THE TEMPERATURE AND HUMIDITY DETECTOR

INTERNET OF THINGS

Time: 60 mins

Introduction

In this class, the student/s will create a temperature and humidity monitor using DHT22 and LCD library.

New Commands Introduced

• #include <DHTesp.h>	Imports the DHTesp.h library
• #define DHT_PIN 12	Enables the client passed to publish or subscribe through wifi
• dht.setup(DHT_PIN, DHTesp::DHT22)	Configures the pin number for the component Selects the DHT22 sensor from the DHTesp library and sets it
• TempAndHumidity data = dht.getTempAndHumidity();	Captures the temperature and humidity values and stores it in data variable od specified data type
• float temperature = data.temperature; float humidity = data.humidity;	Stores the temperature and humidity from data to float variables
• #include <LiquidCrystal_I2C.h> • LiquidCrystal_I2C lcd(0x27, 16, 2);	Adds the LCD library Configures the LCD with I2C protocol and its port, number of columns, and rows
• LCD.init(); LCD.backlight();	Initializes the LCD and starts the backlight
• LCD.setCursor(2, 0);	Sets the cursor and displays the welcome message

Vocabulary

- The DHT22, Digital Temperature and Humidity Sensor Module can measure temperatures from -40°C to 80°C and humidity from 0% to 100%.
- The DHTesp library provides an interface to read temperature and humidity data from a DHT11 or DHT22 sensor.

Learning Objectives

Student/s should be able to:

- ***Recall*** how different devices like ESP32, temperature and humidity sensors can be connected to a circuit.
- ***Explain*** how to measure the temperature and humidity using the sensor.
- ***Demonstrate*** displaying the temperature and sensor on the LCD screen.

Activities

Class Narrative: *(3 mins)*

- Brief the student/s that James and Eva are facing challenges in efficient cargo transport. Explain how they find reasons for spoiling goods during transport due to fluctuating temperatures and excessive sunlight.

Concept Introduction Activity: *(4 mins)*

- Let the student/s observe that the current temperature and humidity are detected using a sensor and displayed on an LCD.
- Explain about how the DHT22, Digital Temperature and Humidity Sensor Module can measure temperatures from -40°C to 80°C and humidity from 0% to 100%.
- Explain that DHT22 uses measures the surrounding air and spits out a digital signal on the data pin.
- Using the slides, explain that the student/s will learn:
    - to connect the devices
    - To measure the temperature and humidity
    - to display the temperature and humidity

Activity 1: Connect the Devices*(10 mins)*

Teacher Activity: *(5 mins)*

- Explain DHT22 pins, functionalities and applications.
- Explain how to connect the data pin of DHT22 sensor to the ESP32 by connecting the data pin to the output pin.

Student Activity: *(5 mins)*

- Guide the student/s to connect the devices to create a humidity and temperature detector.

Activity 2: Measure the Temperature and Humidity *(18 mins)*

Teacher Activity: *(7 mins)*

- Explain how the DHTesp library provides an interface to read temperature and humidity data from a DHT11 or DHT22 sensor.
- Explain how to use the DHT module, its methods and sensor to measure the humidity and temperature values.

Student Activity: *(11 mins)*

- Guide the student/s to measure the temperature and humidity by configuring the DHT22 pins and programming the ESP32.

Activity 3: Display the Temperature and Humidity Values *(12 mins)*

Teacher Activity: *(6 mins)*

- Recall how we used an LCD to display a scrolling welcome message and relate it to displaying the temperature and humidity values.

Student Activity: *(6 mins)*

- Guide the student/s to display the greeting message, setup message along with sensor values for humidity and temperature.

Introduce the Post class project: *(2 min)*

- Create a temperature and humidity monitor using DHT22 and LCD library.

Test and Summarize the class learnings: *(5 mins)*

- Check for understanding through quizzes and summarize learning after respective activities.
- Summarize the overall class learning towards the end of the class.

Additional activities:

- Encourage the student/s to add LED indicators to indicate temperature and humidity range as low, medium or high.
- Encourage the student/s to ring the buzzer when the temperature is high.

State the Next Class Objective: *(1 min)*

- In the next class, student/s will learn to access the temperature and humidity data remotely.

U.S. Standards:

CSTA: 2-AP-11, 2-AP-12, 2-AP-13, 2-AP-14, 2-AP-19

Links Table		
Activity	Activity Name	Link
Class Presentation	THE TEMPERATURE AND HUMIDITY DETECTOR	https://s3-whjr-curriculum-uploads.whjr.online/e08edd8b-b326-41f6-ab19-d13d916b53ee.html
Explore Activity	THE TEMPERATURE AND HUMIDITY DETECTOR	https://wokwi.com/projects/386517188062169089
Student Activity 1	Connect the Devices	https://wokwi.com/projects/386515657806835713
Teacher Reference: Student Activity 1 Solution	Connect the Devices	https://wokwi.com/projects/386515484188840961
Teacher Activity 2	Measure the Temperature and Humidity	https://wokwi.com/projects/388402928101769217
Teacher Reference: Teacher Activity 2 Solution	Measure the Temperature and Humidity	https://wokwi.com/projects/388402939287981057
Student Activity 2	Measure the Temperature and Humidity	https://wokwi.com/projects/386517090407221249
Teacher Reference: Student Activity 2 Solution	Measure the Temperature and Humidity	https://wokwi.com/projects/386515778114168833
Student Activity 3	Display the Temperature and Humidity Values	https://wokwi.com/projects/386517516532872193
Teacher Reference: Student Activity 3 Solution	Display the Temperature and Humidity Values	https://wokwi.com/projects/386517188062169089
Student's Additional Activity 1	Add LED Indicators	https://wokwi.com/projects/386517667493229569
Teacher Reference: Student's Additional Activity 1 Solution	Add LED Indicators	https://wokwi.com/projects/386517616380386305
Student's Additional Activity 2	Add a Temperature Alarm	https://wokwi.com/projects/386517728402915329

Teacher Reference: Student's Additional Activity 2 Solution	Add a Temperature Alarm	https://wokwi.com/projects/386517838922843137
Post Class Project	Monitor the Room Weather	https://wokwi.com/projects/386518128777623553
Teacher Reference: Post Class Project Solution	Monitor the Room Weather	https://wokwi.com/projects/386518055332198401