

AIR POLLUTION MONITORING

IOT PHASE-4

INTRODUCTION:

Technological advancements lead to the emissions of air pollutants over the decades. Major concerns in industrial cities which experience air pollution, can be harmful not only for the environment but also for human health. Due to this urban residents are more likely to live in less polluted neighborhoods to avoid the health impact of air pollution. Atmospheric pollution can be classified into three types based on the sources: mobile, stationary and area sources. Mobile sources are due to the motor vehicles, airplanes, locomotives and other engines and equipment that are able to move to different locations. Stationary sources include foundries, fossil fuel burning, food processing plants, power plants, refineries and other industrial sources. Area sources are caused by certain local actions. Air pollution can be caused due to the pollutants which are emitted directly from a source or which are not directly emitted as such. It can result in the degradation of ambient air quality in the industrial cities. Also daily exposure of people to air pollution results in diseases like asthma, wheezing, and bronchitis.

HARDWARE COMPONENTS

➤ AIR QUALITY SENSORS:

Air quality sensors are the core components for measuring different air pollutants. Common sensors include:

- ❖ MQ series sensor (e.g., MQ-7 for CO, MQ-135 for CO₂)
- ❖ Particulate matter (PM) sensors (e.g., SDS011, PMS5003)
- ❖ Ozone (O₃) Sensors
- ❖ Nitrogen dioxide (NO₂) sensors

➤ MICROCONTROLLER:

NodeMCU (ESP8266) or Arduino boards (e.g., Arduino Uno, Arduino Nano) to interface with sensors, process data and send it to a central server cloud.

➤ COMMUNICATION MODULE:

Wi-Fi module (e.g., ESP8266, ESP32) to connect the microcontroller to the internet, enabling data transmission to the server or cloud.

➤ **POWER SUPPLY:**

Power source (e.g., battery, power adapter) to power the sensor, microcontroller and communication modules.

➤ **BREADBOARD AND JUMPER WIRES:**

Breadboards for prototyping and jumper wires to connect components on the breadboard

➤ **LCD DISPLAY:**

LCD module (e.g., 16x2 character LCD) to display real time air quality data.

➤ **ENCLOSURE:**

A protective housing to house and components and protect them from environmental condition (optional, especially for outdoor installations).

❖ **Software code:**

```
import
random import
time

class
AirQualityMonitor: def
init_(self):
    self.temperature = 0
    self.humidity = 0
    self.air_quality_index = 0

def read_sensor_data(self):
    self.temperature = round(random.uniform(18.0, 30.0), 2)
    self.humidity = round(random.uniform(30.0, 60.0), 2)
    self.air_quality_index = random.randint(0, 500)

def display_sensor_data(self):
```

```

    print(f'Timestamp: {time.time()}')

    print(f'Temperature: {self.temperature} °C')

    print(f'Humidity: {self.humidity} %')

    print(f'Air Quality Index: {self.air_quality_index}')


def run(self):
    while True:

self.read_sensor_data()
self.display_sensor_data() time.sleep(1)


if __name__ == "__main__":
    air_quality_monitor = AirQualityMonitor()
    air_quality_monitor.run()

```

❖ Output:

Timestamp: 1662760902.849983

Temperature: 24.77 °C

Humidity: 42.33 %

Air Quality Index: 375

Timestamp: 1662760903.850208

Temperature: 21.46 °C

Humidity: 51.56 %

Air Quality Index: 89

Timestamp: 1662760904.850433

Temperature: 28.82 °C

Humidity: 44.61 %

Air Quality Index: 187

➤ **Hardware Designing:**



