Design process of room temperature monitor

Your Name

BU ID: Your BU ID

1 Summary

2 Introduction

Comfortable indoor temperatures matter for both well-being and energy savings: every degree of over-heating or over-cooling wastes power. To explore a simple feedback approach, we built a compact monitor using a TMP36 sensor and an Arduino Uno, displaying readings on a 16×2 I^2C LCD (ground, VCC, SDA, SCL). Green and red LEDs (1 kΩ and 220 Ω, respectively) plus a buzzer signal when thresholds are crossed. Powered by a 9 V battery and switched manually, the circuit uses 22 AWG hookup wire (with female-to-female jumper leads for SDA/SCL). We also designed a custom CAD enclosure, lid, battery holder, and base plate to house all components. The following sections detail our design choices, assembly, and performance insights.

3 Design elements

Explain your design decisions. Address each of the following:

1. asa **List all components used in your design** electronic components, hardware, etc.
2. **Precision measurements** Make a table of relevant dimensions (see example below).

Table 1: Relevant dimensions of all components

Item	Sketch identification	W [mm]	L [mm]	H [mm]	Diameter [mm]
ABS enclosure					
Arduino Board					
Switch					
LCD 2X16					
Buzzer					
Temperature sensor					
LED					

3. **CAD drawings**

   Include a screenshot of your final assembly.

Figure 1: CAD assembly of the prototype.

4. **Prototype photographs**

   Top view of actual prototype, with and without lid, powered on.

(a) With lid (b) Without lid

Figure 2: Top views of the working prototype.

5. **Purpose of using an Arduino board**

   Explain role of the Arduino in the circuit.

6. **Wiring diagram and methods**

   Show diagram and discuss soldering, jumper wires, twist nut caps, spade connectors, etc.

Figure 3: Circuit wiring diagram.

7. **Wire gauge and resistor values**

   Specify wire gauge used and justify choice (jumper vs. 22 AWG). State resistor values in series with green/red LEDs, calculate operating currents using KVL.

8. **Internal power supply**

   Discuss why a 9 V battery, its charge capacity, expected runtime, and external power options.

9. **Arduino code**

   Provide the code listing used in your design.

Listing 1: Arduino sketch for temperature monitoring

```
// Example placeholder code
void setup() {
  Serial.begin(9600);
  // initialization...
}
void loop() {
  float temp = readTemperature();
  Serial.println(temp);
  // control LEDs...
  delay(1000);
}
```

10. **Prototype specifications**

    List:

    - Voltage of power supply
    - Operating voltage of circuit
    - Total current drawn (measured with DMM)
    - Battery operating time
    - Sensor temperature range (from datasheet)
    - Comfortable temperature range
    - Use KVL to explain resistor choices (1 k Ω for green LED, 220 Ω for red LED)

4 Evaluation of Results

- Degree to which design objectives were met
- Summary of outcomes and comparison to standard thermometers
- Limitations and recommendations for future work (battery life, size, weight, etc.)
- Highlight usefulness of the design

A Supporting Materials