

Project Title: Environmental Monitoring System using Arduino

1. Introduction: This project is designed to monitor temperature and gas levels using an Arduino-based system. A temperature sensor detects ambient temperature, and if it exceeds a predefined threshold, an LED indicator turns ON. Similarly, a gas sensor monitors air quality, and if gas concentration exceeds the set limit, a piezo buzzer is activated to alert the user. This system is useful for safety and environmental monitoring applications.

2. Components Used:

1. Arduino Uno

- A microcontroller board based on the ATmega328P, used to read sensor data and control output devices. It has 14 digital I/O pins, 6 analog inputs, and operates at 5V.

2. Temperature Sensor (LM35)

- A precision integrated circuit temperature sensor that provides an output voltage linearly proportional to the Celsius temperature. It has a range of -55°C to 150°C with an accuracy of $\pm 0.5^{\circ}\text{C}$.

3. Gas Sensor (MQ-2 or MQ-135)

- A sensor capable of detecting gases like LPG, methane, alcohol, hydrogen, and carbon monoxide. It provides an analog output based on the concentration of gas present in the environment.

4. Piezo Buzzer

- An audio signaling device that emits a sound when activated. It is used in the system to alert users when gas levels exceed the threshold.

5. LED (Light Emitting Diode)

- A semiconductor light source that glows when a voltage is applied. It is used as a visual indicator when the temperature crosses the threshold value.

6. Resistors (220 Ω , 1k Ω)

- Electrical components that limit current flow to protect circuits. The 220 Ω resistor is used with the LED, while the 1k Ω resistor is used in the gas sensor circuit.

7. Breadboard & Jumper Wires

- A prototyping board used for making circuit connections without soldering. Jumper wires are used to connect different components on the breadboard.

3. Circuit Description:

- The **Arduino Uno** provides a 5V power supply to the **temperature sensor**, **gas sensor**, and other components.
- The **temperature sensor's output** is connected to the **A0** pin of the Arduino.
- The **gas sensor's output** is connected to the **A1** pin of the Arduino.
- The **piezo buzzer** is connected to **digital pin 8**.
- The **LED** is connected to **digital pin 13**.
- If the temperature exceeds **25 $^{\circ}\text{C}$** , the LED turns ON.
- If the gas concentration surpasses **85**, the buzzer turns ON.

4. Working Principle:

- The Arduino reads the sensor values continuously.
- If the temperature sensor detects a value higher than **25°C**, it turns on the LED.
- If the gas sensor detects a value above **85**, it triggers the buzzer.
- The system operates in real-time, ensuring prompt alerts when necessary.

5. Applications:

- Home and industrial air quality monitoring.
- Fire and gas leakage detection systems.
- Temperature-sensitive environments like laboratories.

6. Conclusion: This project demonstrates a simple yet effective environmental monitoring system using **Arduino** and sensors. It provides immediate visual and auditory alerts when predefined temperature or gas concentration limits are exceeded, making it a useful safety solution for various applications.