Instructor Guide – Module 1: Introduction to Microcontrollers

Learning Outcomes

By the end of this module, learners will be able to:

1. Explain the role and core components of microcontrollers.
2. Identify popular microcontroller families and apply programming skills to build simple projects (e.g., LED control).
3. Recognize real-world applications in robotics, smart devices, automotive systems, IoT, and medical technology.

Lesson Flow

1. Warm-Up (5–10 minutes)

- Ask learners: *"What electronic devices do you use daily?"*
- Guide them to realize that most of these devices rely on microcontrollers.
- Introduce the concept: *"A microcontroller is the brain of many electronic devices."*

2. Core Concepts (20 minutes)

- Present the definition: small computer on a chip, designed for specific tasks.
- Explain components with examples:
    - **CPU** → executes instructions.
    - **Memory (RAM & Flash)** → workspace vs. permanent storage.
    - **I/O Peripherals** → sensors, LEDs, communication.
    - **Timers/Counters** → blinking LEDs, measuring button presses.
- Activity: Match each component to a real-world function.

3. Microcontroller Families (15 minutes)

- Introduce Arduino, ESP32, PIC, STM32.

- Compare beginner-friendly vs. advanced options.
- Show an Arduino Uno board (physical or image).
- Discussion: Which family would be best for IoT projects?

4. Applications & Careers (15 minutes)

- Highlight uses in robotics, smart homes, automotive, IoT, medical devices.
- Group activity: Learners brainstorm devices around them that use microcontrollers.
- Connect to career paths: embedded systems, automation, IoT development.

5. Hands-On Project: LED Blink (30 minutes)

- Demonstrate circuit setup step by step: breadboard, LED, resistor, jumper wires, Arduino Uno.
- Walk through Arduino IDE and code.
- Learners replicate and upload program.
- Troubleshooting tips: LED polarity, resistor placement, code errors.

6. Wrap-Up & Reflection (10 minutes)

- Recap: definition, components, families, applications.
- Ask learners: *"What's one device in your home that likely uses a microcontroller?"*
- Preview next module: sensors and actuators.