



**DEPARTMENT OF INFORMATION TECHNOLOGY AND  
COMMUNICATION**

**DIPLOMA IN INFORMATION TECHNOLOGY  
(DIGITAL TECHNOLOGY)**

**SMOKE PREVENTION SYSTEM**

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**SESSION: 1 2022/2023**

## DECLARATION

We hereby declare that the technical report entitled "SMOKE PREVENTION SYSTEM" is based on the results of our original work under the guidance of the supervisor Mrs. Noor Bahiah Binti Zakaria and takes the quotations that have been acknowledged as appropriate. We also state that it has not been or is being submitted to a diploma or award at the Polytechnic or other institutions.

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## **ABSTRACT**

This project is to upgrade the security level to detect fire smoke and smoking smoke in the Seberang Perai Polytechnic toilets. This project is an improvement from the Conventional Fire Alarm System by providing the location of the fire smoke, a buzzer that will sound if smoke is detected and send a message through the Telegram application to the authorities, and capture photos for students who smoke in the toilet. The detector unit is an integration of ESP8266, ultrasonic sensor, MQ2 Smoke Sensor, LED, Push button, GSM Module, and buzzer. The importance of these improvements is to prevent fires that damage property and cause losses, as well as to prevent the loss of life in the event of a fire. In addition, to stop students smoking in the toilet then they throw cigarette butts in the toilet hole which will cause the toilet to become clogged which can also inconvenience other users and cost the institution to repair it. Smoke-free young people are a healthy group that is needed in our country, because smoking is very dangerous for their own health and even the health of the people around them. After this project is completed, the authorities can take action as soon as possible to overcome the fire that will break out or students who smoke cigarettes.

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## 1.0 PROJECT PLAN

### 1.1 INTRODUCTION

One of the basic needs of humans is fire. Fire is used for many things, including cooking, powering industrial machinery, moving trains, and more. However, there is a proverb that states, "Small is a friend, big is an enemy." There are numerous uncontrollable fires that destroy property and even result in human death, which leads to the loss of loved ones. Therefore, taking action as soon as a fire is detected is crucial to avoiding undesirable outcomes. 5449 building fire incidents were reported in total in 2019, according to data from the website data.gov.my. When it comes to those fires, young people are the most vulnerable. Young people are a very important asset because they are the backbone of our country in the future. Berita Harian (28 Ogos 2022) titled "Rakan bergurau main api, remaja rentung dalam tandas terbiar" needs to be taken seriously.

In addition, the case of smoking is increasingly affected among students "Like mushrooms after rain". Smoking has become a common activity in public spaces. Despite the dangers of engaging in these activities, many people continue to pursue them as a hobby or as a way to relieve stress. Smoking causes short-term and long-term effects on smokers and those around them, it was officially declared as haram according to fatwa in 1995. Toilets are a favorite place for students to smoke. There are various disadvantages including clogging the toilet due to cigarette butts thrown in the toilet hole and also the occurrence of fire. Clogged toilets and fires will cost hundreds or even thousands of ringgit.

As a result, our project employs cutting-edge technology to detect cigarette smoke as well as fire smoke. According to the National Fire Protection Association (NFPA), smoke inhalation kills more people than fires. The victims were already dead from the smoke before they could even reach the building's exit. This demonstrates why, rather than burns, smoke inhalation is the leading cause of death in most fires. If the smoke is detected early enough, victims will have enough time to flee the building. Cigarette smoke has the potential to kill other toilet users, who are classified as passive smokers. With this effort, our country Malaysia can produce smoke-free generation.



## **1.2 PROBLEM STATEMENT**

A traditional fire alarm system is made up of various smoke detectors or call points that are wired to the control panel. The fire alarm control panel (FACP) controls or monitors all of the components and devices in this system based on zones. One of the disadvantages of the current fire detection system, according to Vijayalakshmi and Muruganand (2018), is that it cannot provide the location of the fire. It only informs you of the zone that is on fire. According to Hasan and Razzak (2016), the traditional fire detection system lacks a false alarm prevention system. A false alarm occurs when the system detects high humidity, dust or insects, chemical odours, or cigarette smoke.

Students who smoke in the toilet will cause other toilet users to become passive smokers, individuals exposed to cigarette smoke are likely to suffer from various diseases such as cancer, heart disease, asthma and so on. The smoke contained in cigarettes is very dangerous for other people, it even pollutes the air and makes the toilet smell worse, the ash makes the floor dirty and the cigarette butts thrown in the toilet hole cause blockages. Clogged toilets are not something to be taken lightly because the cost to fix them can reach thousands of ringgits.

## **1.3 OBJECTIVES**

There are several objectives in the development of "Smoke Prevention System":

- i. To alert the authorities with buzzer when fire occur.
- ii. To notify the authorities about smoke.
- iii. To avoid the student from touch the devices.

## **1.4 PROJECT SCOPE**

This project was developed to help the Department of Communication and Information Technology (JTMK) at Seberang Perai Polytechnic to improve the level of safety of the people in it. This project will be placed in the toilet in the JTMK building.

Below is the scope of this project, user scope and system scope.

### **1.4.1 USER SCOPE**

- i. Toilet users: This project will help students detect a fire by listening to the sound of a buzzer.
- ii. Authorities: This project will help the authorities take appropriate action when students smoke cigarettes, toilet on fire and also when there are entities that try to reach project items.

### **1.4.2 SYSTEM SCOPE**

This project uses NodeMCU ESP8266, breadboard, Ultrasonic sensor, MQ2 Gas sensor, buzzer, GSM SIM900A, SIM Card, Jumper wire and USB Micro-USB power supply. NodeMCU is an open-source platform based on ESP8266 which can connect objects and let data transfer using the Wi-Fi protocol. The role of ESP8266 in our project is to act as a motherboard that will control all the task that been uploaded.

Next, the ultrasonic sensor is an electronic device that measures the distance on the object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. This device will connect with ESP8266 to communicate. The Module SIM900A looks like a single chip but it has a bunch of features that can help to build many commercial applications such as communication. This device is use to make call to the owner and need to have SIM card, it's for allow the GSM to connect with the network(telecommunication).

In addition, the MQ2 gas sensor module is a versatile sensor that can detect smoke concentrations in the air. It can detect flammable gas in a range of 300 - 10000ppm or known as “parts per million”, this device also will communicate with ESP8266. In addition, the buzzer is a device that produces sound when an electric current is passed through, this device will be used when the MQ2 gas sensor or ultrasonic sensor triggered.

Finally, the Micro-USB power supply is a physical connection that is used on the ESP8266 to flow the power supply. The role of a USB flash drive is to act as a NAS (Network Attached Storage).

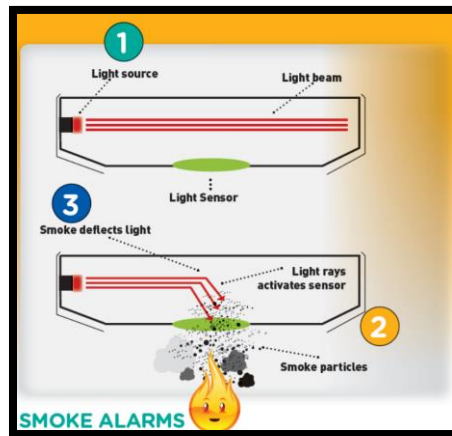
## 1.5 LITERATURE REVIEW

In this chapter, it will discuss the comparisons and explain about smoke detector that use other or similar method with our project. The literature review will also allow to improve many aspects in term practicality of the smoke detector and keep up to date with nowadays technology.

### 1.5.1 Type of Smoke Detectors

A smoke detector is a device that senses smoke, typically as an indicator of fire. Smoke detectors are usually housed in plastic enclosures, typically shaped like a disk, but shape and size vary. Smoke can be detected either optically (photoelectric) or by physical process (ionization).

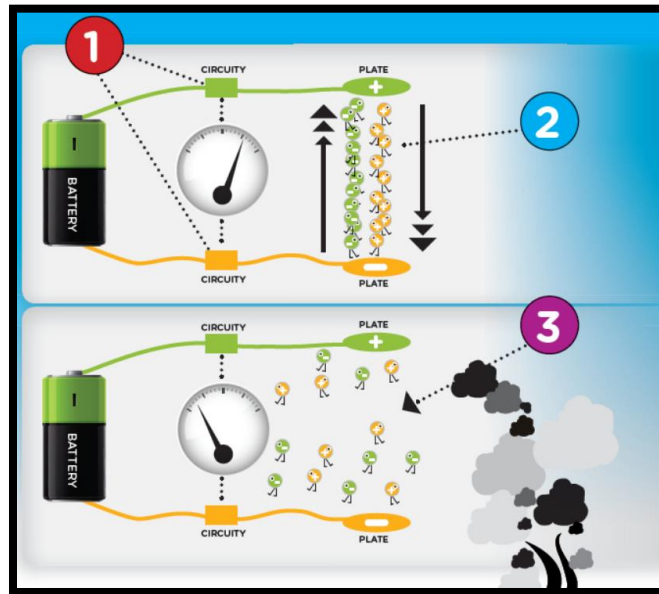
### 1.5.2 Photoelectric Smoke Detector



**Figure 1.0:** Photoelectric Smoke Detector

The function of the photosensor is to detect light. The purpose of LED is to generate a beam of light across the chamber but it is not directed towards the photosensor. When smoke enters the chamber, it will cause the light beam to be interrupted and scattered. Under this condition, some of the light might be scattered to the photosensor unintentionally. When the sensor detected a certain amount of light, it will trigger the alarm.

### 1.5.3 Ionization Smoke Detector



**Figure 1.1:** Ionization Smoke Detector

Ionization-type smoke alarms have a small amount of radioactive material between two electrically charged plates, which ionizes the air and causes current to flow between the plates. When smoke enters the chamber, it disrupts the flow of ions, thus reducing the flow of current and activating the alarm.

**Table 1.1:** Comparison Photoelectric vs Ionization

	<b>Photoelectric Smoke Detector</b>	<b>Ionization Smoke Detector</b>
Advantages	<ul style="list-style-type: none"> <li>-Good for smoldering fire and dense smoke.</li> <li>-Not as prone to cooking nuisance alarms as ionization alarms</li> </ul>	<ul style="list-style-type: none"> <li>-Very good with fast flaming fires with little visible smoke.</li> <li>-Less prone to false alarms caused by dust and steam.</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>-Slightly more expensive than ionization alarms.</li> </ul>	<ul style="list-style-type: none"> <li>-Susceptible to nuisance alarms if placed too close to cooking.</li> </ul>

## 1.6 METHODOLOGY

In Developing a Smoke Prevention System project using ESP8266. We have implemented this study effectively, the conceptual methodology involves hypothesis formation, design, choice, data collection methods and data analysis methods. Agile methodology has been implemented in implementing this project.

### 1.6.1 AGILE LIFE CYCLE

This methodology was chosen based on the activities performed in order to complete the Smoke Prevention System project, problems or unexpected changes are well suited to this methodology because it can return to a phase before or after a certain point. Based on figure 1.2 shows that, it is divided into five phases, planning, analysis and design, construction, and testing.



**Figure 1.2:** Agile Model Phase Cycle

## 1.6.2 ACTIVITY IN AGILE PHASE

### PHASE 1: PLANNING

This phase is an important step to start the project. To achieve this project group members are required to analyze the problem with complete information. Also, state all objectives to help define goals and make decisions to successfully achieve this project. Finally, analyze the system that will be developed to meet the needs of the users and to achieve the best results for building the system.

- i. In Figure 1.2.1 during the visit to the toilet, we studied the appropriate place to put our project.



**Figure 1.2.1:** Site visit

## PHASE 2: ANALYSIS

For analysis phase our group discussed with our supervisor to ensure the necessary hardware after the visit. At the same time, we discuss aspects and approaches that include various techniques to be used when this project is carried out.











	NodeMCU V2 / LoLin V3 / ESP32 ESP-32 Arduino Lua IoT ESP8266 ESP-12E ESP 12 I2c WIFI Wi-Fi Bluetooth Micro... Color Family:NodeMCU V3 (LoLin) - Board + USB Cable 3 Months Local Manufacturer Warranty	RM19.20	Qty: 1	<a href="#">Write A Review</a>
	Arduino / CCTV / LED 12V 2A AC to DC Power Supply Adapter Color Family:Not Specified 3 Months Local Manufacturer Warranty	RM10.90	Qty: 1	<a href="#">Write A Review</a>
	【10PCS】 LED LEDs 3MM 5MM Light Emitting Diode Bulb DIY STEM RBT PROJECT ( RED / GREEN / YELLOW ... Color:Yellow (3mm) 10pcs 3 Months Local Manufacturer Warranty	RM1.00	Qty: 1	<a href="#">Write A Review</a>
	【10PCS】 LED LEDs 3MM 5MM Light Emitting Diode Bulb DIY STEM RBT PROJECT ( RED / GREEN / YELLOW ... Color:Blue (5mm) 10pcs 3 Months Local Manufacturer Warranty	RM1.20	Qty: 1	<a href="#">Write A Review</a>
	【10PCS】 LED LEDs 3MM 5MM Light Emitting Diode Bulb DIY STEM RBT PROJECT ( RED / GREEN / YELLOW ... Color:Red (5mm) 10pcs 3 Months Local Manufacturer Warranty	RM1.20	Qty: 1	<a href="#">Write A Review</a>
	【10PCS】 LED LEDs 3MM 5MM Light Emitting Diode Bulb DIY STEM RBT PROJECT ( RED / GREEN / YELLOW ... Color:Green (5mm) 10pcs 3 Months Local Manufacturer Warranty	RM1.20	Qty: 1	<a href="#">Write A Review</a>
	Servo Motor MG995 MG996r 55g SG90 9g MG90s S3003 Metal / Plastic Gear 180 / 360 Deg Degree Standard / ... Color family:SG90-180Deg (Plastic Gear Micro Servo) 3 Months Local Manufacturer Warranty	RM6.70	Qty: 1	<a href="#">Write A Review</a>
	[READY STOCK @KL] Arduino UNO R3 Rev3 Compatible Atmel DIP ATMEGA328P UNO R3 Board / USB B type... Color:Board+cable 3 Months Local Manufacturer Warranty	RM47.90	Qty: 1	<a href="#">Write A Review</a>
	Arduino 40p 40pcs Breadboard Experiment Rainbow Dupont Jumper Wire Cable Male to Male ( MM ) 10cm / ... Color family:10cm	RM3.60	Qty: 1	<a href="#">Write A Review</a>
	Arduino Range Finder Ultrasound Ultrasonic Sensor HC-SR04 HC SR 04 Distance Measure Measurement Module... Color family:Blue 3 Months Local Manufacturer Warranty	RM3.20	Qty: 1	<a href="#">Write A Review</a>

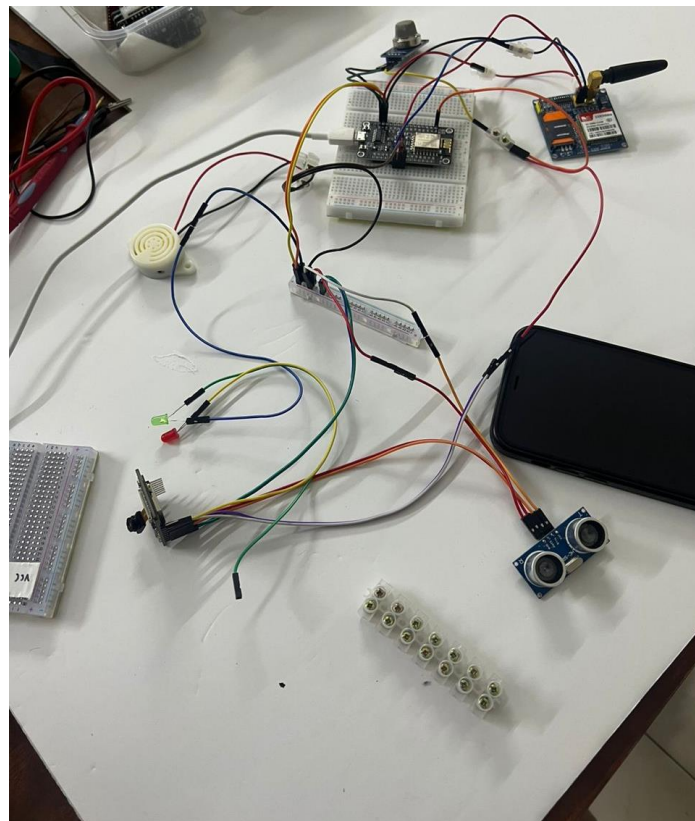
Figure 1.2.2: Project component

### **PHASE 3: DESIGN**

For the design phase we have also sketched the model design for the hardware installation so that it is easier for our supervisors to see the preliminary sketches before the project starts.

### **PHASE 4: INSTALLATION**

For our installation phase, a group will start developing this project according to the design and procedures that have been discussed in phase 3, As we develop this project, supervisors will monitor and guide as we develop this project.



**Figure 1.2.3:** During the installation



## PHASE 5: TESTING

For the testing phase, a group of us carried out a testing process involving the functional of every component attached to ESP8266, works like a preliminary plan and sent messages or alerts to authorities.

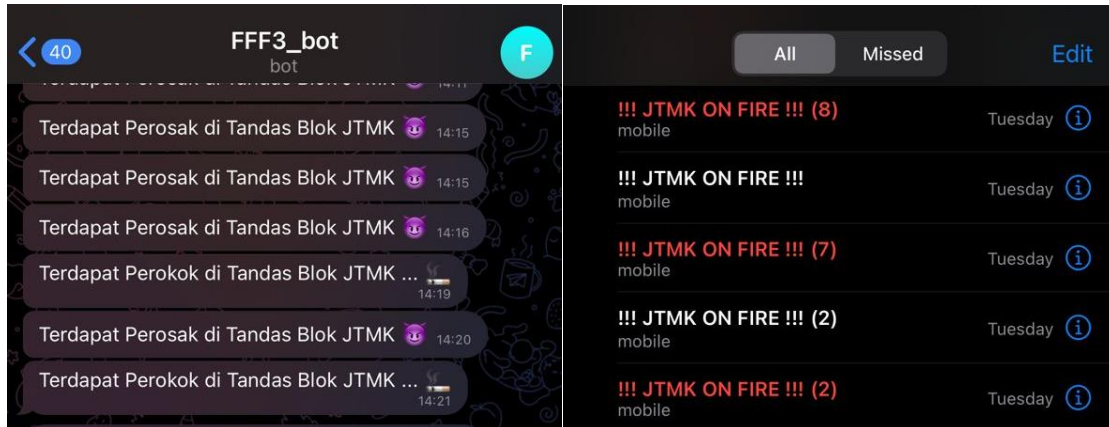


Figure 1.2.4: Testing on telegram and call

## PHASE 6: DOCUMENTATION

For the documentation phase, our group does the process of preparing technical reports and manuals so that in the event of an unwanted problem, users can refer to the manuals for solutions.



Figure 1.2.5: User manual

## 1.7 GANTT CHART

Figure 1.2 below shows a gantt chart to show each activity that we have done through to complete this project. We used MindView application to develop this gantt chart.

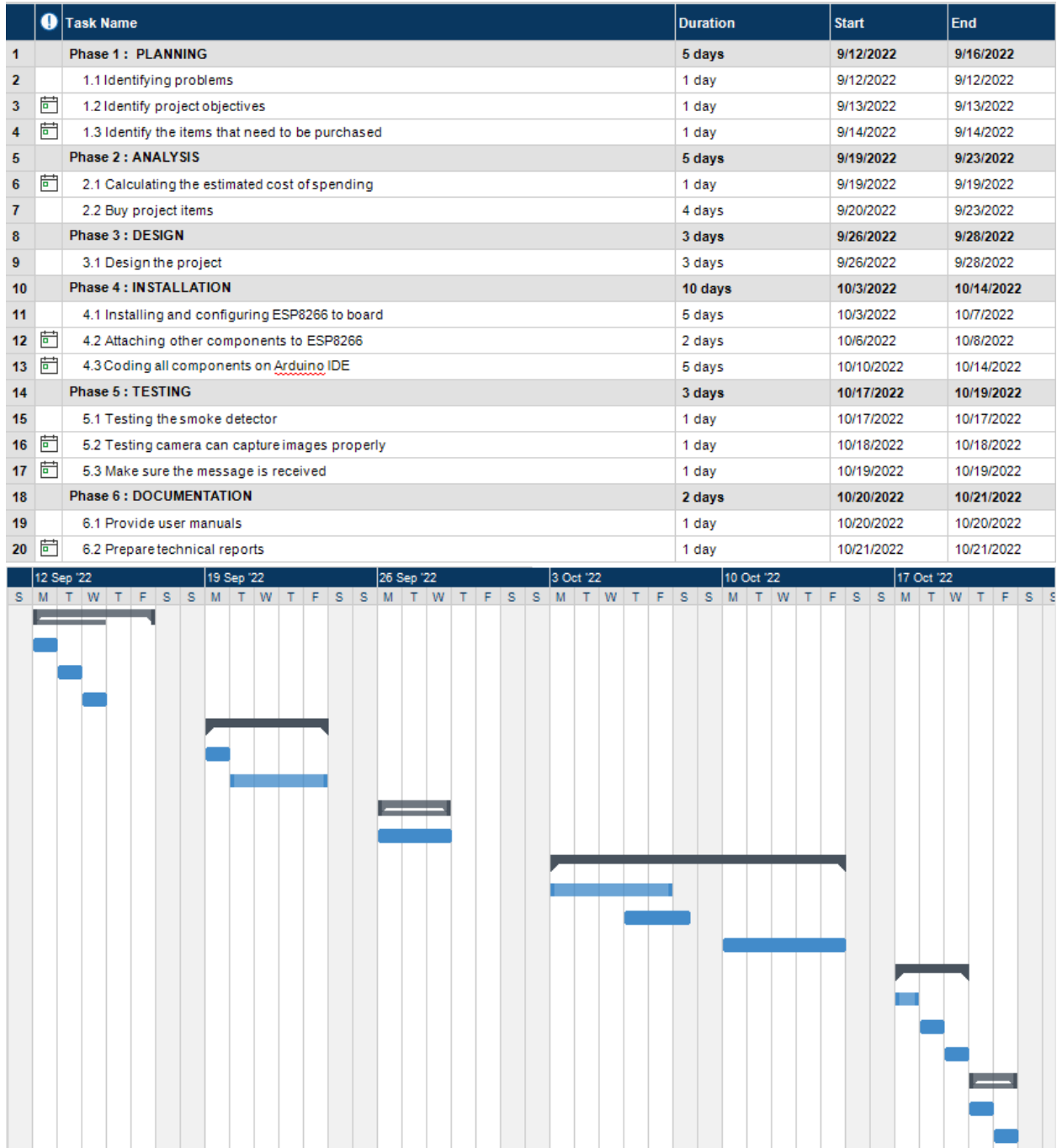


Figure 1.2: Gantt chart

## **2.0 REQUIREMENT SPECIFICATION**

### **2.1 FUNCTIONAL REQUIREMENT**

Functional requirements are meant by a list of the main functions of the project. Between the main list of project functions are:

- i. Detect fire smoke or cigarette smoke in the toilet.
- ii. Send a message through the Telegram application when the sensor detects smoke.
- iii. Take pictures of smokers, vandalism and send them via Telegram.
- iv. Sound a buzzer when detecting fire smoke.

### **2.2 NON-FUNCTIONAL REQUIREMENT**

There are 3 non-functional requirements are needed in this project. As listed below.

- i. Availability

This smoke prevention system can operate 24 hours and 7 days a week as long as it has a Wi-Fi connection and also electricity supply.

- ii. Usability

This project can be used by toilet users by listening to the buzzer when there is a fire and also by the authorities when they receive a message via Telegram.


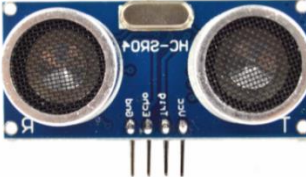



- iii. Reliability






There is no doubt about the level of security in the event of an emergency because toilet users can save themselves as soon as the buzzer sounds.

## 2.3 Hardware and Software Requirement

For this project includes components in terms of hardware and software.

**Table 2.1:** Hardware and software use.

Components	Pictures
NodeMCU V3 ESP8266	 A NodeMCU V3 ESP8266 development board, which is a small black PCB with a USB Type-C port, a micro-USB port, and a 5-pin header.
Ultrasonic Sensor	 An HC-SR04 ultrasonic sensor module, a blue PCB with two circular transducers and a 4-pin header.
MQ2 Smoke Sensor	 An MQ2 smoke sensor module, a blue PCB with a circular metal mesh sensor and a 4-pin header.
LED 3mm	 Five 3mm LEDs in different colors: blue, red, white, yellow, and green.
GSM Module SIM900A	 A SIM900A GSM module, a blue PCB with a SIM card slot, a 4-pin header, and a black antenna.

<p>Piezo Buzzer</p>	 A black cylindrical piezo buzzer with two wires, one red and one black, extending from the bottom.
<p>Wire Jumper</p>	 A bundle of multi-colored jumper wires with female headers on both ends.
<p>USB Cable Micro B</p>	 A white USB cable with a standard USB-A connector on one end and a Micro-B connector on the other.
<p>White Form board</p>	 A stack of several white, rectangular form boards.
<p>Arduino Software (IDE)</p>	 The Arduino logo, featuring a stylized infinity symbol with a minus sign on the left and a plus sign on the right, above the word "ARDUINO" in white capital letters on a teal background.

### 2.3.1 Nodemcu V3 Esp8266:

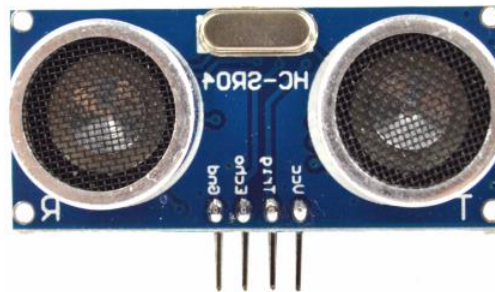
Figure 2.0 below show NodeMCU V3 ESP8266, it is a development board that is based on the ESP8266 WiFi module. The ESP8266 is a low-cost microcontroller with built-in WiFi capability, making it an ideal choice for Internet of Things (IoT) applications. The NodeMCU V3 ESP8266 development board includes a range of features that make it easy to develop and test IoT applications. It includes a USB interface for programming and power supply, an on-board voltage regulator, and a microSD card slot for storing data. The board also includes a variety of input/output (I/O) pins that can be used to connect sensors, actuators, and other components. The NodeMCU V3 ESP8266 development board is compatible with a wide range of programming languages and development environments, including Arduino, Python, and Lua. It is widely used by hobbyists and professionals alike for building IoT projects, such as home automation systems, smart devices, and wireless sensor networks.



**Figure 2.0:** Nodemcu V3 Esp8266

### 2.3.2 Ultrasonic Sensor:

Figure 2.1 below show HC-SR04 ultrasonic sensor, it is a type of sensor that uses high-frequency sound waves to measure distance, detect objects, and measure the speed of moving objects. It operates by emitting ultrasonic waves and measuring the time it takes for the waves to bounce back after hitting an object. By calculating the time it takes for the waves to return, the sensor can determine the distance to the object and can also detect the presence of objects in its field of view. Ultrasonic sensors are often used in a variety of applications, including automated parking systems, distance measurement, and object detection. They are commonly used in industrial and manufacturing settings, as well as in robotics, security systems, and automotive applications.



**Figure 2.1:** Ultrasonic Sensor

### 2.3.3 MQ2 Smoke Sensor:

Figure 2.2 below show the MQ2 smoke sensor, it is a type of sensor that is used to detect the presence of smoke in the air. It is commonly used in fire detection systems, as well as in other applications where the detection of smoke is important, such as in cooking appliances and ventilation systems. The MQ2 smoke sensor works by measuring the concentration of certain gases in the air. When smoke is present, the sensor detects the increase in the concentration of these gases and sends a signal to indicate the presence of smoke. The sensitivity of the sensor can be adjusted to detect different levels of smoke, depending on the specific application. MQ2 smoke sensors are often preferred to other types of smoke detectors because they are relatively inexpensive, easy to use, and reliable. They are also widely available and can be easily integrated into a variety of different systems.



**Figure 2.2:** MQ2 Smoke Sensor



### 2.3.4 LED 3mm:

Figure 2.3 below show LED 3mm, it is a type of light-emitting diode (LED) that is 3 millimeters in diameter. LED stands for "light-emitting diode," which is a type of electronic component that produces light when an electrical current is passed through it. LED 3mm lamps are commonly used in a wide variety of applications, including indicator lights on electronic devices, display panels, and automotive lighting. They are often preferred to traditional incandescent bulbs because they are more energy-efficient and have a longer lifespan. LED 3mm lamps are typically available in a range of colors, including red, green, blue, and white. They can also be purchased in various shapes and sizes to suit different needs.



**Figure 2.3:** LED 3mm

### 2.3.5 GSM Module SIM900A:

Figure 2.4 below show SIM900A, it is a GSM (Global System for Mobile Communications) module that is used to provide wireless communication capabilities to devices. It is commonly used in a variety of applications, including mobile phones, wireless alarms, GPS trackers, and other electronic devices that need to send and receive data over a wireless network. The SIM900A is a quad-band GSM/GPRS module that supports data rates of up to 85.6 kbps. It includes a built-in TCP/IP stack and can be easily controlled using AT commands. The module has a wide range of features, including SMS messaging, data transmission, and voice communication. It also has a built-in SIM card reader, making it easy to connect to a wireless network. The SIM900A is a compact module that is easy to integrate into a wide range of applications. It is often used in combination with microcontrollers or single-board computers, such as the Arduino or Raspberry Pi, to add wireless communication capabilities to projects.



**Figure 2.4:** GSM Module SIM900A

### 2.3.6 Piezo Buzzer:

Figure 2.5 below show Piezo buzzer, it is a type of electronic component that generates a sound when an alternating current is applied to it. It consists of a piezoelectric crystal, which is a material that produces an electric charge when subjected to mechanical stress. When an alternating current is applied to the piezoelectric crystal, it vibrates at a high frequency and produces a sound. Piezo buzzers are often used as alarms or indicators in a variety of applications, including alarms, timers, and consumer electronics. They are commonly used in place of traditional mechanical buzzers because they are more reliable and have a longer lifespan. Piezo buzzers are also relatively inexpensive and easy to use. Piezo buzzers are available in a range of sizes and shapes to suit different applications. They can be purchased with different frequency ranges and loudness levels to suit different needs. Some piezo buzzers also include additional features, such as built-in amplifiers or a range of different sounds that can be played.



**Figure 2.5:** Piezo Buzzer

### 2.3.7 Wire Jumper:

Figure 2.6 below show jumper wires, which is a type of electrical wire that commonly used for prototyping and testing electronic circuits. They are named after their connector type, which is called a Dupont connector. Jumper wires have a male connector on one end and a female connector on the other end. They are typically made of flexible, insulated wire and are available in a variety of lengths and colors. They are commonly used to connect components in a circuit, such as sensors, actuators, and microcontrollers. Jumper wires are widely used in a variety of applications, including robotics, home automation, and prototyping. They are often used in combination with breadboards, which are used to build and test electronic circuits. Dupont jumper wires are convenient to use because they can easily be connected and disconnected, making it easy to change or modify a circuit. They are also relatively inexpensive and widely available.



**Figure 2.6:** Jumper Wires

### 2.3.8 USB Cable Micro-B:

Figure 2.7 show USB cable Micro-B connector, it is a type of cable that is used to connect devices to a computer or other device that has a USB port. The Micro-B connector is a small, rectangular connector that is commonly used on devices such as smartphones, tablets, and portable hard drives. A USB cable with a Micro-B connector has a male Micro-B connector on one end and a standard USB-A connector on the other end. The USB-A connector is the larger, rectangular connector that is typically found on computers and other devices that have a USB port. The Micro-B connector is smaller and is used on devices that need to be connected to a computer or other device for charging or data transfer. USB cables with Micro-B connectors are widely used because they are convenient and allow for easy connectivity between devices. They are commonly used to connect smartphones and tablets to computers for charging and data transfer, as well as to connect other portable devices to computers and other devices for similar purposes.



**Figure 2.7:** USB Cable Micro-B

### **2.3.9 White Form board:**

Figure 2.8 below show white foam board, also known as foam core or foam core, is a lightweight, rigid material that is commonly used for a variety of applications, including mounting prints, creating models, and displaying signs. It is made of a layer of foam sandwiched between two layers of paper or cardboard, which gives it its rigidity and strength. White foam board is often preferred for its versatility, lightweight, and durability. It is easy to cut and shape, making it a popular choice for crafts and DIY projects. It is also a good choice for display and signage applications because it is lightweight and easy to handle. White foam board is also resistant to moisture, making it a good choice for outdoor use. White foam board is widely available in a range of sizes and thicknesses to suit different needs. It is often used in combination with adhesives, such as mounting squares or foam tape, to attach it to other surfaces. It is also available in different colors, including black, gray, and green, in addition to white.



**Figure 2.8:** White Form board

### 2.3.10 Arduino Software (IDE):

Arduino Integrated Development Environment (IDE) is a software application that is used to develop and upload code to an Arduino microcontroller. The Arduino IDE is a cross-platform software application that is available for Windows, Mac, and Linux operating systems. The Arduino IDE includes a range of features that make it easy to write, test, and upload code to an Arduino microcontroller. It includes a code editor, a debugger, and a serial monitor that can be used to communicate with the microcontroller. It also includes a library manager that allows users to easily import libraries and code snippets into their projects. The Arduino IDE is based on the C++ programming language and includes a range of tools and features that are specifically designed for developing Arduino projects. It is widely used by hobbyists, educators, and professionals to build a wide range of electronic projects, including robots, home automation systems, and IoT devices.



**Figure 2.9:** Arduino Software

## 2.4 SYSTEM CONFIGURATION

Below is the coding we have configured in esp8266 by using Arduino IDE application. We used ESP8266 WiFi module.

```
#include <ESP8266WiFi.h>
#include <WiFiClientSecure.h>
#include <UniversalTelegramBot.h>
#include <ArduinoJson.h>
#include <SoftwareSerial.h>

const char* ssid = "Fzuxxx"; // Nama Wifi
const char* password = "12121212"; // Password Wifi
#define BOTtoken "5901309992:AAF01AJQ_o_2Nj4JgZiEnfCxc99-gRs_1Y"
#define CHAT_ID "314978319"
#define CHAT_ID_2 "313053856"

X509List cert(TELEGRAM_CERTIFICATE_ROOT);
WiFiClientSecure client;
UniversalTelegramBot bot(BOTtoken, client);
SoftwareSerial mySerial(12,13); // Pin for GSM module
const int trigPin = 16; //D0
const int echoPin = 5; //D1
int RedLed = 4; //D2
int GreenLed = 0; //D3
int buzzer = 14; //D5
int smokeA0 = A0; //A0

// defines variables
long duration;
int distance;
char msg;
char call;

void setup()
{
  pinMode (RedLed, OUTPUT); // Led merah
  pinMode (GreenLed, OUTPUT); // Led hijau
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
  pinMode(smokeA0, INPUT); //Smoke Sensor
  pinMode(buzzer, OUTPUT); //buzzer

  Serial.begin(9600); // serial monitor for Ultrasonic & MQ2
  mySerial.begin(9600); // serial monitor for GSM module
```



```

// untuk Connect to WiFi
configTime(0, 0, "pool.ntp.org");
client.setTrustAnchors(&cert);
Serial.print("Connecting Wifi: ");
Serial.println(ssid);

WiFi.mode(WIFI_STA);
WiFi.begin(ssid, password);
while (WiFi.status() != WL_CONNECTED)
{
    Serial.print(".");
    delay(500);
}

Serial.println("");
Serial.println("WiFi connected");
Serial.print("IP address: ");
Serial.println(WiFi.localIP());
}

void loop() {

    int analogSensor = analogRead(smokeA0);
    Serial.print("Distance: " );    // Prints the distance on the Serial Monitor
    Serial.println(distance);      // distance tidak trigger
    digitalWrite(GreenLed, HIGH);  // turn the LED on
    digitalWrite(RedLed, LOW);     // turn the LED off
    digitalWrite(trigPin, LOW);    // Clears the trigPin
    Serial.print(" Smoke : ");     //ppm value @ tak trigger
    Serial.println(analogSensor);

    // Sets the trigPin on HIGH state for 10 micro seconds
    digitalWrite(trigPin, HIGH);
    digitalWrite(trigPin, LOW);

    // Reads the echoPin, returns the sound wave travel time in microseconds
    duration = pulseIn(echoPin, HIGH);

    // Calculating the distance
    distance = (duration/2) / 29.1;
}

```

```

if (distance<=20)
{
  Serial.print("Distance Detect: " );
  Serial.print(distance);
  Serial.println(" cm");
  digitalWrite(RedLed, HIGH); // turn the LED on
  digitalWrite(GreenLed, LOW); // turn the LED off
  tone (buzzer, 1000, 500); // turn the buzzer
  delay(500);
  bot.sendMessage(CHAT_ID, " Terdapat Perosak di Tandas Blok JTMK...🐱 "); //
Message perosak ke telegram
  bot.sendMessage(CHAT_ID_2, " Terdapat Perosak di Tandas Blok JTMK...🐱 ");
// Message perosak ke telegram
}
if ((analogSensor>=130) && (analogSensor<=150))
{
  Serial.print("Smoke Detect : " );
  Serial.print(analogSensor);
  Serial.println(" ppm");
  digitalWrite(RedLed, HIGH); // turn the LED on
  digitalWrite(GreenLed, LOW); // turn the LED off
  tone(buzzer, 1000, 200);
  bot.sendMessage(CHAT_ID, " Terdapat Perokok di Tandas Blok JTMK...👤 ");
// Message perokok ke telegram
  bot.sendMessage(CHAT_ID_2, " Terdapat Perokok di Tandas Blok JTMK...👤
"); // Message perokok ke telegram
}
if (analogSensor>=450)
{
  Serial.print("High Smoke Detect : " );
  Serial.print(analogSensor);
  Serial.println(" ppm");
  digitalWrite(buzzer, HIGH); // turn the buzzer
  delay(500);
  tone(buzzer, 1000, 200);
  MakeCall(); // Untuk GSM call
  delay (1000);
}
delay(550);
}
void MakeCall() {
  mySerial.println("ATD+60126823291;"); // ATDxxxxxxxxxx; -- watch out here
for semicolon at the end!!
  Serial.println(" Calling... "); // print response over serial port
  delay(1000);
}

```

```
void MakeCall() {
  mySerial.println("ATD+60126823291;"); // ATDxxxxxxxx; -- watch out here for
  semicolon at the end!!
  Serial.println(" Calling... "); // print response over serial port
  delay(1000);
}
void HangupCall() {
  mySerial.println("ATH");
  Serial.println("Hangup Call");
  delay(1000);
}
```

### 3.0 FINAL DESIGN

#### 3.1 Circuit Diagram

To sketch the logical topology, we use the Fritzing application to sketch the topology in figure 3.0.

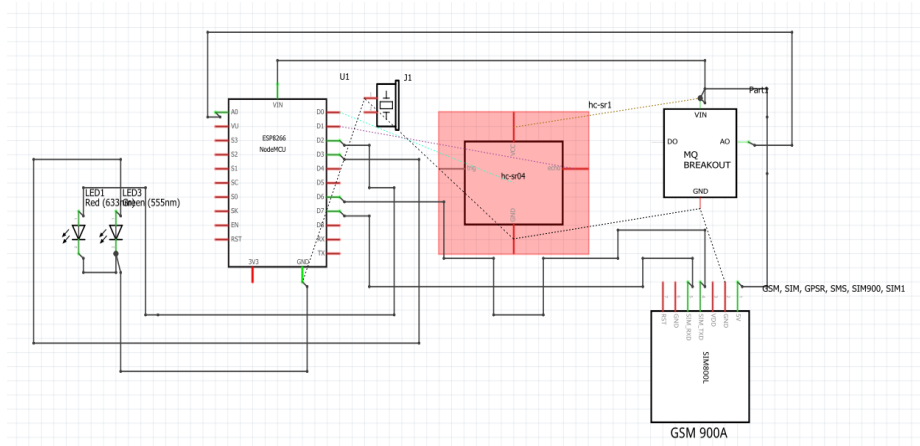


Figure 3.0 : Circuit Diagram

#### 3.2 Physical Diagram

To sketch the physical topology, we also use the Fritzing application to sketch the topology in figure 3.1.

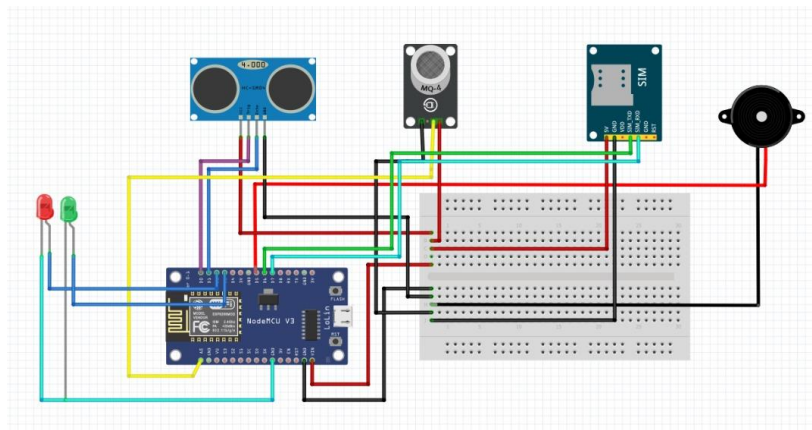


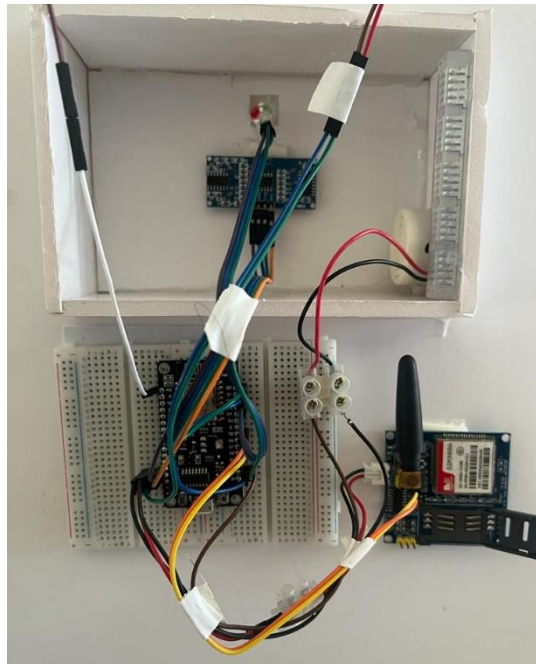
Figure 3.1 : Physical Diagram

### 3.3 Prototype

The diagram below shows the final result of the prototype and also component wiring that we have produced before the final presentation.



**Figure 3.2:** The prototype

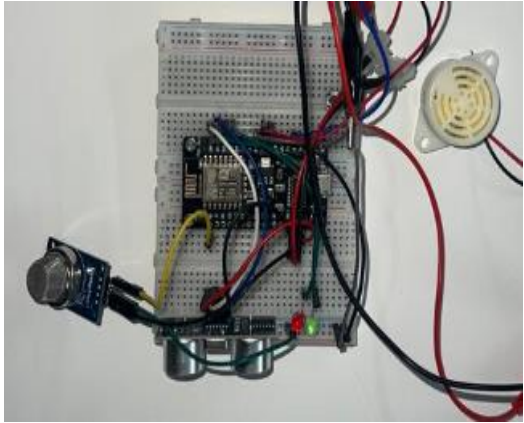
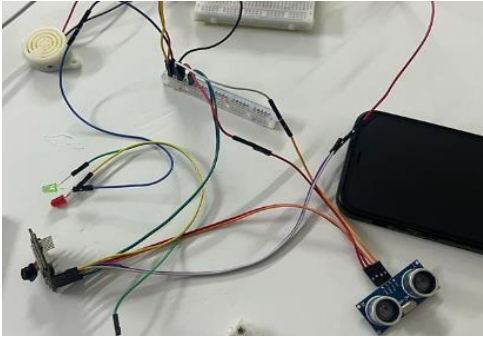
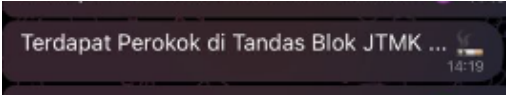



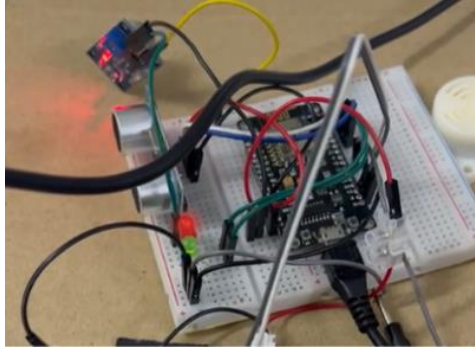
**Figure 3.3:** Component wiring

## 4.0 TEST DESCRIPTION AND RESULTS

### 4.1 Unit Testing Plan

Table 3.1 below shows all the tests that have been carried out after completion of configuration and after hardware installation.

No.	Test Case Name	Pictures	Result
1	The buzzer beeping when the sensor detects fire smoke		Success
2	The buzzer beeping when the distance sensor detects an entity approaching the project.		Success
3	A message is sent via Telegram when detecting cigarette smoke		Success

4	<p>Authorities received phone call when detecting fire smoke</p>		<p>Success</p>
5	<p>Red LED light up when detects an entity approaching the project.</p>		<p>Success</p>

**Table 3.1:** Unit Testing Plan (UTP)

## **5.0 MAJOR FINDINGS AND DISCUSSIONS**

### **5.1 Advantage of the project**

There are advantages when completing this project. Among the advantages are:

- i. Save costs.
- ii. Increase the level of safety in the toilet.
- iii. Reduce the rate of loss of life when there is a fire.
- iv. Reduce students smoking in the toilet.

### **5.2 Disadvantage of the project**

There are several constraints to completing this project. Below is constraints to complete this project:

- i. Require a Wi-Fi connection in order to send messages.
- ii. Limited budget.
- iii. If the electricity goes out, there is no backup.



## **6.0 CONCLUSIONS**

### **6.1 Conclusion Project**

Based on the analysis and implementation of the system, it can be concluded that the development of the Smoke Prevention System successfully achieved its objective of detecting fire smoke and cigarette smoke and sending messages to the authorities well. The identity of the student who smoked can be identified through the photo received by the authorities. With this, the toilet can be well maintained because there is no cigarette ash, the smell of cigarette smoke and fires caused by smoking can be avoided. As a result, educational institutions can reduce the cost of toilet maintenance. Our country is also able to produce a high-quality young generation free from cigarettes.

### **6.2 Recommendations in Future**

Based on this project, there have been some possible suggestions submitted. First, the installation of cameras in the project. This makes it easier for the authorities to detect the presence of smokers or students who are trying to damage the project. Secondly, proposals to develop applications to change project settings by creating an interface for users with the apps, the users can do things like change the Wi-Fi password, distance to alert, PPM value of smoke to alert, and finally, increase the number of users for the authorities. Finally, we will install the solar and backup battery power supplies in the future.

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