

Wania Zanib
23-NTU-CS-1289
BSAI 5th
Embedded IOT
Week 3 – Assignment 1

Code:

```
//Week 3 - Assignment
// Embedded IoT System Fall-2025

// Name: wania zanib           Reg#: 1289

#include <Arduino.h>

//pins
#define LED1_PIN    2
#define LED2_PIN    15
#define SWITCH1_PIN 25
#define SWITCH2_PIN 14

#define DEBOUNCE_MS  50
#define DEBOUNCE_US  (DEBOUNCE_MS * 1000UL)

//Timer Handles
hw_timer_t* debounceTimer1 = nullptr;
hw_timer_t* debounceTimer2 = nullptr;

//Debounce Flags
volatile bool debounceActive1 = false;
volatile bool debounceActive2 = false;

//Timer ISR for Switch 1
void ARDUINO_ISR_ATTR onDebounceTimer1() {
    if (digitalRead(SWITCH1_PIN) == LOW) { //still pressed?
        digitalWrite(LED1_PIN, !digitalRead(LED1_PIN)); //toggle LED1
    }
    debounceActive1 = false; //ready for next press
}
```

```

//Timer ISR for Switch 2
void ARDUINO_ISR_ATTR onDebounceTimer2() {
    if (digitalRead(SWITCH2_PIN) == LOW) { //still pressed?
        digitalWrite(LED2_PIN, !digitalRead(LED2_PIN)); //toggle LED2
    }
    debounceActive2 = false; //ready for next press
}

//External interrupt for Switch 1
void ARDUINO_ISR_ATTR onSwitch1ISR() {
    if (!debounceActive1) {
        debounceActive1 = true;
        timerAlarm(debounceTimer1, DEBOUNCE_US, false, 0); //start one-shot timer
    }
}

//External interrupt for Switch 2
void ARDUINO_ISR_ATTR onSwitch2ISR() {
    if (!debounceActive2) {
        debounceActive2 = true;
        timerAlarm(debounceTimer2, DEBOUNCE_US, false, 0); //start one-shot timer
    }
}

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

    //LEDs
    pinMode(LED1_PIN, OUTPUT);
    pinMode(LED2_PIN, OUTPUT);
    digitalWrite(LED1_PIN, LOW);
    digitalWrite(LED2_PIN, LOW);

    //Configure switches with internal pull-ups
    pinMode(SWITCH1_PIN, INPUT_PULLUP);
    pinMode(SWITCH2_PIN, INPUT_PULLUP);

    //Attached external interrupts (on button press)
    attachInterrupt(SWITCH1_PIN, onSwitch1ISR, FALLING);
    attachInterrupt(SWITCH2_PIN, onSwitch2ISR, FALLING);

    //Created 1 MHz timers
    debounceTimer1 = timerBegin(1000000);
    debounceTimer2 = timerBegin(1000000);
}

```

```

//Attached debounce ISRs
timerAttachInterrupt(debounceTimer1, &onDebounceTimer1);
timerAttachInterrupt(debounceTimer2, &onDebounceTimer2);

Serial.println("System Ready – Press Buttons to Toggle LEDs");
}

void loop() {
  // Nothing needed here; interrupts do all the work.
}

```

Output:

no input (initial state):

The screenshot shows the Wokwi online IDE interface. The left pane displays a C++ sketch for an ESP32, and the right pane shows a 3D simulation of the hardware.

Sketch Code (sketch.ino):

```

1 //Week 3 - Assignment
2 // Embedded IoT System Fall-2025
3
4 // Name: wania zanib          Reg#: 1289
5
6
7 #include <Arduino.h>
8
9 //pins
10 #define LED1_PIN    2
11 #define LED2_PIN    15
12 #define SWITCH1_PIN  25
13 #define SWITCH2_PIN  14
14
15 #define DEBOUNCE_MS  50
16 #define DEBOUNCE_US  (DEBOUNCE_MS * 1000UL)
17
18 //Timer Handles
19 hw_timer_t* debounceTimer1 = nullptr;
20 hw_timer_t* debounceTimer2 = nullptr;
21
22 //Debounce Flags
23 volatile bool debounceActive1 = false;
24 volatile bool debounceActive2 = false;
25
26 //Timer ISR for Switch 1
27 void ARDUINO_ISR_ATTR onDebounceTimer1() {
28   if (digitalRead(SWITCH1_PIN) == LOW) { //still pressed?
29     digitalWrite(LED1_PIN, !digitalRead(LED1_PIN)); //toggle LED1
30   }

```

Simulation: The simulation shows an ESP32 board with two push buttons and two LEDs. The top button is connected to pin 25 (SWITCH1_PIN) and the top LED is connected to pin 2 (LED1_PIN). The bottom button is connected to pin 14 (SWITCH2_PIN) and the bottom LED is connected to pin 15 (LED2_PIN). The simulation is running, with a timer at 00:10.432 and 35% CPU usage.

Serial Monitor: The serial monitor shows the output of the sketch:

```

mode:DIO, clock div:2
load:0x3fff0030,len:1156
load:0x40100000,len:11456

```

LED 1 turned on:

Wokwi - Online ESP32, STM32

wokwi.com/projects/444084918831876097

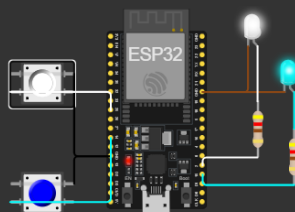
WOKWI SAVE SHARE Week 3 -Assignment Docs

sketch.ino diagram.json libraries.txt Library Manager

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4 // Name: wania zanib          Reg#: 1289
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11 #define LED2_PIN    15
12 #define SWITCH1_PIN 25
13 #define SWITCH2_PIN 14
14
15 #define DEBOUNCE_MS 50
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17
18 //Timer Handles
19 hw_timer_t* debounceTimer1 = nullptr;
20 hw_timer_t* debounceTimer2 = nullptr;
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24 volatile bool debounceActive2 = false;
25
26 //Timer ISR for Switch 1
27 void ARDUINO_ISR_ATTR onDebounceTimer1() {
28   if (digitalRead(SWITCH1_PIN) == LOW) { //still pressed?
29     digitalWrite(LED1_PIN, !digitalRead(LED1_PIN)); //toggle LED1
30   }
31 }
```

Simulation

00:33.166 38%



mode:DIO, clock div:2
load:0x3fff0030,len:1156
load:0x40078000,len:11456

LED 2 turned on:

Wokwi - Online ESP32, STM32

wokwi.com/projects/444084918831876097

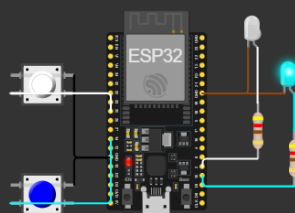
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26 //Timer ISR for Switch 1
27 void ARDUINO_ISR_ATTR onDebounceTimer1() {
28   if (digitalRead(SWITCH1_PIN) == LOW) { //still pressed?
29     digitalWrite(LED1_PIN, !digitalRead(LED1_PIN)); //toggle LED1
30   }
31 }
```

Simulation

00:22.866 41%



mode:DIO, clock div:2
load:0x3fff0030,len:1156
load:0x40078000,len:11456

Project Link:

<https://wokwi.com/projects/444084918831876097>