Embedded Systems Intern Assignment -

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Part 1: System Design Document

This document presents the design of a basic **automatic heater control system**, which monitors ambient temperature using a digital sensor (such as the DHT22). The system uses **embedded control logic** programmed into a microcontroller (like ESP32 or Arduino Uno) to decide when to turn the heater **ON or OFF** based on predefined temperature thresholds. This approach helps in **maintaining desired temperature levels automatically**, ensures **energy efficiency**, and offers **safety features** such as overheat detection and alerts.

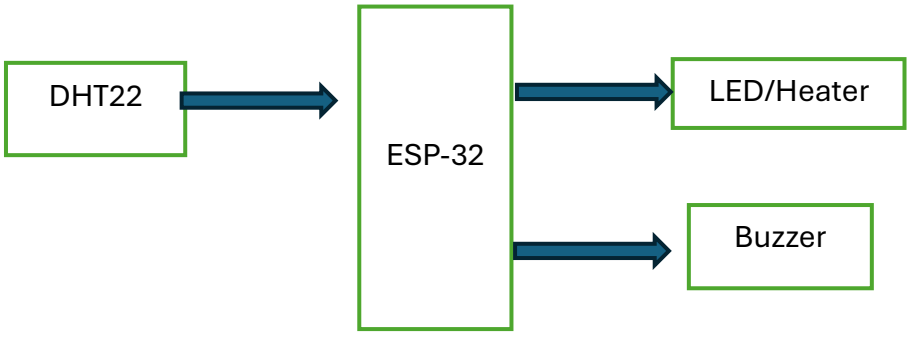
1. Minimum Sensors Required: - Temperature Sensor (e.g., DHT22)
This sensor is responsible for continuously measuring the ambient temperature of the environment. The measured data is used to determine the heater's operating state — whether it should be turned ON, stabilized, or turned OFF.
The DHT22 is preferred over DHT11 because it offers:

- Better accuracy (±0.5°C)
- Wider temperature range (–40°C to +80°C)
- Higher resolution (0.1°C)

2. Recommended Communication Protocol: - I2C or UART Justification:

I2C is chosen for its ability to support multiple devices with just two wires (SCL, SDA). It's ideal for communication between microcontrollers and sensors like temperature modules. UART is used for serial logging.

3. 3. Block Diagram



4. Future Roadmap:

- Overheat protection with auto shutdown
- Multiple heating profiles (Low/Medium/High)

- BLE broadcasting for mobile app integration
- Manual control interface via buttons or mobile
- Cloud-based logging and temperature analytics

Part 2: Embedded Implementation

2.1 Platform: Wokwi

- Use the Wokwi simulator to test code.
- Add ESP32 (or Arduino Uno), DHT22 sensor, LED, buzzer, etc.

2.2 Language :- C/C++ (code)

Code at https://wokwi.com/projects/438608855860611073

2.3 Github Repository :- https://github.com/vikash-banwari/basic-heaeter-indicator

2.4 Working Image