buildings, generating electricity in volcanic regions.

5. Biomass Energy

Source: Organic materials (plants, wood, waste).

How it works: Burned or biologically processed to release energy.

Used for: Heating, electricity, and fuel (like bioethanol, biodiesel).

✅ Benefits of Renewable Energy

Environmentally friendly (low or no emissions).

Sustainable (won't run out).

Reduces dependence on fossil fuels.

Can be decentralized (like rooftop solar panels).

⚠ Challenges

Initial cost can be high.

Intermittency: Some sources (like solar & wind) depend on weather.

Storage: Energy storage (like batteries) is needed to balance supply & demand.

✳ Fun Fact

The sun provides enough energy in 1 hour to power the entire world for a year—we just need the right tech to capture and store it!

DAY 13
-SIMPLE AUTOMATION-

⚙️ What Is Simple Automation?

Simple automation means using technology to perform tasks automatically—without needing you to do it manually every time.

Think: "Set it and forget it."

🏠 Examples of Simple Automation in Daily Life

🔌 1. Smart Plug Automation

Turn your lamp on/off at specific times.

Example: “Turn off all devices at 11 PM automatically.”

🕒 2. Scheduled Routines

Lights turn on at sunset.

Coffee machine starts brewing at 7 AM.

🧠 3. IFTTT ("If This Then That")

A free platform that links apps/devices.

Example: “If I leave home, then turn off the lights.”

📱 4. Phone Automation

Do Not Disturb mode during meetings.

Auto-replies when driving.

🔒 5. Security System Automation

Motion sensor turns on outdoor lights.

Camera starts recording when door opens.

🛠️ Tools You Can Use

Smartphone apps (Google Home, Apple Shortcuts, SmartThings).

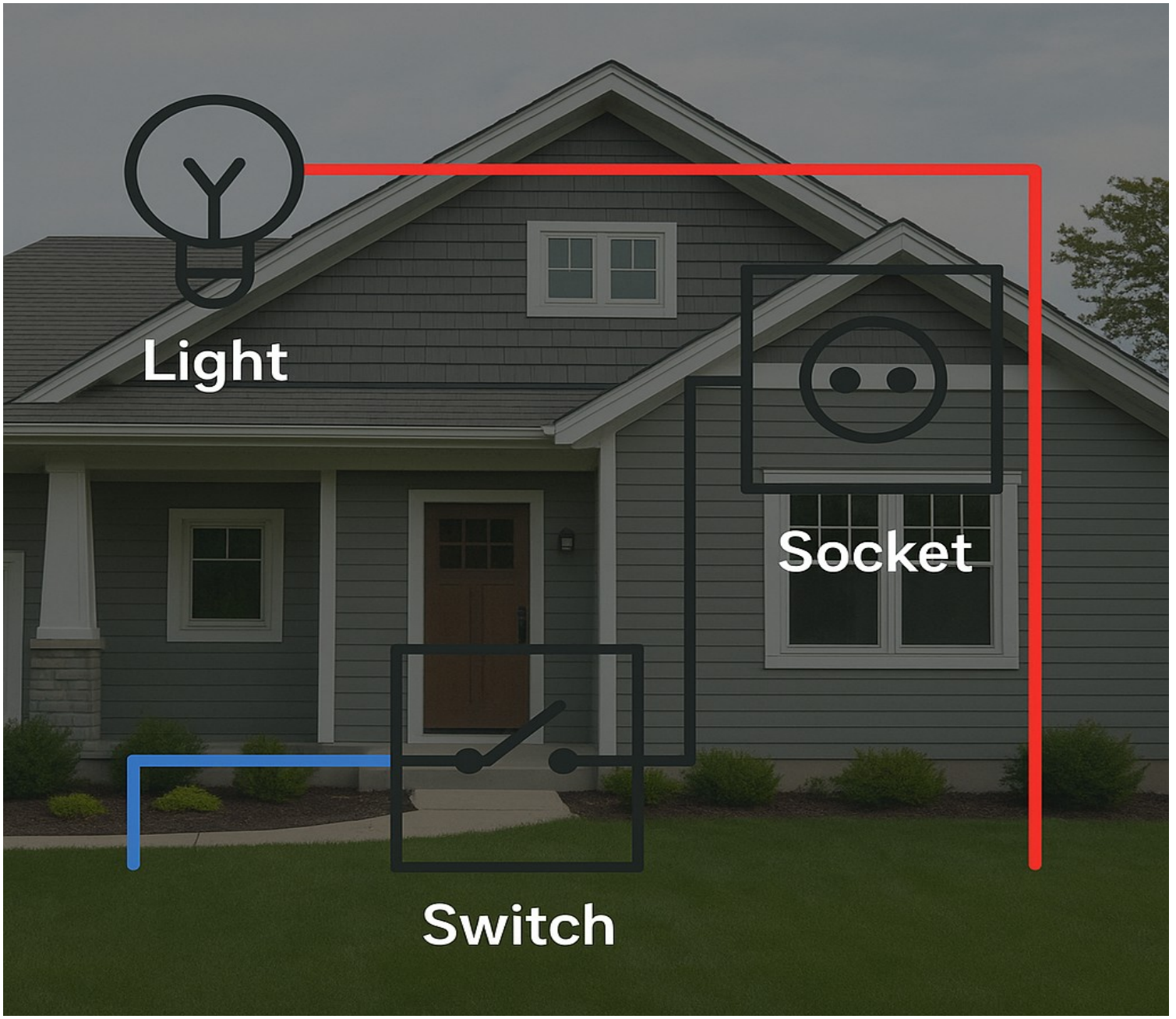
Voice assistants (Alexa, Google Assistant, Siri).

IFTTT or Zapier (for linking apps/services).

Timers/Sensors (simple motion sensors or smart timers).

💡 Simple Automation = Less Work + More Comfort + Better Efficiency

DAY 14
-MINI PROJECT DESIGN-



DAY 15
-PREPARE AND PRESENT FINDINGS AND DISAGRAMS –

📃 Project Report: Simple Electrical Home Circuit with Automation and Smart Integration

📌 1. Objective

Design and present a basic home electrical circuit that includes:

A light, socket, and switch

Diagram for basic and more complex circuits

A background showing real-world house placement

Reflections on renewable energy and smart automation

🔧 2. Project Findings

⚙️ Basic Concepts Covered:

Smart Home Basics: Integration of devices for convenience and efficiency.

Renewable Energy: Use of sustainable power sources like solar.

Simple Automation: Scheduled lighting, smart sockets, and sensor-driven devices.

Fault Detection in Electrical Circuits: Open circuits, short circuits, overloads.

📐 3. Diagrams

✅ Basic Wiring Diagram

Simple connection of light, switch, and socket.

🏠 Enhanced Diagram with House Background

Overlaid wiring on a real house to visualize installation.

🧠 4. Self-Reflection

"This project helped me understand not only how a basic electrical system works but also how it connects to smart and sustainable living. Drawing and visualizing circuits made the concept more real. The integration of automation and renewable energy opened my eyes to how small ideas can build into a full smart system. Next time, I'd like to include solar integration and maybe try building it physically!"