**NATIONAL TEXTILE UNIVERSITY, FAISALABAD**

**Dept. of CS , School of Science**

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| **TITLE** | **ESP32 Web Server with DHT11, NeoPixel, and OLED Display** |
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| **SUBMITTED TO** | Dr. Nasir Mehmood |

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**Submitted To**

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**Introduction**

This project implements a web server on an ESP32 microcontroller, enabling users to monitor temperature and humidity data from a DHT11 sensor, control an RGB LED (NeoPixel), and display custom messages on an OLED screen. The ESP32 connects to a WiFi network and also functions as an access point, allowing users to access the web interface for controlling these features.

**Features**

* **DHT11 Sensor Integration:** Measures temperature and humidity.
* **NeoPixel RGB LED Control:** Allows users to change LED colors via the web interface.
* **OLED Display Integration:** Displays custom text messages received from the web page.
* **WiFi Connectivity:** Connects to an existing WiFi network and hosts a web server.
* **Access Point Mode:** Provides an alternative connection method.
* **Interactive Web Page:** Users can monitor sensor data and control hardware components.

**Hardware Setup**

* **DHT11 Sensor:** Connected to GPIO 4.
* **NeoPixel LED:** Connected to GPIO 48.
* **OLED Display:** Uses I2C with SCL on GPIO 9 and SDA on GPIO 8.

**WiFi and Access Point Setup**

* Connects to a predefined WiFi network using SSID and password.
* If WiFi is unavailable, it starts an access point with custom credentials.

**Web Server Implementation**

* The server listens on port 80 and serves an HTML page with sensor data and control buttons.
* Users can toggle RGB LED colors by sending GET requests.
* Custom text messages can be sent to the OLED display through a form submission.

**Web Interface**

* Displays live temperature and humidity readings.
* Provides buttons to set LED colors (Red, Green, Blue) or custom RGB values.
* Allows users to input and display custom text on the OLED screen.

**Conclusion**

This ESP32-based web server project effectively demonstrates IoT applications by integrating multiple hardware components. Users can interact with the system remotely via a user-friendly web interface, making it a practical implementation for smart monitoring and control systems.