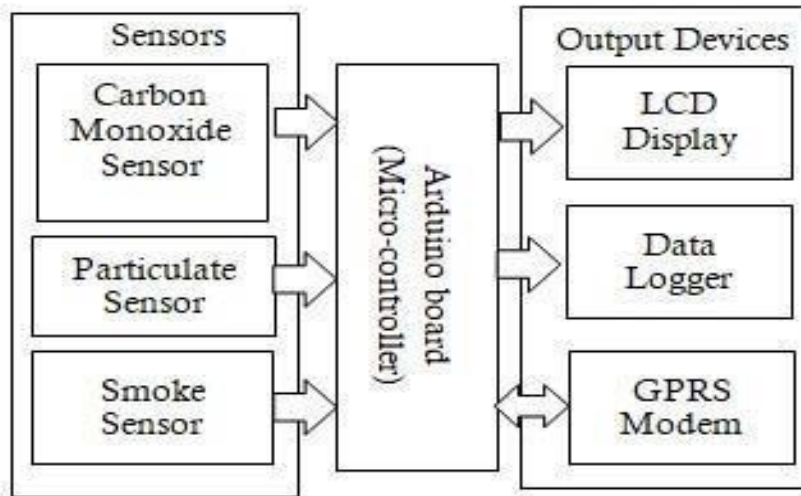# 9209-NSN COLLEGE OF ENGINEERING AND TECHNOLOGY-GROUP 4

PHASE 3 - AIR QUALITY MONITORING SYSTEM USING IOT

TEAM MEMBERS

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BLOCK DIAGRAM:

Carbon Monoxide Sensor :

When carbon monoxide enters the gas-permeable compartment that houses the sensor, a chemical reaction occurs that causes the electrical current passing through the electrolyte to surge. The specific amount by which the current increases tells the detector the concentration of the carbon monoxide molecules. **Particulate sensor** :

A particulate matter sensor measures the quantity of (fine) dust particles in the air, expressed in PM(Particulate Matter). Particulate matter are (dust) particles smaller than 10 micrometers (μm). The more particulate matter in the air, the unhealthier the air.

Smoke Sensor :

A smoke detector is an electronic fire-protection device that automatically senses the presence of smoke, as a key indication of fire, and sounds a warning to building occupants.

Arduino Board :

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs-light on a sensor, a finger on a button, or a twitter message-and turn it into an output-activating a motor, turning on an LED, publishing something online

Data Logger :

Data loggers are electronic devices which automatically monitor and record environmental parameters over time, allowing conditions to be measured, documented, analysed and validated.

GPRS Modem :

A GSM/GPRS modem is a class of wireless modems, designed for communication over the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network

Flow Chart :
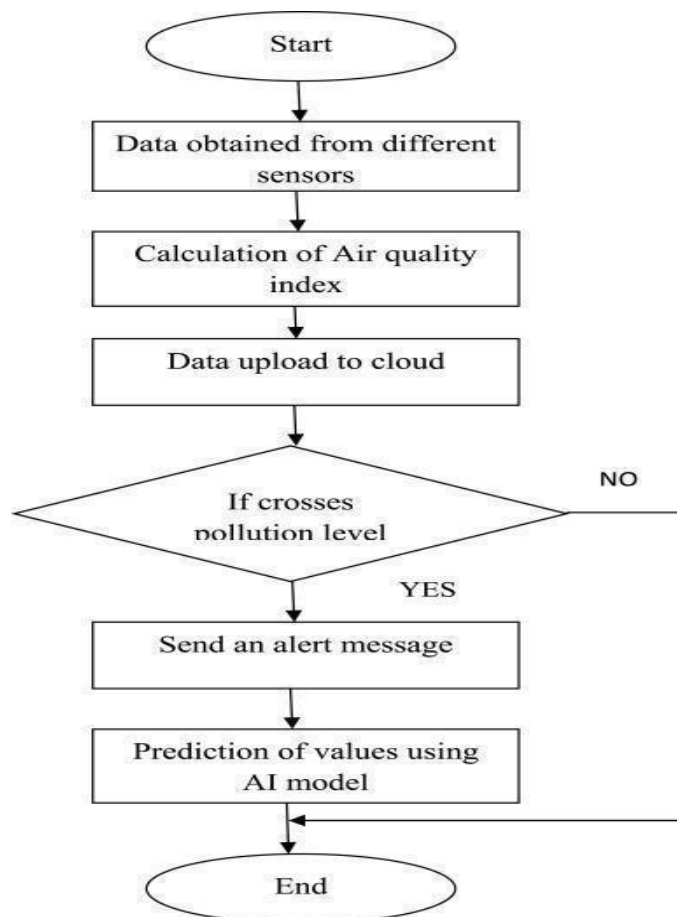
Air Quality Index :

The Air Quality Index (AQI) is a scale of air pollution that gives Canberrans an indication of how clean the air is so we can change our outdoor activities if pollution levels are high.

The AQI is calculated from air quality data relating to the five pollutants that are monitored in the ACT. For each pollutant, the AQI is the data value expressed as a percentage of the level specified by the National Environment Protection Measure for Ambient Air (NEPM) standard.

AQI is not used for the purpose of providing health advice. For detailed health advice on air quality and pollen please go to the Air Quality Health Advice Portal .

There are six AQI categories ranging from 'Very good' to 'Hazardous'. Each category is shown in a different colour.

A lower value indicates better air quality, and a higher value indicates poorer air quality.

When a pollutant AQI is poor, very poor and hazardous, this means the pollutant has exceeded its corresponding air quality standard.

When a pollutant AQI is poor, very poor and hazardous, this means the pollutant has exceeded its corresponding air quality standard.

Very Good	Good	Fair	Poor	Very Poor	Hazardous
0-33	34-66	67-99	100-149	150-200	200+
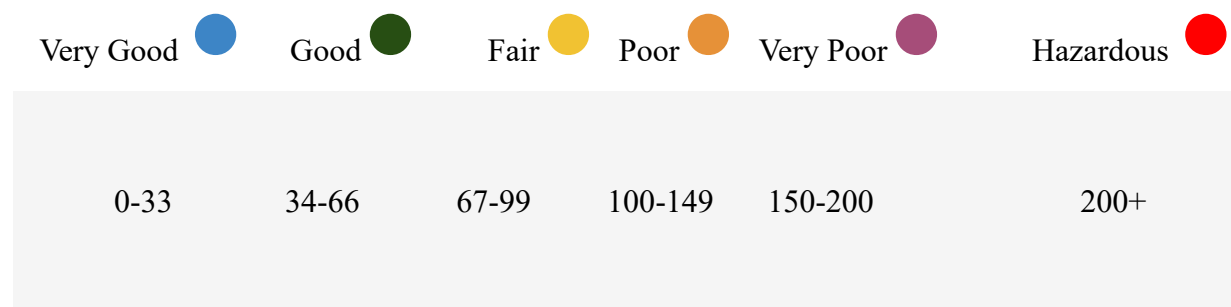
You can see the latest data readings on our Air Quality in the ACT Page.

Air Quality Index Calculations :

Monitoring and reporting air quality starts with data from a network of air quality sensors and instruments that we manage at three sites across the ACT.

Data readings are actual measurements—numbers with measurement units, from scientific instruments for each air pollutant. Data is collected on five major pollutants.

The Air Quality Index (AQI) is a scale of air pollution over a designated time period that gives Canberrans an indication of how clean the air is so we can change our outdoor activities if pollution levels are high.

EPM air quality standards used to calculate the AQI		
Pollutant	**Averaging period**	**Air NEPM Standard**
$PM_{2.5}$	24 hours	25 micrograms per cubic meter($\mu g/m3$)
PM_{10}	24 hours	50 micrograms per cubic meter($\mu g/m3$)
Carbon monoxide	8 hours	9.0 parts per million (ppm)
Nitrogen dioxide	1 hour	0.08 parts per million (ppm)
Ozone	8 hours	0.065 parts per million (ppm)

Calculating the AQI

To calculate the index (AQI) values for each pollutant, the data reading is divided by the national standard and multiplied by 100 to get the AQI for the pollutant.

The formula is:

$$AQI pollutant = \frac{pollutant data reading}{standard} \times 100$$

program:

sensor needs:

```python
import math
import sys
import time
from grove.adc import ADC


class GroveAirQualitySensor:

    def __init__(self, channel):
        self.channel = channel
        self.adc = ADC()

    @property
    def value(self):
        return self.adc.read(self.channel)

Grove = GroveAirQualitySensor


def main():
    if len(sys.argv) < 2:
        print('Usage: {} adc_channel'.format(sys.argv[0]))
        sys.exit(1)

    sensor = GroveAirQualitySensor(int(sys.argv[1]))

    print('Detecting ...')
    while True:
        value = sensor.value
        if value > 100:
            print("{}, High Pollution.".format(value))
        else:
            print("{}, Air Quality OK.".format(value))

        time.sleep(.1)

if __name__ == '__main__':
    main()
```

monitoring chips:

```python
import time
import grovepi

# Connect the Grove Air Quality Sensor to analog port A0
# SIG,NC,VCC,GND
air_sensor = 0

grovepi.pinMode(air_sensor,"INPUT")

while True:
    try:
        # Get sensor value
        sensor_value = grovepi.analogRead(air_sensor)

        if sensor_value > 700:
            print "High pollution"
        elif sensor_value > 300:
            print "Low pollution"
        else:
            print "Air fresh"

        print "sensor_value =", sensor_value
        time.sleep(.5)

    except IOError:
        print "Error"
```