

# **National Textile University, Faisalabad**

## **Department of Computer Science**

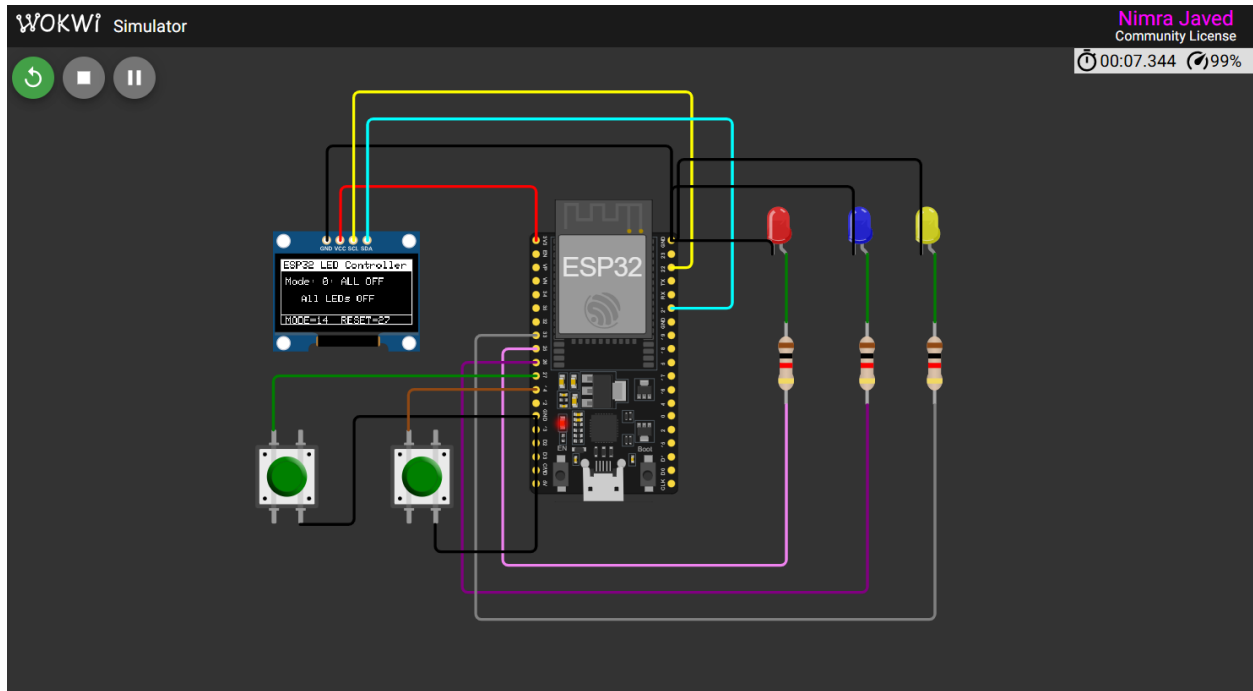


Name	Nimra Javed
Section	BSCS-B
Semester	5 <sup>th</sup>
Registration no.	23-NTU-CS-1082
Course title	Embedded IOT System
Submitted to	Sir Nasir Mahmood
Submission date	23-Oct-2025

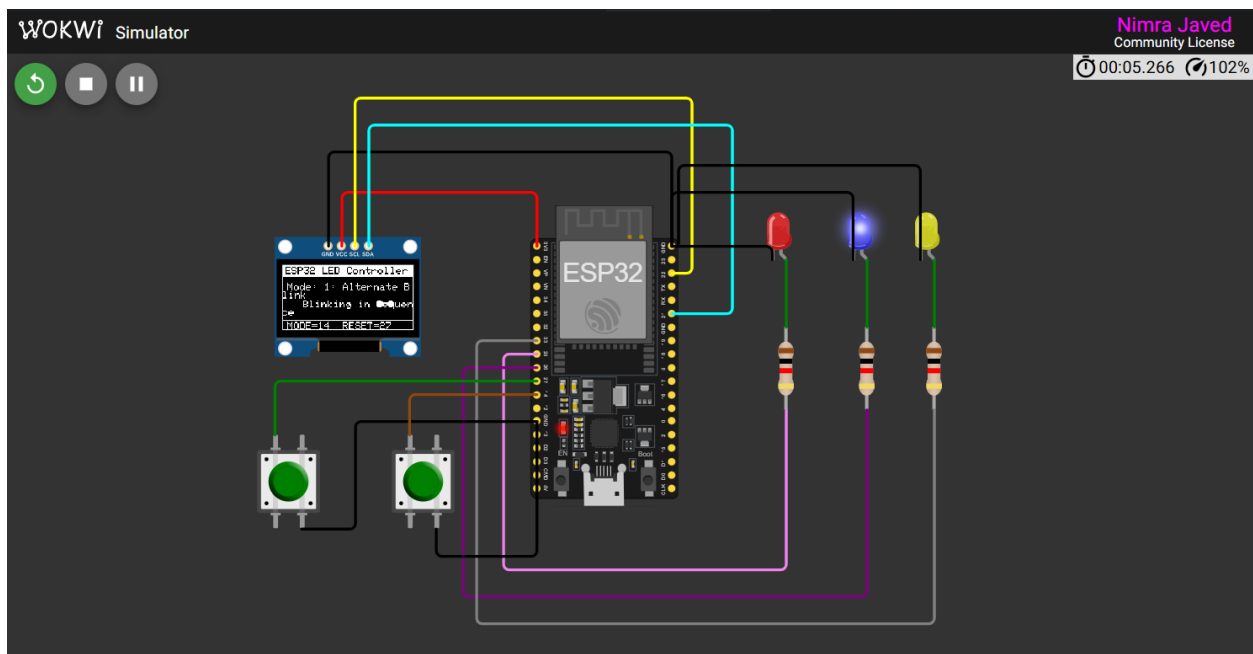
# TASK A

Wokwi diagram:

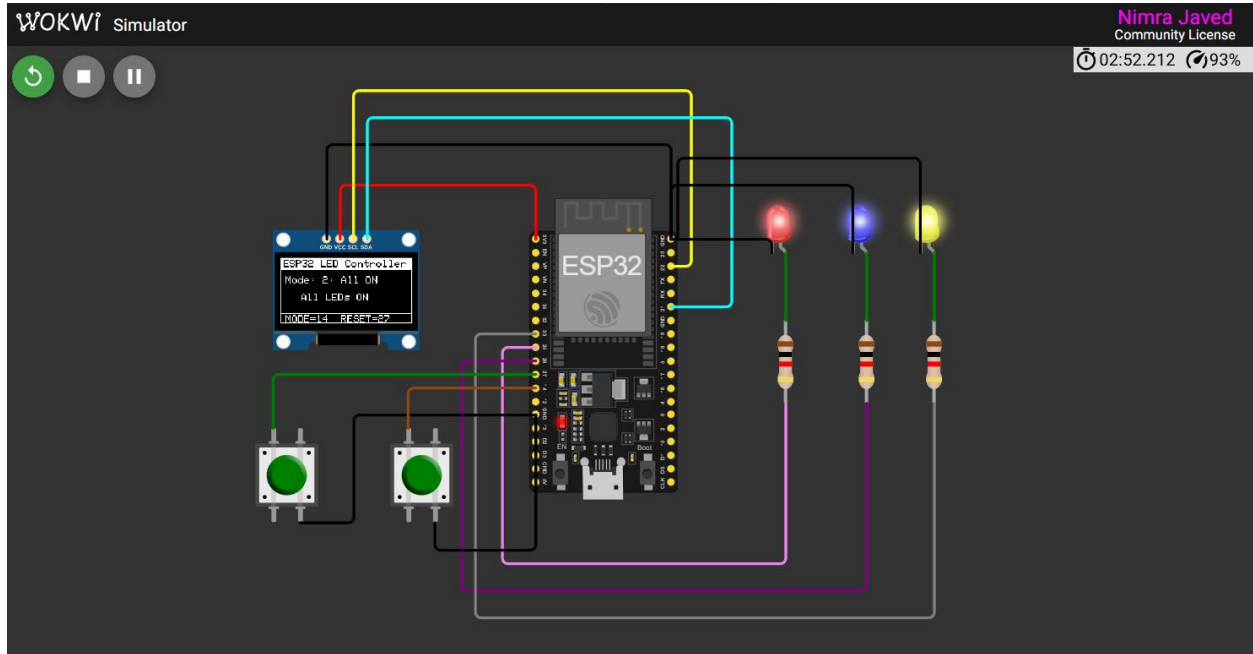
Mode 0:



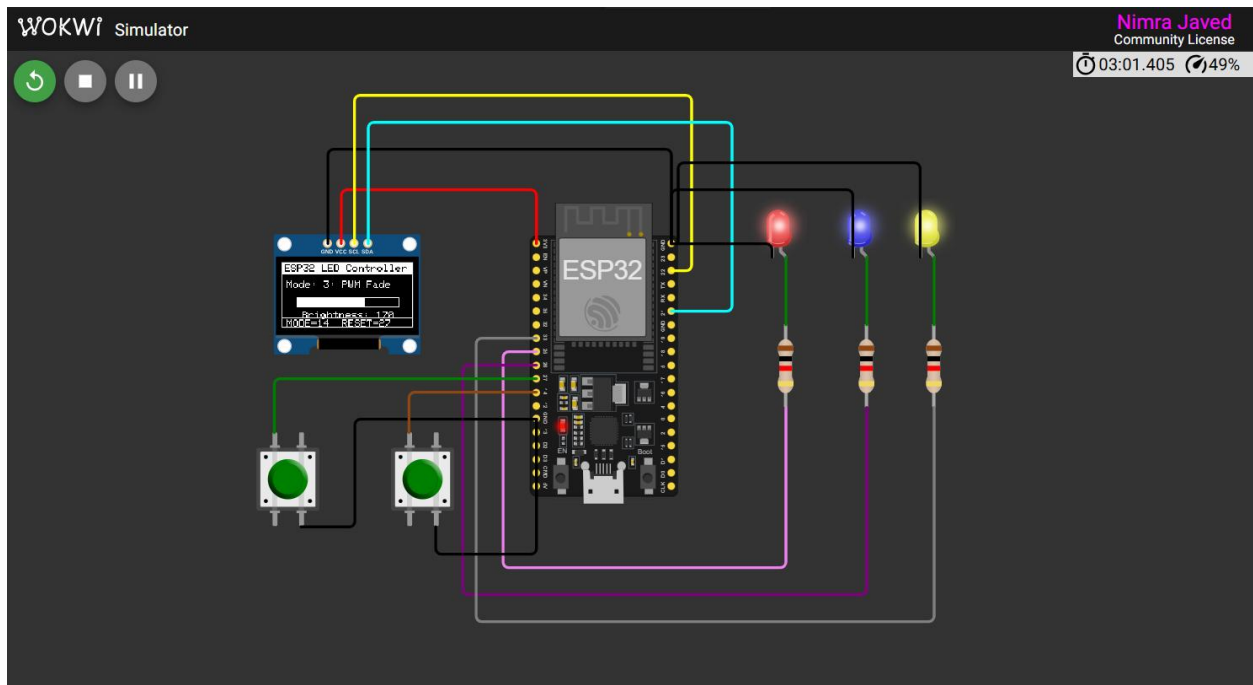
Mode 1:



## Mode 2:



## Mode 3:



Pin diagram: (ESP32 with OLED and LEDs)

ESP32 Pin	Label	Connected To	Description
25	LED1	LED1 (via 220Ω resistor)	First LED output
26	LED2	LED2 (via 220Ω resistor)	Second LED output
33	LED3	LED3 (via 220Ω resistor)	Third LED output
14	BTN_MODE	Push Button 1 → GND	Changes LED mode
27	BTN_RESET	Push Button 2 → GND	Resets mode
21	SDA	OLED SDA	I <sup>2</sup> C data line
22	SCL	OLED SCL	I <sup>2</sup> C clock line
3.3V	VCC	OLED VCC	Power for OLED
GND	GND	OLED, LEDs, Buttons	Common ground

## Code:

```
platformio.ini U  README.md U  main.cpp U x  diagram.json U  Wokwi Simulator  PIO Home  diagram.json U
src > main.cpp > loop()
1 // Name: Nimra Javed
2 // Reg no: 23-NTU-CS-1082
3 // Section: BS-CS 5th B
4 // Title: Task A - LED Modes with OLED and Push Buttons
5
6 #include <Wire.h>
7 #include <Adafruit_GFX.h>
8 #include <Adafruit_SSD1306.h>
9
10 #define SCREEN_WIDTH 128
11 #define SCREEN_HEIGHT 64
12 #define OLED_ADDR 0x3C
13 Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);
14
15 // --- Pin Configuration ---
16 #define LED1 25 // First LED pin
17 #define LED2 26 // Second LED pin
18 #define LED3 33 // Third LED pin
19 #define BTN_MODE 14 // Button to change LED mode
20 #define BTN_RESET 27 // Button to reset to OFF mode
21
22 // --- PWM Configuration ---
23 #define PWM_CH1 0 // PWM Channel for LED1
24 #define PWM_CH2 1 // PWM Channel for LED2
25 #define PWM_CH3 2 // PWM Channel for LED3
26 #define PWM_FREQ 5000 // PWM frequency in Hz
27 #define PWM_RES 8 // PWM resolution (8-bit = 0-255)
28
29 int mode = 0; // Current LED mode
30 unsigned long lastPress = 0; // For button debounce
31 int brightness = 0; // Current LED brightness (for fade)
32 int fadeAmount = 10; // Brightness change per loop in fade mode
33
34 void setup() {
35     Serial.begin(115200);
36
37     // --- Configure buttons as input with internal pull-up ---
38     pinMode(BTN_MODE, INPUT_PULLUP);
39     pinMode(BTN_RESET, INPUT_PULLUP);
```

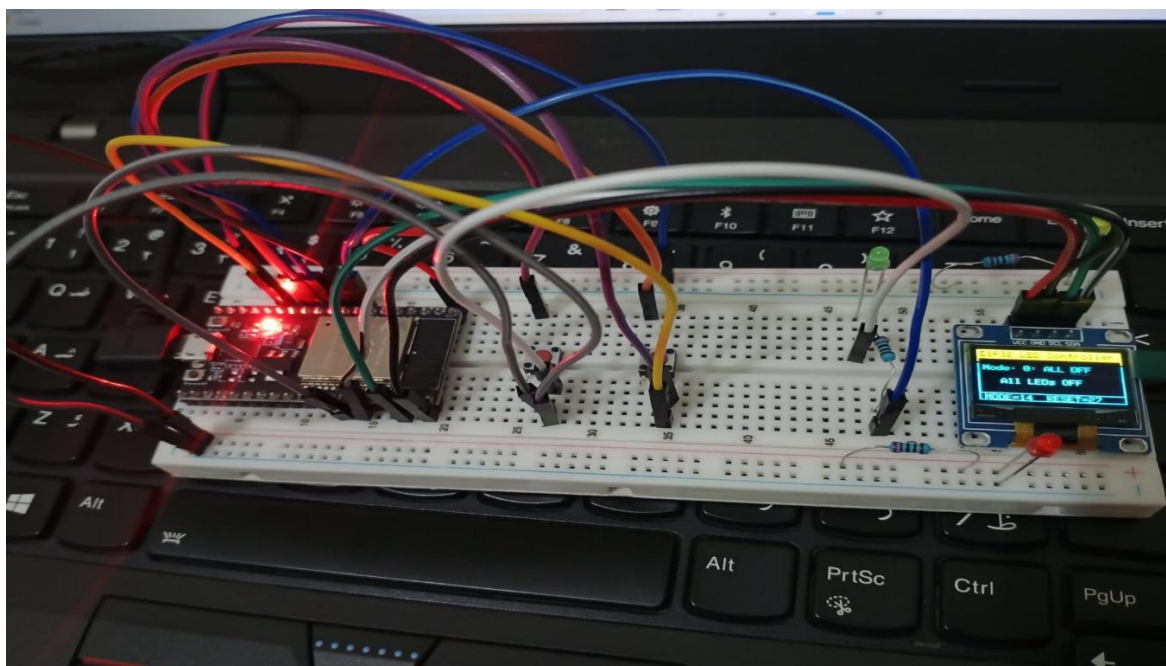
```
platformio.ini U  README.md U  main.cpp U x  diagram.json U  Wokwi Simulator  PIO Home  diagram.json U
src > main.cpp > loop()
34 void setup() {
41     // --- Setup PWM for LEDs ---
42     ledcSetup(PWM_CH1, PWM_FREQ, PWM_RES);
43     ledcSetup(PWM_CH2, PWM_FREQ, PWM_RES);
44     ledcSetup(PWM_CH3, PWM_FREQ, PWM_RES);
45     ledcAttachPin(LED1, PWM_CH1);
46     ledcAttachPin(LED2, PWM_CH2);
47     ledcAttachPin(LED3, PWM_CH3);
48
49     // --- Initialize OLED Display ---
50     Wire.begin(21, 22); // Set custom I2C pins
51     if (!display.begin(SSD1306_SWITCHCAPVCC, OLED_ADDR)) {
52         Serial.println("OLED not found!");
53         while (true); // Halt program if OLED fails
54     }
55
56     // --- Startup message ---
57     display.clearDisplay();
58     display.setTextSize(1);
59     display.setTextColor(SSD1306_WHITE);
60     display.setCursor(15, 25);
61     display.println("System Ready...");
62     display.display();
63     delay(1000);
64     display.clearDisplay();
65 }
66
67 /*
68 drawUIFrame():
69 Draws the OLED layout including header, border,
70 and footer with pin information. Displays current mode text.
71 */
72 void drawUIFrame(String modeText) {
73     display.clearDisplay();
74
75     // --- Header Bar ---
76     display.fillRect(0, 0, 128, 12, SSD1306_WHITE); // top header bar
77     display.setTextColor(SSD1306_BLACK);
78     display.setCursor(3, 2);
79     display.print("ESP32 LED Controller");
```

```
platformio.ini U README.md U main.cpp U diagram.json U Wokwi Simulator PIO Home diagram.json U v ✓ ✓ ...
```

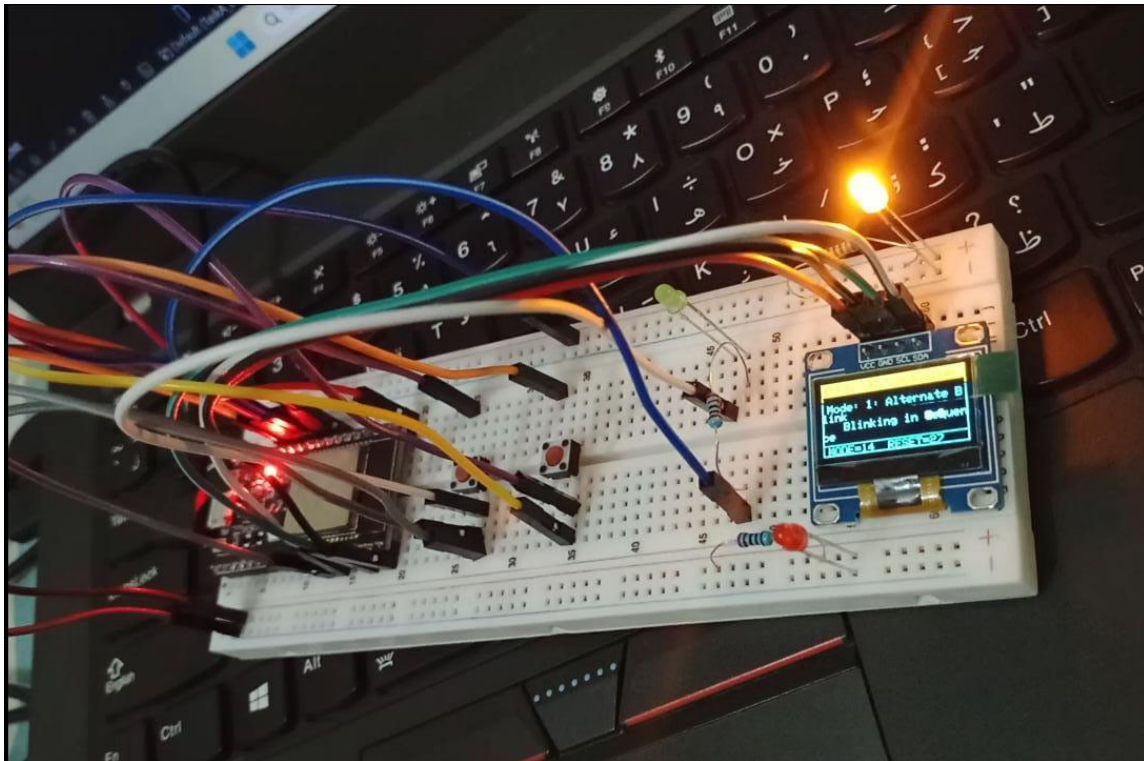
```
src > main.cpp > loop()
72 void drawUIFrame(String modeText) {
81     // --- Outer Border ---
82     display.drawRect(0, 0, SCREEN_WIDTH, SCREEN_HEIGHT, SSD1306_WHITE);
83
84     // --- Mode Title ---
85     display.setTextColor(SSD1306_WHITE);
86     display.setTextSize(1);
87     display.setCursor(5, 18);
88     display.print("Mode: ");
89     display.println(modeText);
90
91     // --- Footer Bar (Instructions) ---
92     display.drawLine(0, 54, 128, 54, SSD1306_WHITE);
93     display.setCursor(5, 56);
94     display.print("MODE=14  RESET=27");
95 }
96
97 void loop() {
98     // --- Button Handling (with debounce delay) ---
99     if (digitalRead(BTN_MODE) && millis() - lastPress > 250) {
100         mode = (mode + 1) % 4; // Cycle through 4 modes
101         lastPress = millis();
102     }
103     if (digitalRead(BTN_RESET) && millis() - lastPress > 250) {
104         mode = 0; // Reset to OFF mode
105         lastPress = millis();
106     }
107
108     // --- Mode Logic + OLED Display ---
109     switch (mode) {
110
111         // MODE 0: All LEDs OFF
112         case 0: {
113             drawUIFrame("0: ALL OFF");
114             ledcWrite(PWM_CH1, 0);
115             ledcWrite(PWM_CH2, 0);
116             ledcWrite(PWM_CH3, 0);
117             display.setCursor(20, 35);
118             display.println("All LEDs OFF");
119             break;
120         }
```

### Hardware Output:

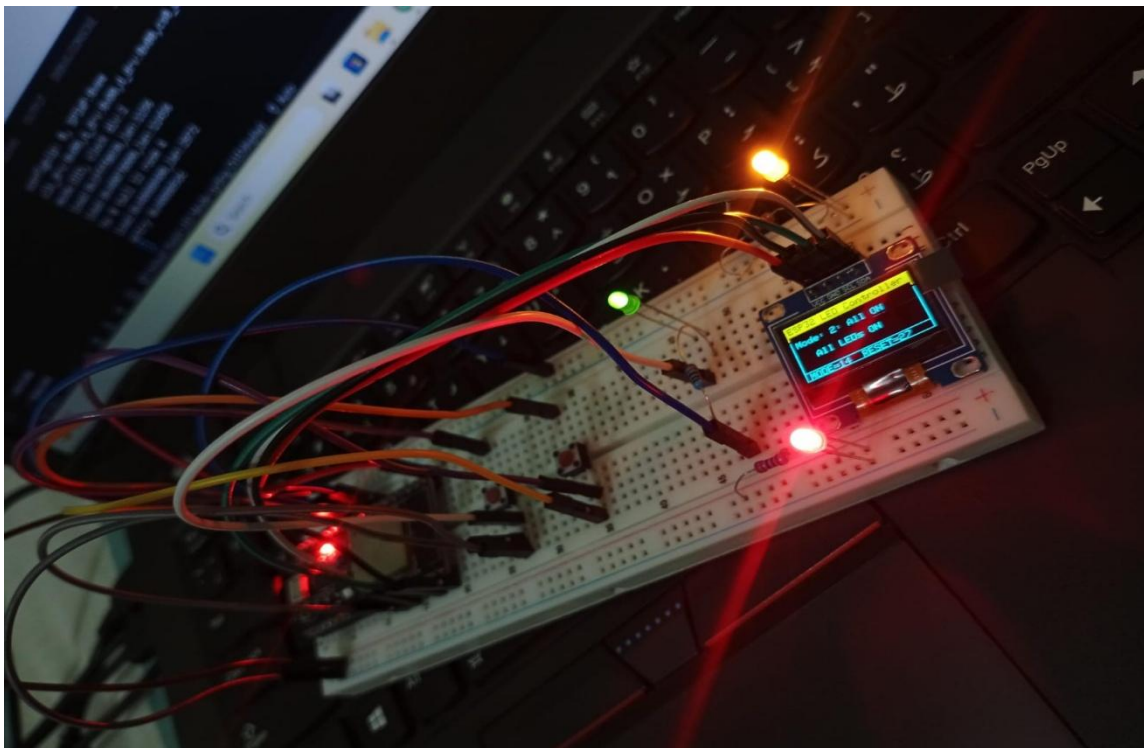
### Mode 0:



**Mode 1:**

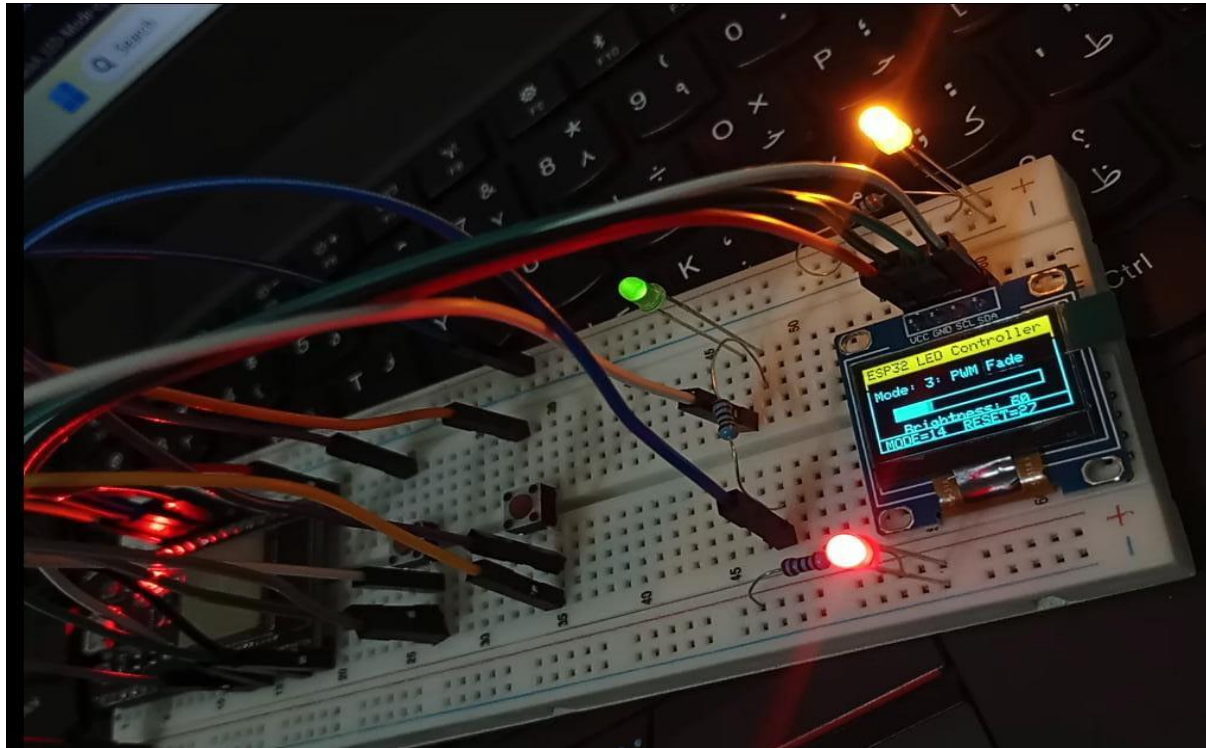


**Mode 2:**





## Mode 3:

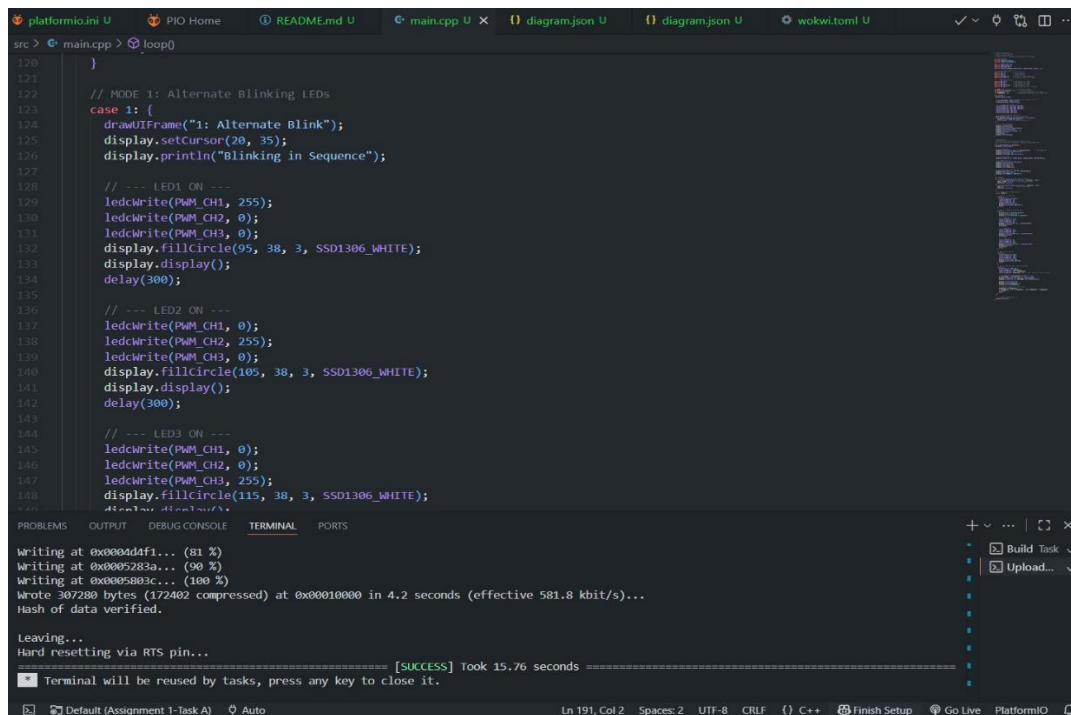


## Build Success:

```
platformio.ini U  PIO Home  README.md U  main.cpp U x  diagram.json U  diagram.json U  wokwi.toml U
src > main.cpp > loop()
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121
122 // MODE 1: Alternate Blinking LEDs
123 case 1: {
124   drawUIFrame("1: Alternate Blink");
125   display.setCursor(20, 35);
126   display.println("Blinking in Sequence");
127
128   // --- LED1 ON ---
129   ledcWrite(PWM_CH1, 255);
130   ledcWrite(PWM_CH2, 0);
131   ledcWrite(PWM_CH3, 0);
132   display.fillCircle(95, 38, 3, SSD1306_WHITE);
133   display.display();
134   delay(300);
135
136   // --- LED2 ON ---
137   ledcWrite(PWM_CH1, 0);
138   ledcWrite(PWM_CH2, 255);
139   ledcWrite(PWM_CH3, 0);
140   display.fillCircle(105, 38, 3, SSD1306_WHITE);
141   display.display();
142   delay(300);
143
144   // --- LED3 ON ---
145   ledcWrite(PWM_CH1, 0);
146   ledcWrite(PWM_CH2, 0);
147   ledcWrite(PWM_CH3, 255);
148   display.fillCircle(115, 38, 3, SSD1306_WHITE);
149   display.display();
150   delay(300);
151 }
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```



Upload success:



```
src > main.cpp > [loop]
120 }
121
122 // MODE 1: Alternate Blinking LEDs
123 case 1: {
124   drawUIFrame("1: Alternate Blink");
125   display.setCursor(20, 35);
126   display.println("Blinking in Sequence");
127
128   // --- LED1 ON ---
129   ledcWrite(PWM_CH1, 255);
130   ledcWrite(PWM_CH2, 0);
131   ledcWrite(PWM_CH3, 0);
132   display.fillCircle(95, 38, 3, SSD1306_WHITE);
133   display.display();
134   delay(300);
135
136   // --- LED2 ON ---
137   ledcWrite(PWM_CH1, 0);
138   ledcWrite(PWM_CH2, 255);
139   ledcWrite(PWM_CH3, 0);
140   display.fillCircle(105, 38, 3, SSD1306_WHITE);
141   display.display();
142   delay(300);
143
144   // --- LED3 ON ---
145   ledcWrite(PWM_CH1, 0);
146   ledcWrite(PWM_CH2, 0);
147   ledcWrite(PWM_CH3, 255);
148   display.fillCircle(115, 38, 3, SSD1306_WHITE);
149   display.display();
150   delay(300);
151 }
152 }
```

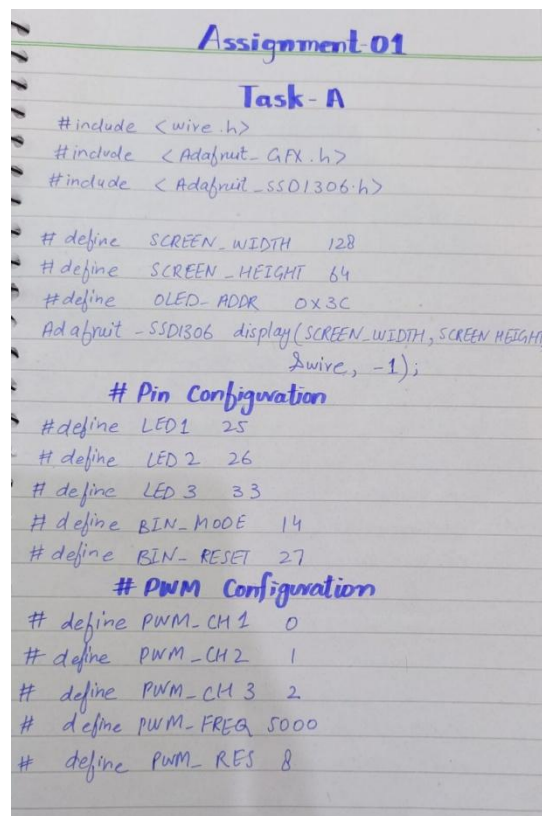
Writing at 0x0000d4f1... (81 %)  
Writing at 0x0005283a... (90 %)  
Writing at 0x0005803c... (100 %)  
Wrote 307280 bytes (172402 compressed) at 0x00010000 in 4.2 seconds (effective 581.8 kbit/s)...  
Hash of data verified.

Leaving...  
Hard resetting via RTS pin...

[SUCCESS] Took 15.76 seconds

Terminal will be reused by tasks, press any key to close it.

Handwritten Code:



Assignment 01

Task - A

```
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>

#define SCREEN_WIDTH 128
#define SCREEN_HEIGHT 64
#define OLED_ADDR 0x3C
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);

# Pin Configuration
#define LED1 25
#define LED2 26
#define LED3 33
#define BIN_MODE 14
#define BIN_RESET 27

# PWM Configuration
#define PWM_CH1 0
#define PWM_CH2 1
#define PWM_CH3 2
#define PWM_FREQ 5000
#define PWM_RES 8
```

```
int mode = 0;
unsigned long lastpress = 0;
int brightness = 0;
int ledcount = 10;
```

```
void setup() {
  Serial.begin(115200);
```

```
  pinMode(BIN_MODE, INPUT_PULLUP);
  pinMode(BIN_RESET, INPUT_PULLUP);
```

### # Setup PWM for LEDs

```
  ledSetup(PWM_CH1, PWM_FREQ, PWM_RES);
  ledSetup(PWM_CH2, PWM_FREQ, PWM_RES);
  ledSetup(PWM_CH3, PWM_FREQ, PWM_RES);
  ledAttachPin(LED1, PWM_CH1);
  ledAttachPin(LED2, PWM_CH2);
  ledAttachPin(LED3, PWM_CH3);
```

### # Initialize OLED Display

```
  Wire.begin(21, 22);
  if (!display.begin(SSD1306_SWITCHCAPVCC,
    OLED_ADDR)) {
    Serial.println("OLED not found!");
    while (true);
  }
```

### # Startup message

```
  display.clearDisplay();
  display.setTextSize(1);
  display.setTextColor(SSD1306_WHITE);
  display.setCursor(15, 25);
  display.println("system ready--");
  display.display();
  delay(1000);
  display.clearDisplay();
```

```
void drawUIFrame(String modeText) {
  display.clearDisplay();
```

### # Header bar

```
  display.fillRect(0, 0, 128, 12, SSD1306_WHITE);
  display.setTextColor(SSD1306_BLACK);
  display.setCursor(3, 2);
  display.print("ESP32 LED controller");
```

### # Outer border

```
  display.drawRect(0, 0, SCREEN_WIDTH, SCREEN_
    HEIGHT, SSD1306_WHITE);
```

### # Mode Title

```
  display.setTextColor(SSD1306_WHITE);
  display.setTextSize(1);
  display.setCursor(5, 18);
  display.print("Mode: ");
  display.println(modeText);
```

### # Header bar (Instructions)

```
  display.drawLine(0, 54, 128, 54, SSD1306_WHITE);
  display.setCursor(5, 54);
  display.print("mode = 14 Reset = 27");
```

```
void loop() {
```

### # Button Handling (with debounce delay)

```
  if (!digitalRead(BIN_MODE) && 250 - (lastpress > 250)) {
```

```
    mode = (mode + 1) % 4;
    lastpress = millis();
```

```
  }
  if (!digitalRead(BIN_RESET) && 250 - (lastpress > 250)) {
```

```
    mode = 0;
    lastpress = millis();
```

### # Mode Logic + OLED Display

```
  switch (mode) {
```

#### # Mode 0 (All LEDs OFF)

```
    case 0: {
      drawUIFrame("0: ALL OFF");
      ledWrite(PWM_CH1, 0);
      ledWrite(PWM_CH2, 0);
      ledWrite(PWM_CH3, 0);
```

```
    display.setCursor(20, 35);
    display.println("All LEDs OFF");
    break;
```

#### # Mode 1: Alternate blinking LEDs

```
    case 1: {
      drawUIFrame("1: alternate blink");
      display.setCursor(20, 35);
      display.println("Blinking in sequence");
```

##### # LED1 ON

```
      ledWrite(PWM_CH1, 255);
      ledWrite(PWM_CH2, 0);
      ledWrite(PWM_CH3, 0);
      display.fillRect(95, 38, 3, SSD1306_WHITE);
      display.display();
      delay(300);
```

##### # LED2 ON

```
      ledWrite(PWM_CH1, 0);
      ledWrite(PWM_CH2, 255);
      ledWrite(PWM_CH3, 0);
      display.fillRect(105, 38, 3, SSD1306_WHITE);
      display.display();
      delay(300);
```

```

# LED3 ON
ledcwrite (PWM_CH1, 0);
ledcwrite (PWM_CH2, 0);
ledcwrite (PWM_CH3, 255);
display.fillCircle(15, 38, 3, SSD1306_WHITE);
display.display();
delay (300);
break;
}

Mode 2: All LEDs ON
case 2: {
drawUIframe ("2: All ON");
ledcwrite (PWM_CH1, 255);
ledcwrite (PWM_CH2, 255);
ledcwrite (PWM_CH3, 255);
display.setCursor (20, 35);
display.println ("All LED's ON");
break;
}

# Mode 3: PWM Fade
case 3: {
drawUIframe ("3: PWM Fade");
ledcwrite (PWM_CH1, brightness);
ledcwrite (PWM_CH2, 255 - brightness);
ledcwrite (PWM_CH3, brightness / 2);

```

```

# FadeBar visualization on OLED
int barLength = map (brightness, 0, 255, 0, 100);
display.drawPixel (15, 34, 100, 0, SSD1306_WHITE);
display.fillRect (15, 34, barLength, 10, SSD1306_WHITE);

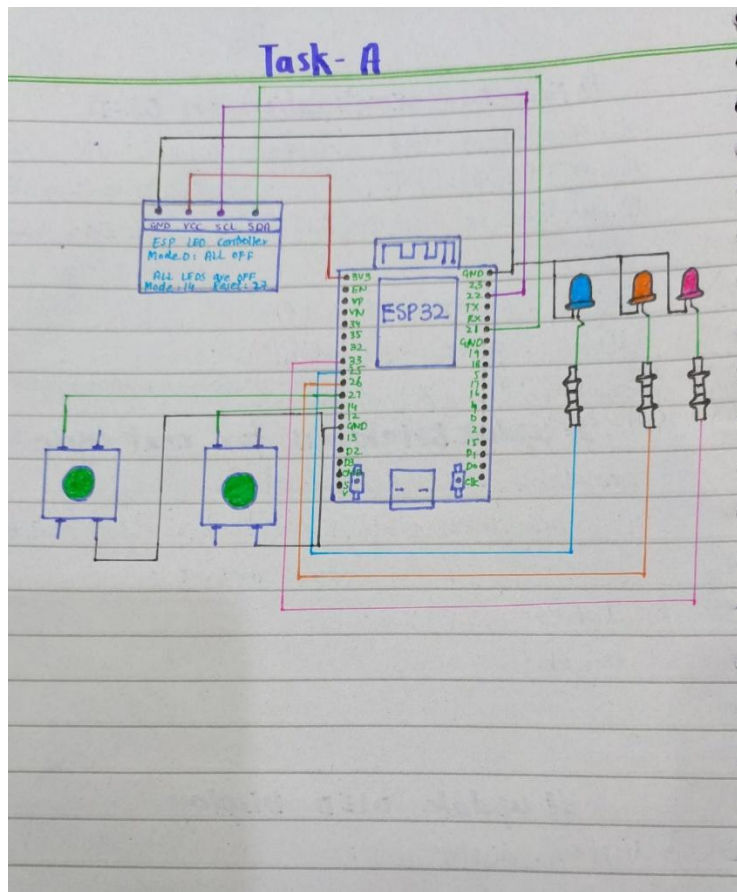
display.setCursor (20, 48);
display.print ("Brightness");
display.println (brightness);

# update Brightness for next cycle
brightness += FadeAmount;
if (brightness <= 0 || brightness >= 255) FadeAmount = -fadeAmount;

delay (25);
break;
}

# update OLED Display
display.display ();
}

```



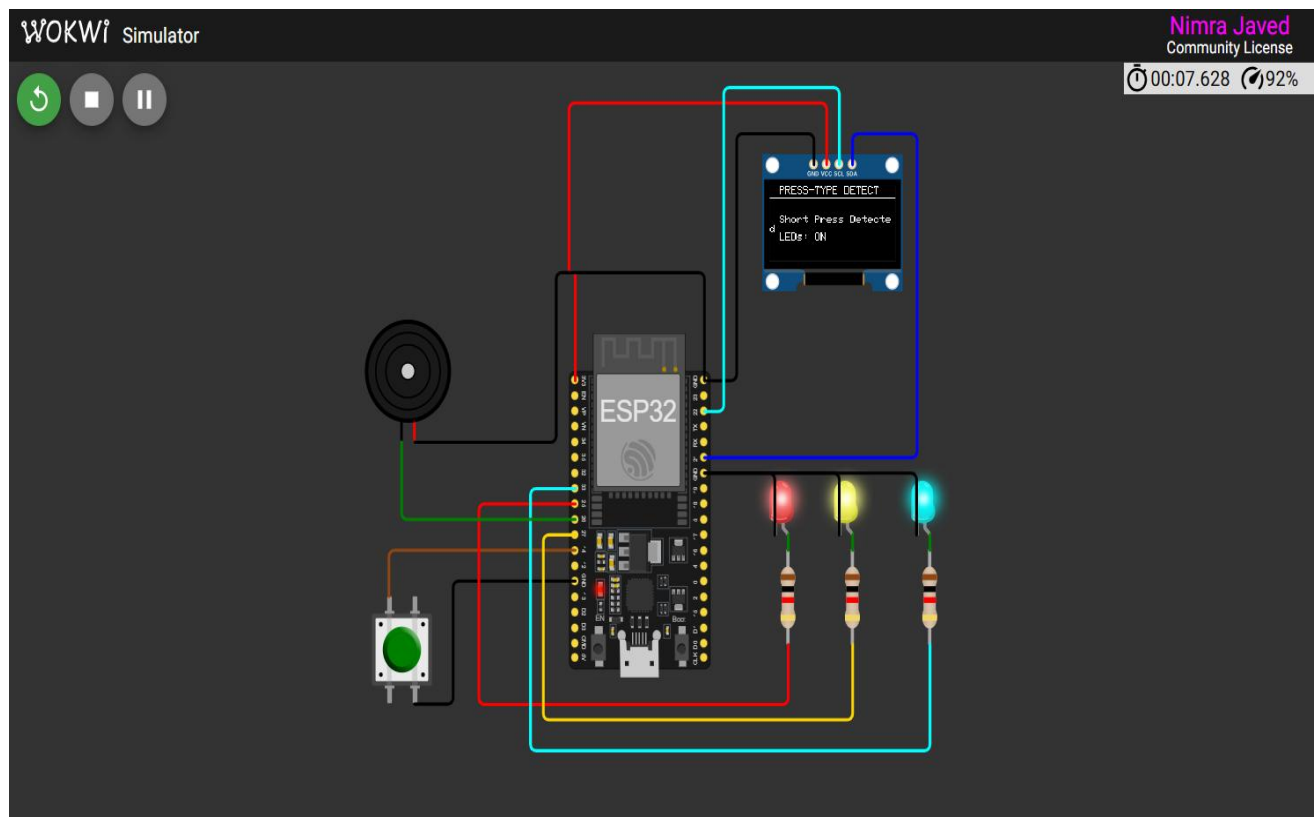
**Wokwi Link (Task-A):**

<https://wokwi.com/projects/445507758525483009>

## **TASK B**

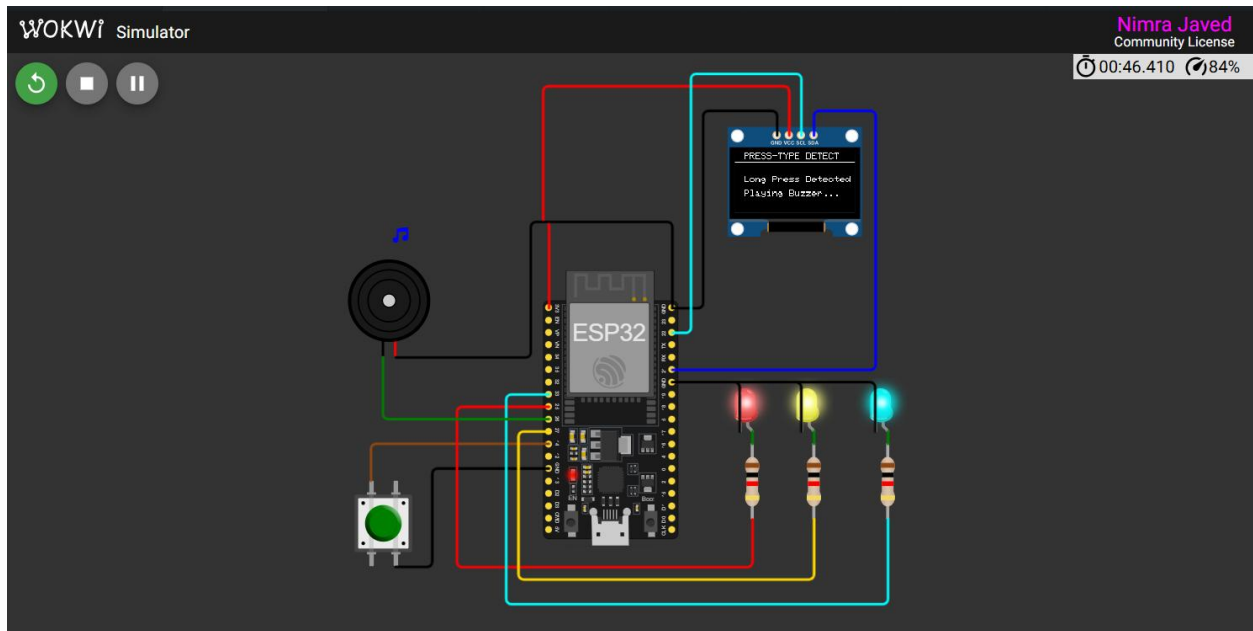
**Wokwi diagram:**

**Short press Detected: (LEDS ON)**





## Long press Detected: (Buzzer)



### Pin diagram:

ESP32 Pin	Label	Connected To	Description
25	LED1	LED1 (via 220Ω resistor)	First LED output
27	LED2	LED2 (via 220Ω resistor)	Second LED output
33	LED3	LED3 (via 220Ω resistor)	Third LED output
26	BUZZER_PIN	Buzzer (active buzzer)	Activates buzzer on long press
14	BUTTON_PIN	Push Button → GND	Detects short or long button press
21	SDA	OLED SDA	I <sup>2</sup> C data line for OLED communication
22	SCL	OLED SCL	I <sup>2</sup> C clock line for OLED communication
3.3V	VCC	OLED VCC	Power supply for OLED (3.3V)
GND	GND	OLED, LEDs, Buzzer, Button	Common ground connection

## Code:

```
src > main.cpp > ...
1  #include <Wire.h>
2  #include <Adafruit_GFX.h>
3  #include <Adafruit_SSD1306.h>
4
5  // --- OLED Configuration ---
6  #define SCREEN_WIDTH 128
7  #define SCREEN_HEIGHT 64
8  #define OLED_ADDR 0x3C
9  Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);
10
11 // --- Pin Configuration ---
12 #define LED1 25
13 #define LED2 27
14 #define LED3 33
15 #define BUZZER_PIN 26
16 #define BUTTON_PIN 14
17
18 // --- Variables ---
19 bool ledState = false;           // Stores ON/OFF state for all LEDs
20 unsigned long pressStart = 0;    // Time when button was pressed
21 bool isPressed = false;         // Flag to track button press
22 const unsigned long longPressTime = 1500; // 1.5s threshold for long press
23
24 // --- Function to display header and message on OLED ---
25 void showOnOLED(const String &line1, const String &line2 = "") {
26     display.clearDisplay();
27
28     // Header area
29     display.setTextSize(1);
30     display.setTextColor(SSD1306_WHITE);
31     display.setCursor(10, 0);
32     display.println("PRESS-TYPE DETECT");
33     display.drawLine(0, 10, 127, 10, SSD1306_WHITE); // underline
34
35     // Main message
36     display.setCursor(10, 25);
37     display.println(line1);
38     if (line2 != "") {
39         display.setCursor(10, 40);
40         display.println(line2);
41     }
42
43     display.display();
44 }
45
46 void setup() {
47     Serial.begin(115200);
48
49     // --- Pin Modes ---
50     pinMode(LED1, OUTPUT);
51     pinMode(LED2, OUTPUT);
52     pinMode(LED3, OUTPUT);
53     pinMode(BUZZER_PIN, OUTPUT);
54     pinMode(BUTTON_PIN, INPUT_PULLUP); // Button active LOW
55
56     // --- Initialize OLED ---
57     Wire.begin(21, 22);
58     if (!display.begin(SSD1306_SWITCHCAPVCC, OLED_ADDR)) {
59         Serial.println("OLED not found!");
60         while (true);
61     }
62
63     // --- Startup Screen ---
64     showOnOLED("System Ready...", "Press Button");
65     delay(1500);
66
67     // Turn off LEDs and Buzzer initially
68     digitalWrite(LED1, LOW);
69     digitalWrite(LED2, LOW);
70     digitalWrite(LED3, LOW);
71     digitalWrite(BUZZER_PIN, LOW);
72 }
73
74 void loop() {
75     int buttonState = digitalRead(BUTTON_PIN);
76
77     // --- Detect button press start ---
78     if (buttonState == LOW && !isPressed) {
79         isPressed = true;
80         pressStart = millis();
81     }
```



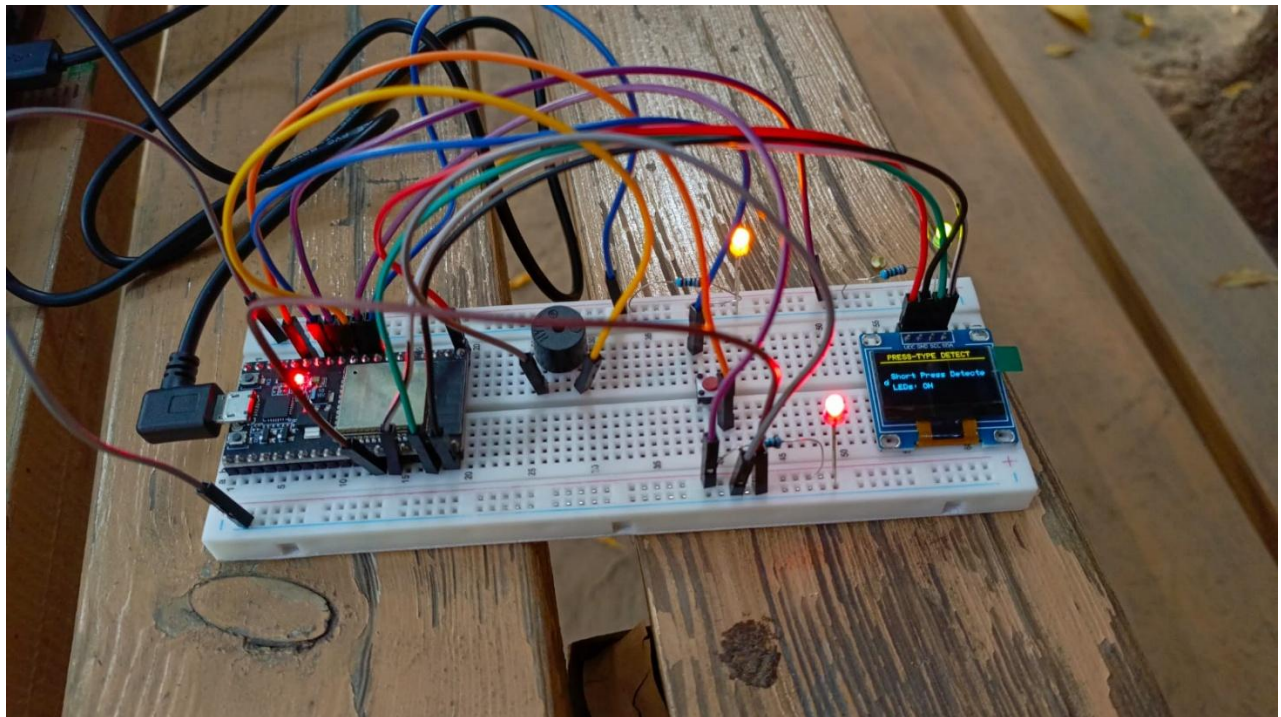
```

83 // --- Detect button release ---
84 if (buttonState == HIGH && isPressed) {
85     unsigned long pressDuration = millis() - pressStart;
86     isPressed = false;
87
88     if (pressDuration < longPressTime) {
89         // --- SHORT PRESS ACTION: Toggle LEDs ---
90         ledState = !ledState;
91         digitalWrite(LED1, ledState);
92         digitalWrite(LED2, ledState);
93         digitalWrite(LED3, ledState);
94
95         showOnOLED("Short Press Detected", ledState ? "LEDs: ON" : "LEDs: OFF");
96         Serial.println(ledState ? "LEDs ON" : "LEDs OFF");
97
98     } else {
99         // --- LONG PRESS ACTION: Buzzer Tone ---
100        showOnOLED("Long Press Detected", "Playing Buzzer...");
101        tone(BUZZER_PIN, 1000, 500); // 1kHz for 0.5s
102        Serial.println("Buzzer Tone Played");
103    }
104
105    delay(300); // Small delay to avoid flicker
106 }
107 }

```

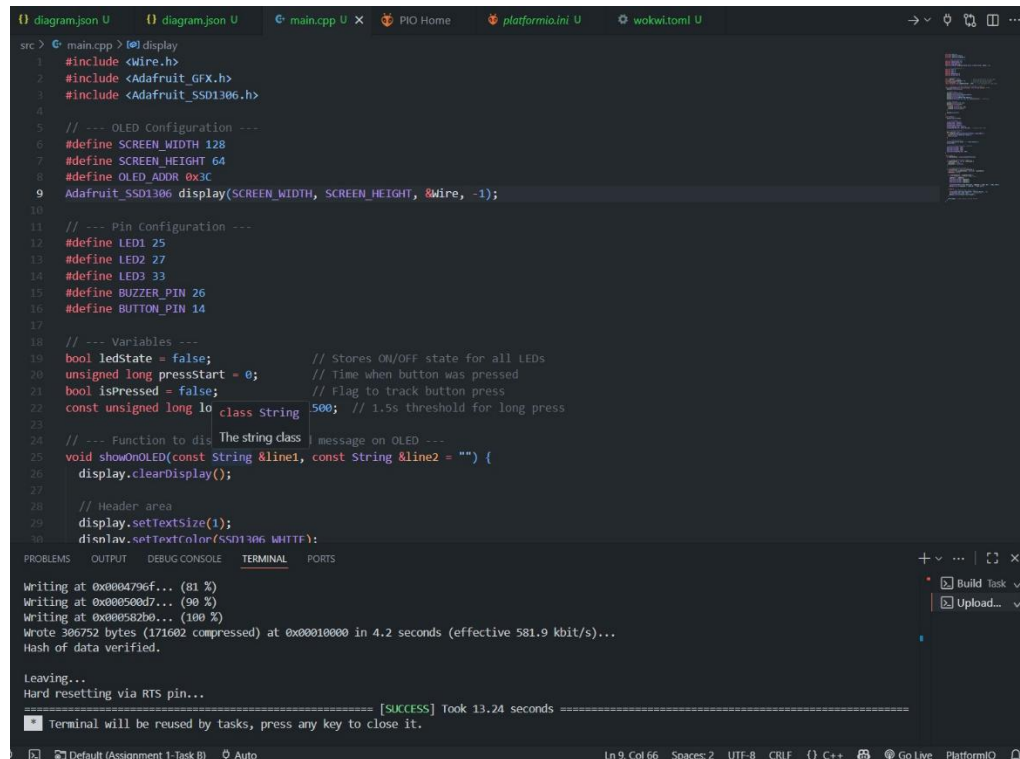
## Hardware Output:

### Short press detected:



```
diagram.json U  main.cpp U x  PIO Home  platformio.ini U  wokwi.toml U
src > main.cpp > loop()
1  #include <Wire.h>
2  #include <Adafruit_GFX.h>
3  #include <Adafruit_SSD1306.h>
4
5  // --- OLED Configuration ---
6  #define SCREEN_WIDTH 128
7  #define SCREEN_HEIGHT 64
8  #define OLED_ADDR 0x3C
9  Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);
10
11 // --- Pin Configuration ---
12 #define LED1 25
13 #define LED2 27
14 #define LED3 33
15 #define BUZZER_PIN 26
16 #define BUTTON_PIN 14
17
18 // --- Variables ---
19 bool ledState = false;           // Stores ON/OFF state for all LEDs
20 unsigned long pressStart = 0;    // Time when button was pressed
21 bool isPressed = false;         // Flag to track button press
22 const unsigned long longPressTime = 1500; // 1.5s threshold for long press
23
24 // --- Function to display header and message on OLED ---
25 void showOLED(const String &line1, const String &line2 = "") {
26     display.clearDisplay();
27
28     // Header area
29     display.setTextSize(1);
30     display.setTextColor(SSD1306_WHITE);
31
32     // Main content area
33     display.setCursor(0, 10);
34     display.print(line1);
35     display.print(line2);
36
37     display.display();
38 }
39
40 void loop() {
41     if (digitalRead(BUTTON_PIN) == LOW) {
42         if (!isPressed) {
43             pressStart = millis();
44             isPressed = true;
45         }
46         if (millis() - pressStart > longPressTime) {
47             // Long press detected
48             digitalWrite(LED1, !ledState);
49             digitalWrite(LED2, !ledState);
50             digitalWrite(LED3, !ledState);
51             ledState = !ledState;
52             showOLED("Long Press", "LEDs Toggled");
53             delay(2000);
54         }
55     }
56 }
```

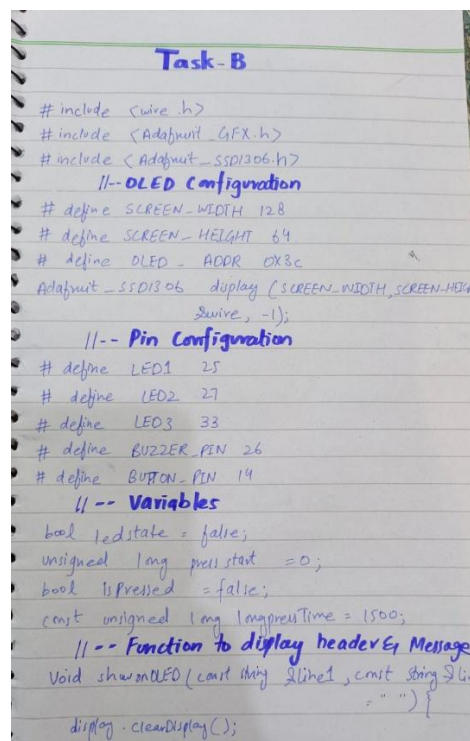
## Upload Success:



The screenshot shows an IDE window with a C++ source file named `main.cpp`. The code includes headers for `Wire`, `Adafruit_GFX`, and `Adafruit_SSD1306`. It defines screen dimensions (128x64), OLED address (0x3C), and pin numbers for LEDs, a buzzer, and a button. Variables for LED state, press start time, and press state are declared. A function `showOnOLED` is defined to display messages on the OLED screen. The terminal output shows the upload process: writing to memory, verifying the code, and a successful upload message indicating it took 13.24 seconds.

```
src > main.cpp > [O] display
1 #include <Wire.h>
2 #include <Adafruit_GFX.h>
3 #include <Adafruit_SSD1306.h>
4
5 // --- OLED Configuration ---
6 #define SCREEN_WIDTH 128
7 #define SCREEN_HEIGHT 64
8 #define OLED_ADDR 0x3C
9 Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);
10
11 // --- Pin Configuration ---
12 #define LED1 25
13 #define LED2 27
14 #define LED3 33
15 #define BUZZER_PIN 26
16 #define BUTTON_PIN 14
17
18 // --- Variables ---
19 bool ledState = false; // Stores ON/OFF state for all LEDs
20 unsigned long pressStart = 0; // Time when button was pressed
21 bool isPressed = false; // Flag to track button press
22 const unsigned long lo class String 500; // 1.5s threshold for long press
23
24 // --- Function to dis The string class message on OLED ---
25 void showOnOLED(const String &line1, const String &line2 = "") {
26   display.clearDisplay();
27
28   // Header area
29   display.setTextSize(1);
30   display.setTextColor(SSD1306_WHITE);
31
32   PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
33
34 Writing at 0x0004796f... (81 %)
35 Writing at 0x000500d7... (90 %)
36 Writing at 0x000582ba... (100 %)
37 Wrote 386752 bytes (171602 compressed) at 0x00010000 in 4.2 seconds (effective 581.9 kbit/s)...
38 Hash of data verified.
39
40 Leaving...
41 Hard resetting via RTS pin...
42
43 ===== [SUCCESS] Took 13.24 seconds =====
44
45 Terminal will be reused by tasks, press any key to close it.
```

## Handwritten Code:



**Task-B**

```
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>

//-- OLED configuration
#define SCREEN_WIDTH 128
#define SCREEN_HEIGHT 64
#define OLED_ADDR 0x3C
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT,
  &Wire, -1);

//-- Pin Configuration
#define LED1 25
#define LED2 27
#define LED3 33
#define BUZZER_PIN 26
#define BUTTON_PIN 14

//-- Variables
bool ledState = false;
unsigned long pressStart = 0;
bool isPressed = false;
const unsigned long longpressTime = 1500;

//-- Function to display header & message
void showOnOLED(const String &line1, const String &line2 = "") {
  display.clearDisplay();
```



```

// Header Area
display.setContrast(1);
display.setTextSize(1);
display.setTextColor(SSD1306_WHITE);
display.setCursor(10,0);
display.println("PRESS TYPE DETECT");
display.drawLine(0,10,127,10,SSD1306_WHITE);

// Main Message
display.setCursor(10,25);
display.println("Line 1");
if (Line 1 == " ") {
    display.setCursor(10,40);
    display.println("Line 2");
}
display.display();

void setup() {
    Serial.begin(115200);
    // -- Pin Modes
    pinMode(LED1, OUTPUT);
    pinMode(LED2, OUTPUT);
    pinMode(LED3, OUTPUT);
    pinMode(BUZZER_PIN, OUTPUT);
    pinMode(BUTTON_PIN, INPUT_PULLUP);

    // -- Initialize OLED
    Wire.begin(21,22);
    if (!display.begin(SSD1306_SWITCHCAPVCC,OLED_ADDR)) {
        Serial.println("OLED not found!");
        while (true);
    }
    showOLED("System Ready... ", "Press button");
    delay(1500);
    // Turn off LED and Buzzer initially
    digitalWrite(LED1, LOW);
    digitalWrite(LED2, LOW);
    digitalWrite(LED3, LOW);
    digitalWrite(BUZZER_PIN, LOW);
}

void loop() {
    int buttonState = digitalRead(BUTTON_PIN);
    // -- Detect Button press start
    if (buttonState == LOW && !isPressed) {
        isPressed = true;
        presstStart = millis();
    }
}

```

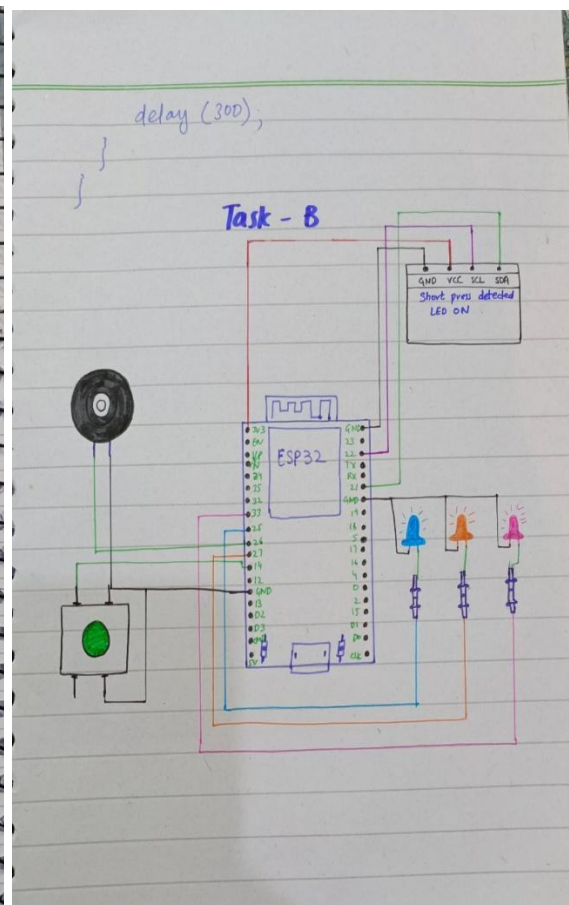
```

// -- Detect Button Release
if (buttonState == HIGH && isPressed) {
    unsigned long presDuration = millis() - presStart;
    isPressed = false;

    if (presDuration < LongPresTime) {
        // -- Short Press action: Toggle LEDs
        ledState = !ledState;
        digitalWrite(LED1, ledState);
        digitalWrite(LED2, ledState);
        digitalWrite(LED3, ledState);

        showOLED("Short Press Detected", ledState ?
            "LEDs: ON" : "LEDs: OFF");
        Serial.println(led ? "LEDs ON" : "LEDs OFF");
    }
    else {
        // -- Long Press action: Buzzer Tone --
        showOLED("Long Press detected", "playing
            buzzer...");
        tone(BUZZER_PIN, 1000, 500);
        Serial.println("Buzzer Tone played");
    }
}

```



**Wokwi Link (TaskB):**

<https://wokwi.com/projects/445508998287505409>