HW5

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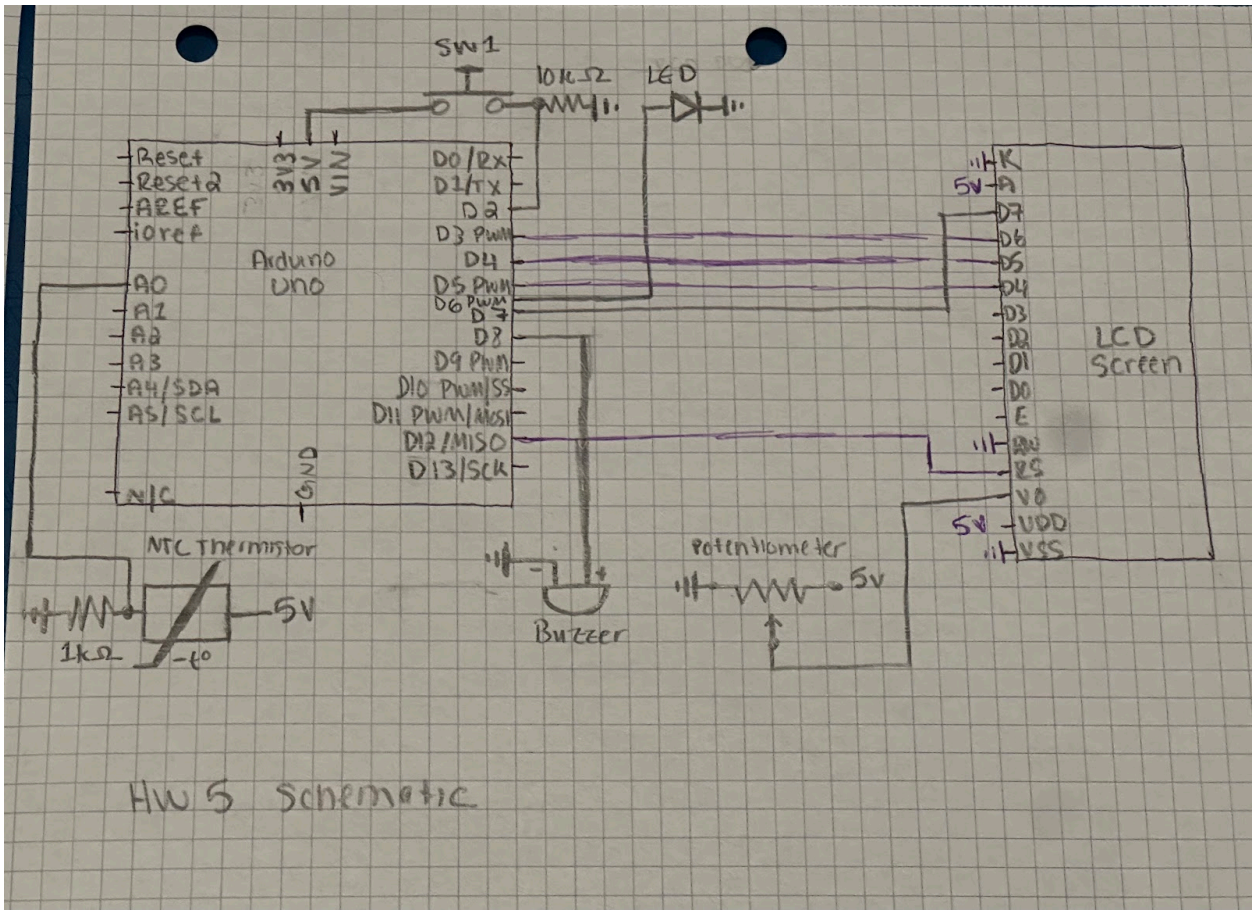
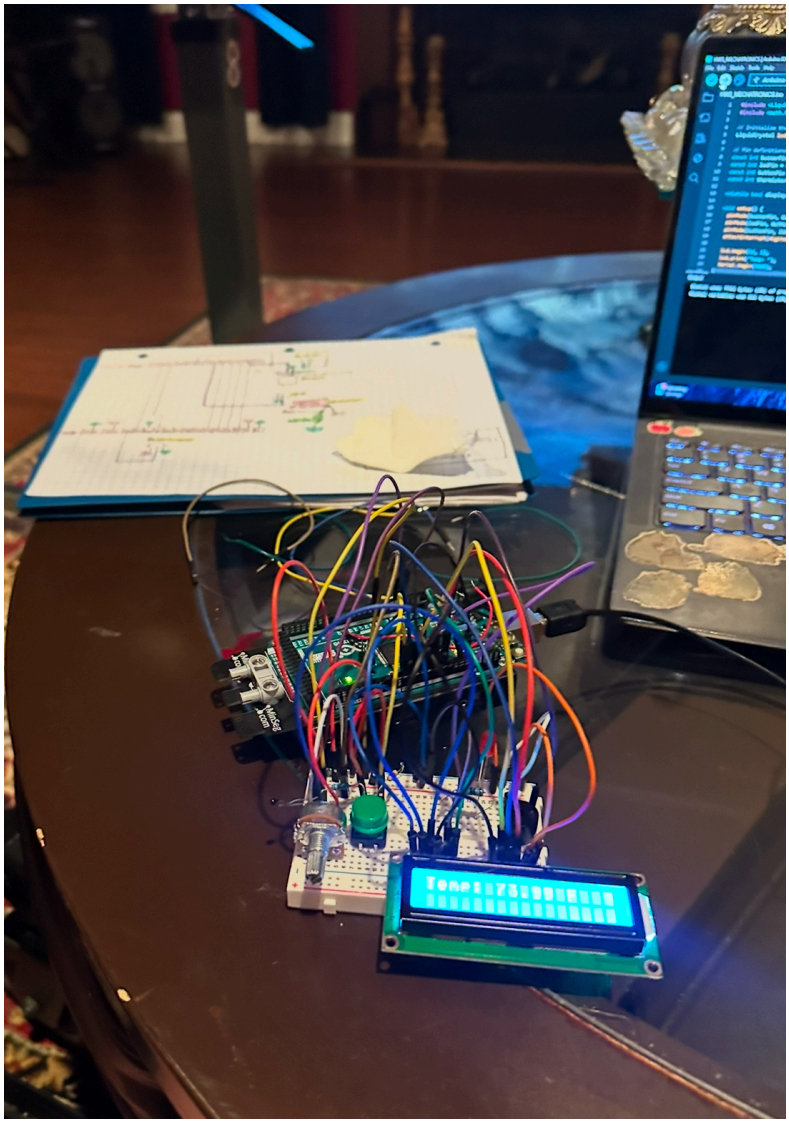
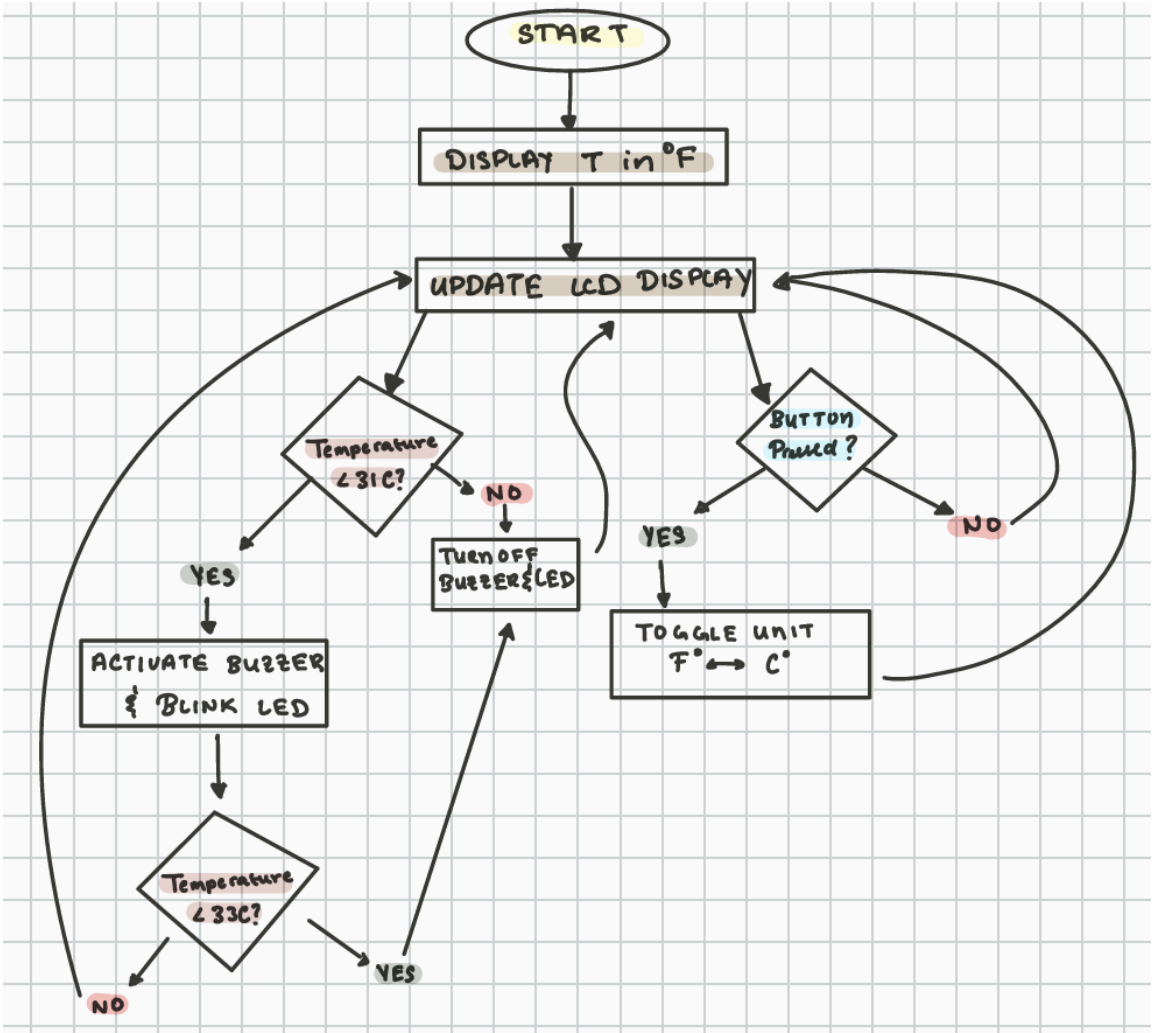
Schematic Diagram



Hardware



Program Flow Chart



Arduino Code

```
#include <LiquidCrystal.h>

#include <math.h> // Include the math library for logarithm and power functions

// Initialize the LCD

LiquidCrystal lcd(12, 11, 5, 4, 3, 7);

// Pin definitions

const int buzzPin = 8;

const int ledPin = 6;

const int buttonPin = 2;

const int thermPin = A0;
```

```
volatile bool displayCelsius = false; // Temperature display mode toggle

void setup() {

pinMode(buzzPin, OUTPUT);

pinMode(ledPin, OUTPUT);

pinMode(buttonPin, INPUT_PULLUP);

attachInterrupt(digitalPinToInterrupt(buttonPin), toggleTemperatureMode, FALLING);

lcd.begin(16, 2);

lcd.print("Temp: ");

Serial.begin(9600);

}

void loop() {

float temp = readTemperature();

displayTemperature(temp);

checkAlarm(temp);

delay(500);

}

float readTemperature() {

int reading = analogRead(thermPin);

float voltage = reading * 5.0 / 1024.0; // Convert analog reading to voltage

float resistance = 10000.0 * ((5.0 / voltage) - 1); // Calculate resistance of the thermistor

float temperatureC = 1 / (0.0010295 + 0.00023885 * log(resistance) + 0.000000150362 * pow(log(resistance), 3)) - 273.15; // Calculate temperature using Steinhart-Hart equation

float temperatureF = (temperatureC * 9.0 / 5.0) + 32; // Convert Celsius to Fahrenheit

temperatureF = round(temperatureF * 100) / 100.0; // Round to two decimal places

// Debug output to Serial Monitor

Serial.print("ADC Reading: "); Serial.print(reading);

Serial.print(", Resistance: "); Serial.print(resistance);

Serial.print(", TempC: "); Serial.print(temperatureC);

Serial.print(", TempF: "); Serial.println(temperatureF);

return displayCelsius ? temperatureC : temperatureF;

}

void displayTemperature(float temp) {

lcd.setCursor(6, 0);

lcd.print(temp, 2); // Display two decimal places
```

```
lcd.print(displayCelsius ? " C" : " F");

}

void checkAlarm(float temperature) {

float thresholdTempC = 31.0; // Temperature threshold in Celsius

if (displayCelsius ? (temperature > thresholdTempC) : (temperature > celsiusToFahrenheit(thresholdTempC))) {

digitalWrite(buzzPin, HIGH);

digitalWrite(ledPin, HIGH);

} else {

digitalWrite(buzzPin, LOW);

digitalWrite(ledPin, LOW);

}

}

float celsiusToFahrenheit(float celsius) {

return (celsius * 9.0 / 5.0) + 32.0;

}

void toggleTemperatureMode() {

displayCelsius = !displayCelsius;

lcd.clear();

lcd.print("Temp: ");

}
```

Video Demonstration

HWK5MECHATRONICS.MOV

HWK5MECHATRONICSVID2.MOV