

**PROJECT SYNOPSIS ON:  
SMART AUTOMATED AIR POLLUTION DETECTION AND  
MONITORING SYSTEM IN VEHICLES**

**Final Report Submitted in Partial Fulfillment of the  
Requirements for the degree of  
Bachelor of Technology in Electronics and  
Instrumentation Engineering**

**Under the guidance of  
Prof. Santu Guin**



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**Certificate of Recommendation**

This is to certify that group members were involved in his Project work titled “Smart Automated Air Pollution Detection and Monitoring System In Vehicles”, under the direct supervision and guidance of Prof. Santu Guin. We are satisfied with his work, which is being presented for the partial fulfilment of the degree of Bachelor of Technology in Electronics and Instrumentation Engineering , Maulana Abul Kalam Azad University of Technology, West Bengal formerly West Bengal University of Technology(WBUT), Kolkata – 700064.

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## **Provisional Certificate of Approval**

The foregoing Project synopsis is hereby approved as a creditable study of Bachelor of Technology and presented in a manner satisfactory to warrant its acceptance as a pre-requisite to the final semester examination for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or any statement made, opinion expressed or conclusion therein but approve this Design only for the purpose for which it is submitted.

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Signature of the examiners

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Abstract :- Every vehicle has its own emission of gases, but the problem occurs when the emission is beyond the standardized values. The primary reason for this breach of emission level being the incomplete combustion of fuel supplied to the engine which is due to the improper maintenance of vehicles. This emission from vehicles cannot be completely avoided, but it definitely can be controlled.

The aim of the project is to monitor and control the pollutants in the vehicle by using the pollution control circuit. This pollution control circuit consists of various sensors like smoke sensor, temperature sensor and GSM, kind of devices, and all of them are integrated and connected to a Controller. It is a real time work where a demo application has been made in which ARDUINO microcontroller is used and a controller board is made where all these devices get integrated and work accordingly. The vehicle is controlled by this circuit. When a vehicle attains certain threshold pollution level then the engine gets automatically switched off and an SMS is generated and sent to the pre-defined number stored in the memory through the GSM module. This paper demonstrates an effective utilization of technology by which we save our environment by controlling the pollution of vehicles.

Introduction :- The incomplete combustion in the engine of a vehicle leads to emission of different gases contributing to increase in the pollution and adversely affecting the environment. Detection and control of these gases is an important area of work. This emission from vehicles cannot be completely avoided but, it definitely can be controlled. As a solution to the above problems we aim to build an automated control system for emission level control of vehicle and accident place detection. Smoke detector is used to detect the carbon percentage in the smoke released by the vehicle due to combustion of fuel in it. Smoke detector is fixed at the end of the exhaust of vehicle from where smoke is released into the environment.

## List of Equipments required :-

### ● Sensors:-

1. MQ135 – Air quality sensor.
2. MQ7 – Carbon Monoxide sensor.
3. DHT – Temperature and Humidity sensor.

### ● Microcontroller:-

1. Arduino board.
2. Arduino GSM module.

### ● Others:-

1. Power supply.
2. Relay.
3. LCD display.



Working Principle:- The smoke detector detects carbon and gives it to the Microcontroller to check the maximum percentage of carbon content in the smoke released by vehicles. Temperature sensor can be used to sense the temperature in the vehicle. So the controller checks the percentage of carbon and temperature, if it exceeds the threshold level the system gets triggered and the engine comes to halt state and then it sends SMS about this to the nearby pollution control office through GSM.

## Block diagram and description:-

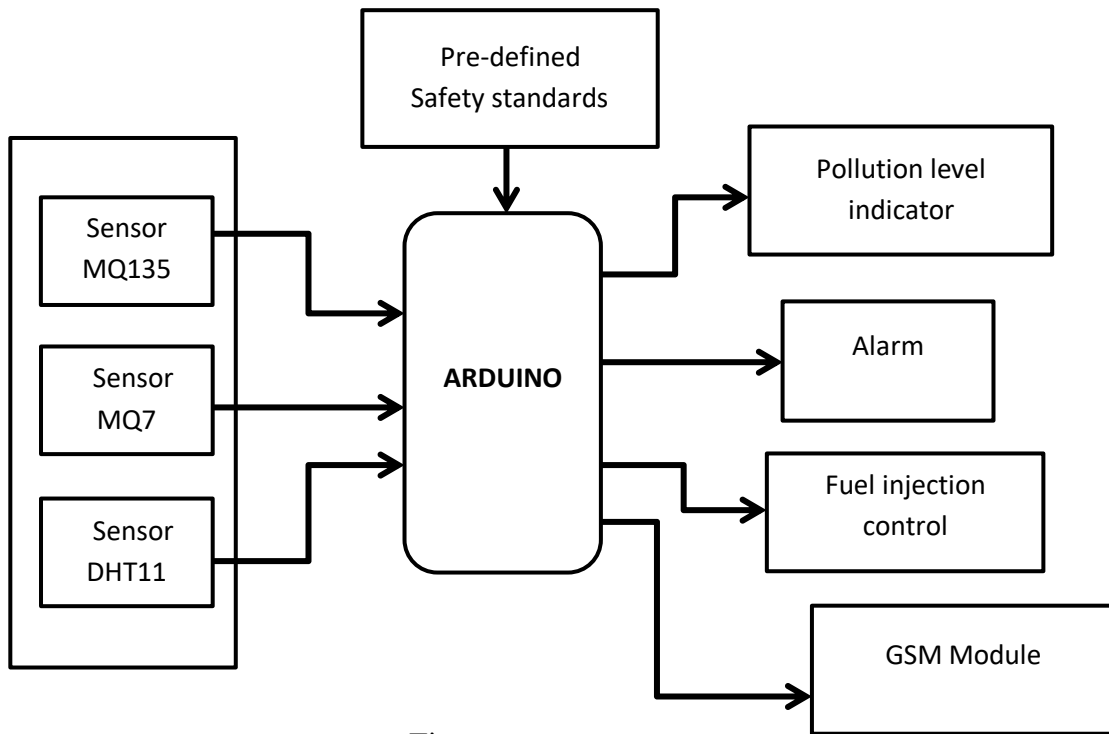


Figure:- 1

The microcontroller is programmed to do mainly three functions namely: Comparison, timer and triggering. It takes two inputs one from the smoke sensor and the other being the pre-defined threshold value. The smoke sensor output is more than the threshold value, the microcontroller triggers the timer circuit and an alarm is set on to inform the driver of the pollution in the vehicle and that it will come to the halt state. Semiconductor sensor MQ-7 is used to detect the smoke CO Sensor having low conductivity in a clean environment is connected to an ARDUINO Microcontroller.

### MQ135 – Air quality sensor:-

Air quality sensor for detecting a wide range of gases, including  $\text{NH}_3$ ,  $\text{NO}_x$ , alcohol, benzene, smoke and  $\text{CO}_2$ . Ideal for use in office or factory. MQ135 gas sensor has high sensitivity to Ammonia, Sulfide and Benze steam, also sensitive to smoke and other harmful gases. It is with low cost and particularly suitable for Air quality monitoring application.



Figure:-2

MQ7 – Carbon Monoxide sensor:- This is a simple-to-use Carbon Monoxide (CO) sensor, suitable for sensing CO concentrations in the air. The MQ-7 can detect CO-gas concentrations anywhere from 20 to 2000ppm.

This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.



Figure:-3

DHT – Temperature and Humidity sensor:- The **DHT11** is a commonly used **Temperature and humidity sensor**. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers.

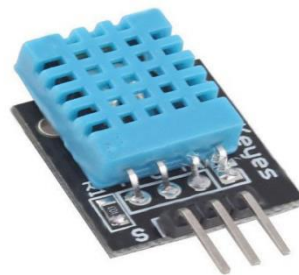


Figure:-4

Arduino board:- Arduino is an open-source platform used for building electronics projects. Arduino consists of both a

physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

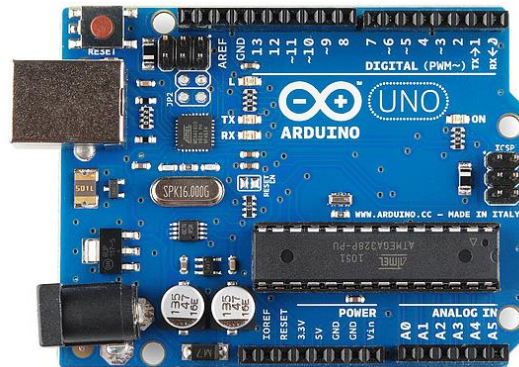


Figure:-5

Arduino GSM module:- A GSM Module is basically a GSM Modem (like SIM 900) connected to a PCB with different types of output taken from the board – say TTL Output (for Arduino, 8051 and other microcontrollers) and Output to interface directly with a PC (personal computer).



Figure:-6

## Project Overview:-

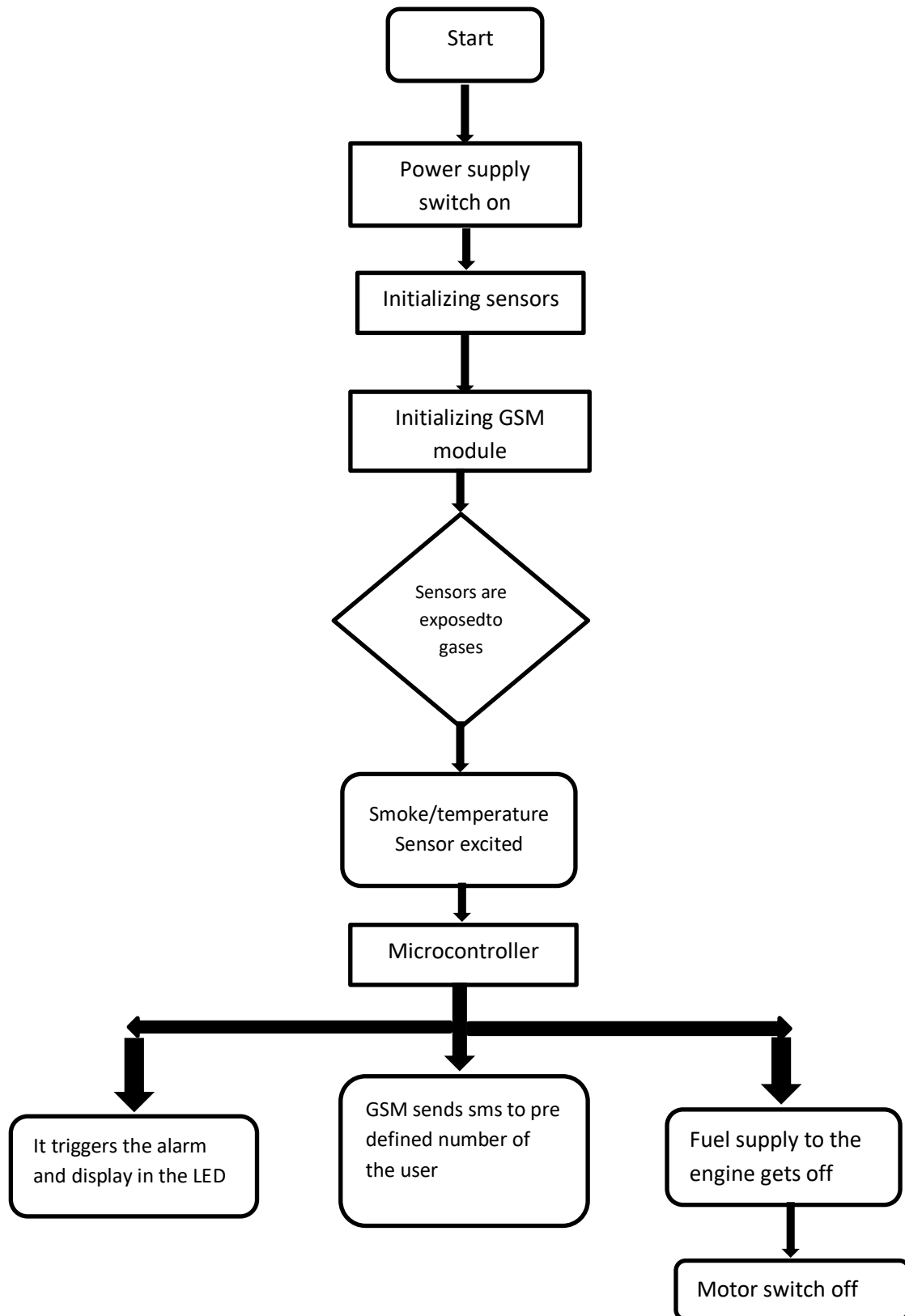


Figure:- 7

## Circuit diagram :-

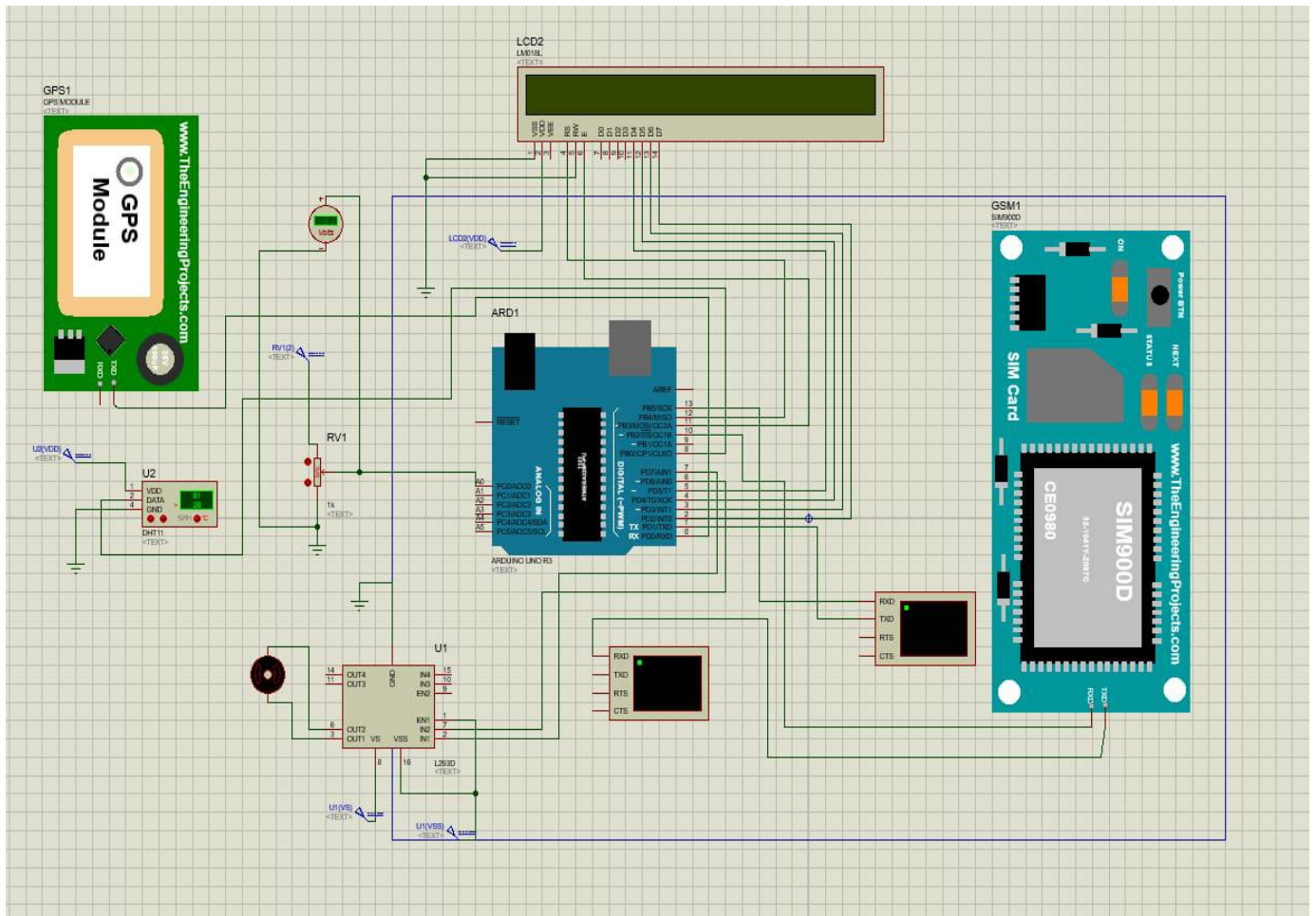


Figure:-8

Working formula:-

$$X = 10^{((\log(R_s/R_o) - y_1)/m + x_1)}$$

X=ppm

X<sub>1</sub> and Y<sub>1</sub> is the arbitrary point on the straight line

m is tangent

Table:- 1

<b>SL No</b>	<b>Voltage (volt)</b>	<b>Sensor Resistance (ohm)</b>	<b>ln(Rs/Ro)</b>	<b>COppmm</b>	<b>LPGppm</b>	<b>SMOKEppm</b>
<b>1.</b>	<b>1</b>	<b>205</b>	<b>2.28</b>	<b>0</b>	<b>0</b>	<b>0</b>
2.	1.8	369	1.474	1	0	1
3.	1.9	389	1.390	2	0	2
4.	2	410	1.304	3	0	3
5.	2.1	430	1.223	4	0	4
6.	2.15	440	1.183	8	1	6
7.	2.25	461	1.0999	15	2	10
8.	2.30	471	1.0605	19	3	12
9.	2.35	481	1.0212	25	3	15
10.	2.60	532	0.8216	100	9	43
11.	2.65	543	0.778	134	12	54
12.	2.70	553	0.739	175	14	66



### Advantages:-

- The designed smart intelligent environmental system monitors the pollutants produced by the vehicles.
- Warn the vehicle owners to control the pollution.
- The air pollution agencies can able to analyze the data and also detect the vehicle registration numbers that causes more pollution in the atmosphere
- Low cost, simple to operate and is easily inserted in any locations.

### Limitations:-

- A SIM card is must for sending the SMS to vehicle owner.
- Short period of one day time is given to the vehicle owner for making tuning of the engine.

Conclusions:- This whole paper mainly focuses on two things. The First thing is the concept of detecting the level of Pollution and indicating it to the driver. There is an increase in the level of Pollution over the last couple of decades, leading to several Environmental problems. There will be a huge population, who do not take the pollution from their vehicles seriously, which has already resulted in several environmental problems such Ozone layer depletion and so on. So, this system will be highly beneficial in curbing this problem. The second reason is that this system will be one of the greatest improvements in technology to keep the Environment free from vehicular emission and bring it to a halt if the Pollution level is more than the Standards mentioned by the Government. The fact that this system is just an add-on, as it does not change the configuration of the engine by any means, will make it easier to employ this system in the existing vehicles. The same concept can also be extended to industries.

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