National Textile University,

Faisalabad



Department of Computer Science

|  |  |
| --- | --- |
| Class: | BS AI 6th Semester |
| Registration No: | 22-NTU-CS-1350  22-NTU-CS-1354  22-NTU-CS-1362 |
| Lab Home Task: | Lab 4 Home tasks WebSocket-Based Home Tasks |
| Course Name: | IoT |
| Submitted To: | Mr. Nasir Mahmood |
| Submission Date: | 12/03/2025 |

## Group members:

Kanza Kashaf

Maryam Sameen

Muhammad Hassaan Raza

Lab Report: IoT Lab - WebSocket-Based Home Tasks

# Task 1: Basic Webserver for RGB Control and Sensor Data

## Description

In Task 1, we created a webserver with four main sections:

### RGB Control:

* + Buttons to turn the RGB LED red, green, or blue.
  + Input fields to set custom RGB values.

### Temperature and Humidity Display:

* + Real-time display of temperature and humidity data from the DHT11 sensor.

### OLED Display Control:

* + A text input field to send custom messages to the OLED display.

### Styling:

* + Used CSS to create a visually appealing interface with dynamic background changes based on temperature.

## Code Overview

The code for Task 1 includes:

* **WiFi Setup:** Connects the ESP32 to a WiFi network in STA mode and creates an AP.
* **DHT11 Sensor:** Reads temperature and humidity data.
* **NeoPixel Control:** Controls the RGB LED based on user input.
* **OLED Display:** Updates the OLED with custom messages.
* **Web Server:** Handles HTTP requests and serves the web page.

## Challenges Faced

* **OLED Display Issues:** Initially, the OLED did not display messages correctly. Kanza fixed this by debugging the I2C communication and ensuring proper text rendering.
* **DHT11 Sensor Errors:** The sensor occasionally failed to read data. Maryam resolved this by adding error handling and retry logic.

# Task 2: Weather Station with Alerts

## Description

In Task 2, we extended the functionality of Task 1 to create a weather station. The weather station provides alerts based on temperature and humidity readings:

### Temperature Alerts:

* + High Temperature (>26°C): Displays a "🔥 Hot Temperature!" alert and blinks the RGB LED red.
  + Normal Temperature (25-26°C): Displays "🌤️ Normal Temperature!"
  + Low Temperature (<25°C): Displays "❄️ Cold Temperature!" and changes the background to a winter theme.

### Humidity Alerts:

* + High Humidity (≥70%): Displays "High Humidity!"
  + Normal Humidity (50-70%): Displays "Normal Humidity!"
  + Low Humidity (<50%): Displays "Dry!"

# Code Overview

## The code for Task 2 includes:

* **Dynamic Backgrounds:** Changes the web page background based on temperature (day, hot, night).
* **Alerts:** Displays alerts for temperature and humidity conditions.
* **OLED Updates:** Shows temperature, humidity, and alerts on the OLED display.

## Challenges Faced

* **Background Transition:** Initially, the background transitions were not smooth. We fixed this by using CSS transitions and JavaScript to dynamically update the background.
* **Alert Timing:** Alerts were disappearing too quickly. We adjusted the timing to ensure users could read the messages.

# Contributions

* **Hassaan**:
  + Created the basic AP-STA mode template.
  + Implemented RGB control with user input.
  + Assisted with HTML and CSS design.
* **Kanza:**
  + Fixed OLED display issues.
  + Implemented custom message display on the OLED.
  + Contributed to the weather station design.
* **Maryam**:
  + Integrated and fixed DHT11 sensor functionality.
  + Implemented temperature and humidity alerts.
  + Assisted with HTML and CSS design.

# Screenshots

## Web Interface for Task 1:

A screenshot of a computer

AI-generated content may be incorrect.

## RGB control buttons and input fields.

A screenshot of a computer screen

AI-generated content may be incorrect.

## Temperature and humidity display.

A screen shot of a weather forecast

AI-generated content may be incorrect.

## OLED message input field.

A screen shot of a computer

AI-generated content may be incorrect.

# Weather Station Interface for Task 2:

* Dynamic background changes (day, hot, night).
* Temperature and humidity alerts.
* OLED display showing sensor data and alerts.

A screenshot of a weather station

AI-generated content may be incorrect.

A screen shot of a cell phone

AI-generated content may be incorrect.