TECHNOLOGICAL UNIVERSITY OF THE PHILIPPINES

Ayala Boulevard, Ermita, Manila

CIT-ELECTRONICS DEPARTMENT

**CPET11L-M – Microprocessor and Microcontroller Systems, Lab**

**1st Semester, SY 2-24-2025**

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| **Course & Section:** BET-CPET- 3A | **Date Submitted:** |

**Activity 1**

**Topic 1: Basic LCD Output**

**Topic 2: Temperature with LM35**

**Topic 3: Humidity and Temperature with DHT11**

1. **OBJECTIVES**

* To apply practical knowledge in using the Arduino Mega 2560
* To explain the functions and components of the related topics
* To implement the LCD output, DHT11 and LM35 components using code and circuit diagrams
* To develop and enhance problem-solving skills related to the topics

1. **EQUIPMENT AND MATERIALS**

**HARDWARE**

* Arduino Uno
* Breadboard
* Jumper Wires
* Laptop
* DHT11
* LM 35
* 20x4 or 16x2 LCD

**SOFTWARE**

* Arduino IDE with libraries for specified components.
* MS Word
* Wokwi & TinkerCAD Simulator

1. **DIAGRAM**

**===== TOPIC 1: Basic LCD Output =====**

1. **Wokwi Simulation**

**A computer chip with wires connected to it

AI-generated content may be incorrect.**

1. **Breadboard**

**A close-up of a circuit board

AI-generated content may be incorrect.**

1. **Source Code**

#include <LiquidCrystal\_I2C.h>

LiquidCrystal\_I2C lcd(0x27, 16, 2);

void setup(){

lcd.init();

lcd.clear();

lcd.backlight();

lcd.setCursor(5, 0);

lcd.print("Ako si");

lcd.setCursor(2, 1);

lcd.print("Joseph Arenas");

}

void loop(){

}

**===== Topic 2: Temperature with LM35 =====**

1. **TinkerCad Simulation**

**A circuit board with wires

AI-generated content may be incorrect.**

1. **Breadboard**

**A electronic device with wires

AI-generated content may be incorrect.**

1. **Source Code**

void loop() {

// === Read LM35 Sensor ===

int rawValue = analogRead(LM35\_PIN);

// LM35 formula: 10mV per °C

// Temp(°C) = (ADC \* 500) / 1023

float celsius = (rawValue \* 500.0) / 1023.0;

float kelvin = celsius + 273.15;

// === Display on LCD ===

lcd.setCursor(0, 0);

lcd.print("Cel: ");

lcd.print(celsius, 1); // 1 decimal place

lcd.print((char)223); // Degree symbol

lcd.print("C");

lcd.setCursor(0, 1);

lcd.print("kel: ");

lcd.print(kelvin, 2);

lcd.print((char)223); // 2 decimal places

lcd.print("K");

// === Print to Serial Monitor (optional) ===

Serial.print("Temp: ");

Serial.print(celsius, 1);

Serial.print(" °C | ");

Serial.print(kelvin, 2);

Serial.println(" °K");

delay(1000); // Update every 1 second

}

#define USE\_I2C 1

#if USE\_I2C

#include <Wire.h>

#include <LiquidCrystal\_I2C.h>

LiquidCrystal\_I2C lcd(0x27, 16, 2); // Change address if needed (0x27 or 0x3F)

#else

#include <LiquidCrystal.h>

LiquidCrystal lcd(12, 11, 5, 4, 3, 2); // RS, EN, D4, D5, D6, D7

#endi

// === LM35 Settings ===

#define LM35\_PIN A0 // LM35 OUT pin connected to analog pin A0

void setup() {

// Start serial monitor (optional)

Serial.begin(9600);

// Initialize LCD

#if USE\_I2C

lcd.init();

lcd.backlight();

#else

lcd.begin(16, 2);

#endif

// Startup message

lcd.clear();

lcd.setCursor(0, 0);

lcd.print("LM35 Temp Sensor");

lcd.setCursor(0, 1);

lcd.print("Initializing...");

delay(2000);

lcd.clear();

}

**=== Topic 3: Humidity and Temperature with DHT11===**

1. **Wokwi Simulation**

**A circuit board with a screen and a display

AI-generated content may be incorrect.**

1. **Breadboard**

**A close-up of a device

AI-generated content may be incorrect.**

1. **Source Code**

#include <LiquidCrystal\_I2C.h>

#include <DHT.h>

#define DHTPIN 2

#define DHTTYPE DHT11

LiquidCrystal\_I2C lcd(0x27, 16, 2);

DHT dht(DHTPIN, DHTTYPE);

void setup(){

lcd.init();

lcd.backlight();

dht.begin();

}

void loop(){

float humi = dht.readHumidity();

float temp = dht.readTemperature();

lcd.setCursor(0, 0);

lcd.print("humi: ");

lcd.print(humi);

lcd.print("%");

lcd.setCursor(0, 1);

lcd.print("temp: ");

lcd.print(temp);

lcd.print("C");

delay(1000);

}

1. **PROCEDURE**

**A. Preparation**

* Gather the required components: Arduino Uno R3, breadboard, LEDs, resistors, potentiometer, switches, and jumper wires.
* Install the Arduino IDE on the computer.
* Review the circuit diagrams for each topic.

**B. Actual**

* Connect the LED with a potentiometer according to the diagram and upload the code.
* Set up the LED with a switch and test the on/off function.
* Combine the potentiometer and switch to control the LED in different ways.

**C. Checking**

* Observe if the LED responds correctly to the potentiometer and/or switch.
* Verify the wiring connections and the uploaded code.
* Adjust values or fix errors if the output is not working as expected.

**D. Uploading**

* Upload the final and corrected code to the Arduino Uno R3.
* Ensure that all three topics (potentiometer, switch, and combination) work properly.

1. **CONCLUSION**

The activities provided hands-on experience in interfacing the Arduino with an LCD, LM35, and DHT11 sensors, effectively displaying temperature and humidity data. These exercises deepened understanding of how sensors communicate with microcontrollers and how outputs can be presented through hardware and code. Overall, the work improved both technical knowledge and problem-solving skills in microcontroller applications.A close-up of a document

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