📘 **PROJECT REPORT**

**TEMPERATURE & HUMIDITY MONITORING WITH LED INDICATION USING DHT11**

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## 1. INTRODUCTION

Monitoring environmental parameters such as **temperature and humidity** is essential in many applications including homes, laboratories, and industrial environments. Visual indication of abnormal temperature conditions helps in early detection and preventive action.

This project implements a **Temperature and Humidity Monitoring System** using a **DHT11 sensor** interfaced with an **Arduino UNO**. The measured values are displayed on a **16×2 LCD**, and an **LED indicator** is used to alert when the temperature exceeds a predefined threshold.

The system is designed and simulated using **Proteus Design Suite**.

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## 2. OBJECTIVES

The main objectives of this project are:

- To measure temperature and humidity using the DHT11 sensor
- To display sensor values on a 16×2 LCD
- To provide visual alert using an LED when temperature exceeds a limit
- To implement a simple real-time monitoring system using Arduino

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## 3. SYSTEM OVERVIEW

The DHT11 sensor continuously measures temperature and humidity. The Arduino processes this data and displays it on the LCD. When the temperature crosses a fixed threshold value, the Arduino turns **ON an LED** to indicate an alert condition. When the temperature falls below the threshold, the LED turns **OFF**.

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## 4. HARDWARE COMPONENTS USED

### 4.1 Arduino UNO

- Acts as the main controller
- Reads data from DHT11 sensor
- Controls LCD and LED output

**4.2 DHT11 Sensor**

- Measures temperature and humidity
- Provides digital output data
- Simple and low-cost sensor

**4.3 16×2 LCD Display**

- Displays real-time temperature and humidity values
- Operates in 4-bit mode

**4.4 LED**

- Used as a visual alert indicator
- Turns ON when temperature exceeds threshold

**4.5 Potentiometer**

- Adjusts LCD contrast

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**5. SOFTWARE TOOLS USED**

- **Arduino IDE** – Code development and compilation
- **Proteus Design Suite** – Circuit design and simulation

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**6. PIN CONFIGURATION**

| Component | Arduino Pin |
|---|---|
| DHT11 Data | D8 |
| LCD RS | D7 |
| LCD EN | D6 |

| Component | Arduino Pin |
|---|---|
| LCD D4–D7 | D5, D4, D3, D2 |
| LED | D9 |

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## 7. WORKING PRINCIPLE

1. The DHT11 sensor measures temperature and humidity.
2. Arduino reads the sensor values using the DHT library.
3. The LCD displays:
    - Temperature in °C on the first line
    - Humidity in % on the second line
4. Arduino compares the temperature value with a predefined threshold (25°C).
5. If the temperature exceeds 25°C:
    - The LED turns **ON**
6. If the temperature is less than or equal to 25°C:
    - The LED remains **OFF**
7. The process repeats continuously in real time.

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## 8. CONTROL LOGIC

| Temperature Condition | LED Status |
|---|---|
| ≤ 25°C | OFF |
| > 25°C | ON |

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## 9. SIMULATION RESULTS

The circuit was simulated successfully in Proteus Design Suite. The following results were observed:

- Temperature and humidity values updated correctly on the LCD
- LED turned ON when temperature exceeded 25°C
- LED turned OFF when temperature dropped below threshold
- Stable and reliable real-time operation

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**10. APPLICATIONS**

- Room temperature monitoring
- Home automation alert systems
- Laboratory environment monitoring
- Educational embedded systems projects

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**11. ADVANTAGES**

- Simple and cost-effective design
- Real-time monitoring
- Easy to understand and modify
- Visual alert without complex hardware

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**12. LIMITATIONS**

- Limited accuracy of DHT11 sensor
- Fixed temperature threshold
- No data logging or remote monitoring

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**13. FUTURE ENHANCEMENTS**

- Use DHT22 for improved accuracy
- Add adjustable temperature threshold
- Add wireless monitoring (Wi-Fi / Bluetooth)

- Include data logging feature

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## 14. CONCLUSION

This project successfully demonstrates a temperature and humidity monitoring system using Arduino and DHT11 sensor. The LED-based alert mechanism provides a simple and effective way to indicate abnormal temperature conditions. The system is suitable for basic monitoring applications and educational purposes.

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## 15. REFERENCES


1. Arduino UNO Datasheet
2. DHT11 Sensor Datasheet
3. Arduino LiquidCrystal Library
4. Proteus Design Suite Documentation


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## 16. AUTHOR


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