## Introduction:

Air pollution is a growing concern worldwide, impacting both environmental and human health. Monitoring air quality in real-time can help in identifying pollution sources and taking preventive measures. This project aims to develop an **IoT-based Air Control Monitor System** that measures air quality parameters such as temperature, humidity, and particulate matter concentrations. Using an **ESP32 microcontroller**, the system collects data from sensors and transmits it to a **web-based interface** for real-time monitoring and analysis.

## Problem Statement

Air pollution, especially due to particulate matter (PM2.5 and PM10), poses serious health risks, including respiratory and cardiovascular diseases. Traditional air monitoring systems are expensive and not easily accessible to individuals or small organizations. This project aims to provide a **cost-effective, real-time air monitoring solution** using IoT technology, allowing users to track air quality remotely and take necessary actions to maintain a healthier environment.

## Hardware and Software Requirements

- ➢ **Hardware Components:**

  - **ESP-WROOM-32 Microcontroller** – Manages sensor data and transmits it wirelessly.

  - **DHT11 Temperature/Humidity Sensor** – Measures temperature and humidity levels.

  - **PM2.5/PM10 Dust Sensor** – Monitors particulate matter concentrations in the air.

  - **Vero Board** – Used for efficient wiring and external connections.

- ➢ **Software Tools:**

  - **Arduino IDE** – For programming the ESP32 microcontroller.

  - **Embedded C/C++** – Used for coding the microcontroller.

  - **Wi-Fi Communication** – To send sensor data to the website.

  - **Web Development (HTML, CSS, JavaScript, Python/PHP)** – To create a user-friendly dashboard for displaying air quality data.

## Block Diagram:
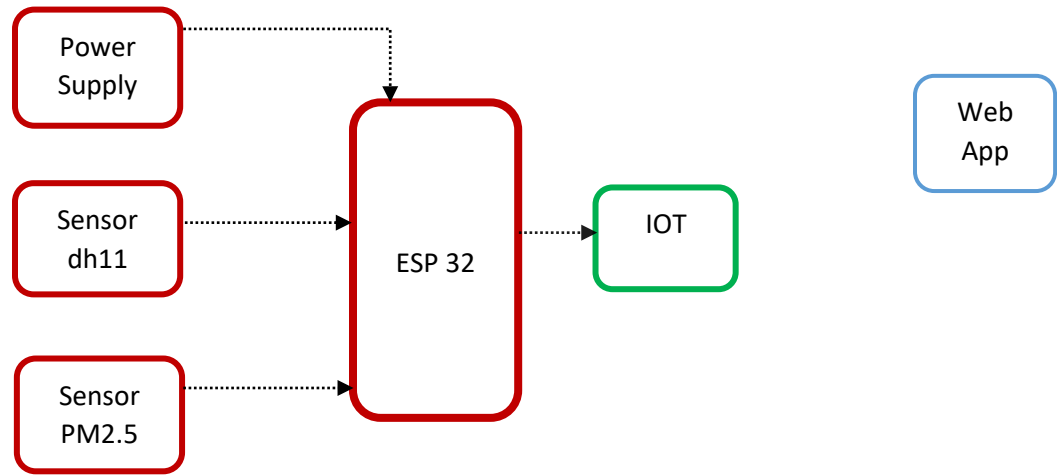


## Circuit Diagram:
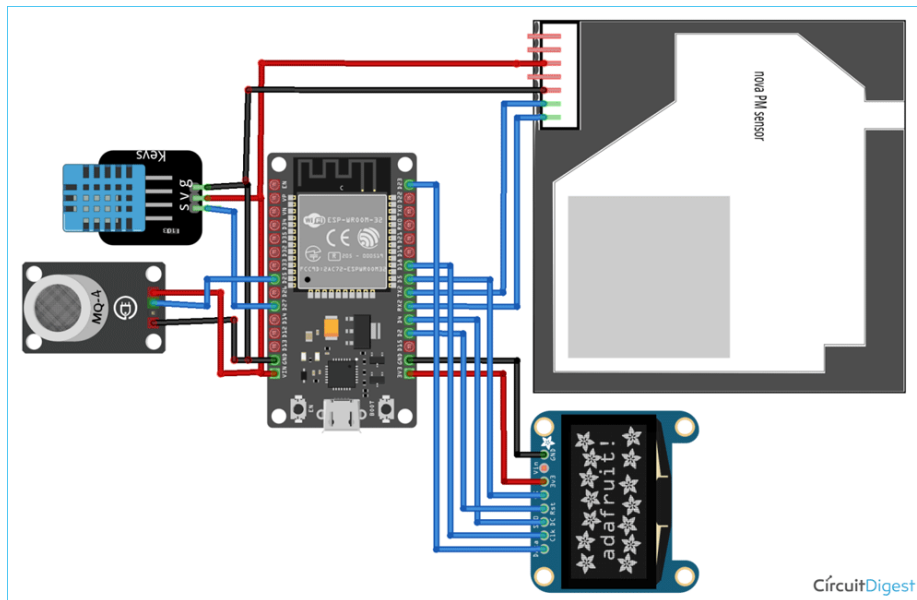
## Implementation

➢ **Sensor Integration:** The ESP32 will be programmed using Arduino IDE to collect data from the **DHT11** and **PM2.5/PM10 sensors**.

➢ **Data Transmission:** The ESP32 will send real-time air quality data to a web-based interface via Wi-Fi.

➢ **Web Dashboard:** A responsive website will be developed to display real-time graphs and historical data trends.

➢ **Power Supply & Connectivity:** The system will be powered using a **5V source** and connected via **Wi-Fi** for seamless data transmission.

## Budget Estimation

The estimated budget for this project is **5000 PKR**, covering the following components:

| Component | Estimated Cost (PKR) |
|---|---|
| ESP-WROOM-32 Microcontroller | 1800 |
| DHT11 Temperature/Humidity Sensor | 500 |
| PM2.5/PM10 Dust Sensor | 2000 |
| Vero Board & Miscellaneous Components | 700 |
| Total Estimated Cost | **5000** |

## Conclusion

This **IoT-based Air Control Monitor System** provides a low-cost and efficient solution for real-time air quality monitoring. By utilizing IoT technology, the system offers **remote accessibility, data visualization, and environmental awareness**. It is a scalable project that can be extended with additional sensors and functionalities in the future. The successful implementation of this system will contribute to a better understanding of air quality, promoting healthier living conditions.