

Components Used in Each Section

Category	Components
Microcontrollers	Arduino Uno, ESP32, ESP8266, Raspberry Pi 4, ESP32-CAM
Sensors	DHT11, BMP180, MQ-135, PIR, Ultrasonic, LDR, RFID, Heartbeat Sensor
Actuators	Relay Module, Servo Motor, Buzzer, OLED Display , lcd interface with i2c
Communication Modules	WiFi, Bluetooth, LoRa, GSM, GPS, RF
Accessories	Breadboard, Jumper Wires, Resistors, Capacitors, Diodes, Power Banks
Software & Cloud	Arduino IDE, Python, ThingSpeak, Edge Impulse, MQTT, OpenCV

Microcontrollers & Boards

These are the core devices for **data collection, processing, and communication**.

- 1 **Arduino Uno** – Basic microcontroller for learning & prototyping
 - 2 **ESP32** – WiFi & Bluetooth-enabled microcontroller for cloud-based IoT applications
 - 3 **ESP8266 (NodeMCU)** – Cheaper alternative for cloud-based IoT projects
 - 4 **Raspberry Pi 4/3B+** – Mini-computer for advanced AI & ML-based IoT applications
 - 5 **ESP32-CAM** – Camera module for object/face recognition projects
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Sensors & Modules

These sensors **collect real-world data** for IoT projects.

Environmental & Weather Sensors:

- 1 **DHT11 / DHT22** – Temperature & humidity sensor
- 2 **BMP180 / BME280** – Atmospheric pressure, temperature, and altitude sensor
- 3 **MQ-2 / MQ-135** – Gas sensors (Smoke, CO2, air quality)
- 4 **UV Sensor (GYML8511)** – Ultraviolet radiation detection
- 5 **Soil Moisture Sensor** – Measures water content in soil

Motion & Presence Detection:

- 6 **PIR Motion Sensor** – Detects human/animal movement
- 7 **Ultrasonic Sensor (HC-SR04)** – Measures distance using sound waves
- 8 **Infrared (IR) Sensor** – Detects obstacles & remote signals

8 **GYROSCOPES and ACCELEROMETERS**

Light & Color Sensors:

- 9 **LDR (Light Dependent Resistor)** – Detects light intensity
- 10 **TCS3200 Color Sensor** – Detects colors for object recognition

Industrial & Health Sensors:

- 11 **Heartbeat & Pulse Sensor** – Measures heart rate
- 12 **Vibration Sensor (SW-420)** – Detects machine vibrations (used in predictive maintenance)

✓ Miscellaneous IoT Sensors:

- 13 **RFID Module (RC522)** – For security & authentication systems
 - 14 **Hall Effect Sensor** – Detects magnetic fields
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Actuators & Output Devices

These components **control external devices** based on sensor input.

- 1 **Relay Module (5V/12V)** – Controls AC devices (lights, fans, motors)
 - 2 **Servo Motor (SG90, MG995)** – Used for robotic arm movement
 - 3 **DC Motor + Motor Driver (L298N)** – Controls small motors
 - 4 **Buzzer** – For alarm-based projects
 - 5 **OLED Display (0.96" I2C SSD1306)** – Small screen to display sensor values
 - 6 **LCD with i2c interface**
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Communication Modules

These modules enable **IoT devices to communicate with each other and the cloud.**

- 1 **WiFi (Built-in ESP32/ESP8266)** – For cloud-based data storage
 - 2 **Bluetooth (HC-05, HC-06)** – For wireless device communication
 - 3 **LoRa Module (SX1278)** – Long-range communication for remote IoT applications
 - 4 **RF Module (433 MHz)** – Wireless short-range data transmission
 - 6 **GPS Module (NEO-6M)** – For location tracking projects
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Secondary Components & Accessories

These materials help with **circuit connections and assembling projects**.

✓ Prototyping Essentials:

- ✓ **Breadboard** – For easy circuit connections
- ✓ **Jumper Wires (Male-Male, Male-Female, Female-Female)** – Connect components
- ✓ **Resistors (1K Ω , 10K Ω , 220 Ω , etc.)** – For circuit protection
- ✓ **Capacitors (100 μ F, 470 μ F, etc.)** – For filtering noise in circuits
- ✓ **Diodes (1N4007, 1N4148)** – For current flow control
- ✓ **Transistors (BC547, 2N2222)** – For switching & amplification







✓ Power & Battery Modules:

-  **9V Battery + Battery Connector** – For portable IoT projects
-  **Lithium-ion Battery (18650) + Battery Management System (BMS)** – For long-term IoT devices
-  **Power Bank (5V)** – For powering Raspberry Pi in field experiments

✓ Soldering guns

✓ Multimeter

Software & Cloud Platforms

-  **Arduino IDE** – For programming Arduino & ESP32
 -  **Thonny / VS Code + Python** – For Raspberry Pi coding & ML projects
 -  **ThingSpeak / Arduino Cloud / Firebase** – Free cloud platforms for IoT data storage
 -  **Edge Impulse / TensorFlow Lite** – For deploying AI models on microcontrollers
 -  **Mosquitto MQTT Broker** – For microcontroller communication
 -  **OpenCV + TensorFlow** – For face/object recognition projects
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