MIT | Academy of Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

School of Electrical Engineering (SEE)

Minor Project Design Sem III/SY B.Tech.

CONTACTLESS TEMPERATURE DETECTOR

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Guide

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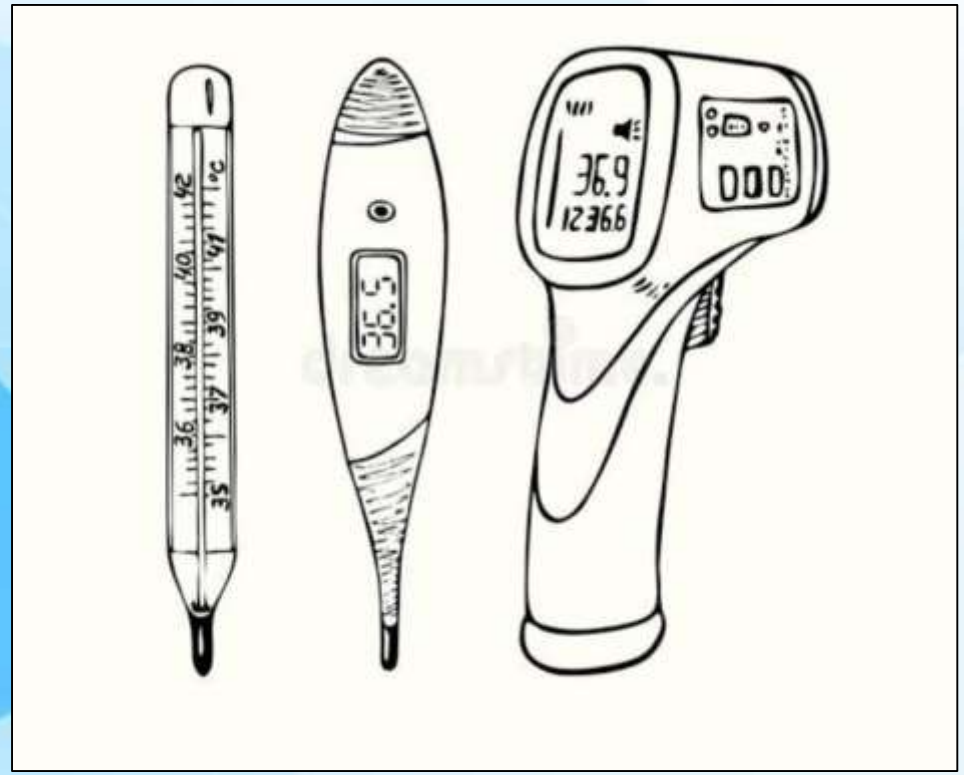
Idea of project

- To reduce the spread of the disease(Covid 19) by contact and maintain the social distancing norms , getting rid of the manual temperature detection is necessary.
- Handheld infrared thermometers and ear gun thermometers are being used for the same.
- Unfortunately, none of these methods have proven entirely accurate.
- So it is possible to create a compact, reliable, and contactless temperature detection device for the same.



Problem Statement

Problem Statement - To design and implement an automatic contactless temperature detector which is in-built in a system(Gate).

Objective:

1) Detection of temperature using infrared sensor based module and temperature sensor.
2) Making the device temperature detection system-compatible.
3) Such system can be used in public places like malls, airports, hospital, etc., to reduce the spread of the disease.
4) By making the process contactless and automatic, to make temperature detection simpler and safer.

Proposed Title

KEYWORDS

- Non-manual temperature detection
- Sensors (Temperature sensor, infrared sensor based module, etc.)
- Contactless procedure
- In-built in the system or walk-through gate

- **PROPOSED TITLE: <u>CONTACTLESS TEMPERATURE DETECTOR</u>**

Feasibility Check

- TELOS is an acronym in project management used to define five areas of feasibility that determine whether a project should run or not
- T - Technical - Is the project technically possible?
- E - Economic - Can the project be afforded? Will it increase profit?
- L - Legal - Is the project legal?
- O - Operational - How will the current operations support the change?
- S - Scheduling - Can the project be done in time?

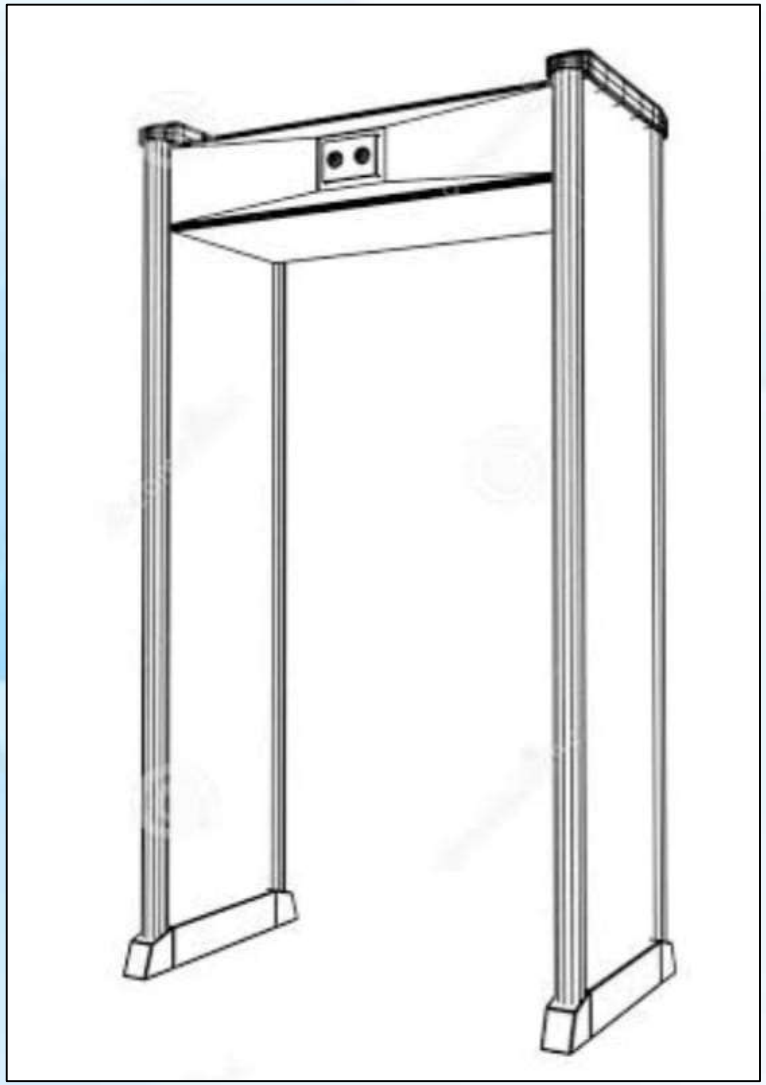
Scope of Project [SY Sem III & IV]

- Second year scope for our project – we will make a contactless temperature detector circuit which we will install on the gate.

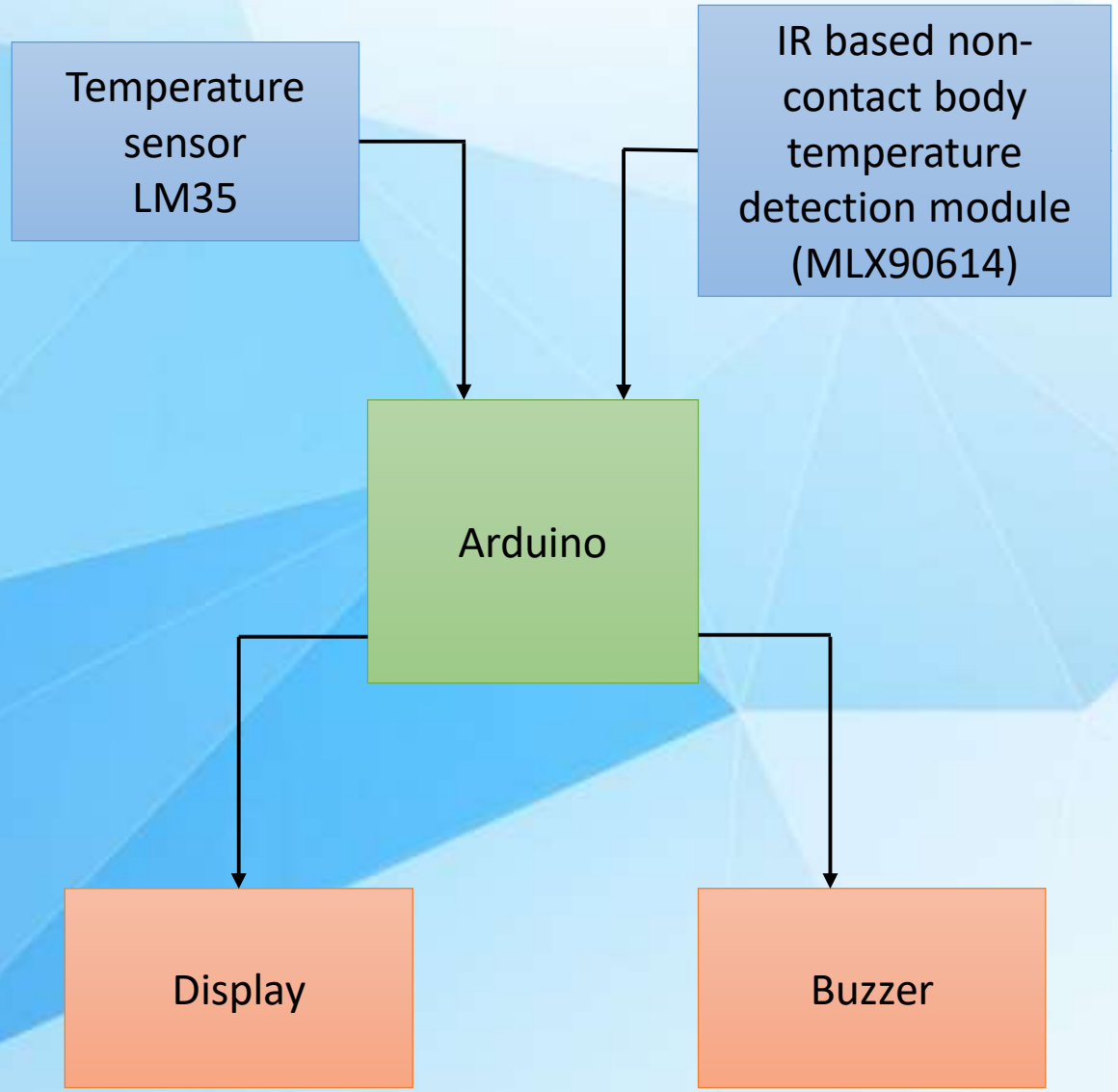
- **FUTURE SCOPE**

1. In many public places like malls ,airport , hospital ,etc. , we have walked through metal detector gate similarly we would design walked through temperature detector gate .

2. When person would pass through the gate the temperature would be detected and recorded in the database along with the information of the person which would make managing records easier .



Proposed Block Diagram



Project Design

Specification	Parameters
1. Channel Dimensions	Width: 780 mm Height: 1990 mm
2. External Dimensions	Width: 900 mm Height: 2230 mm
3. Operating Temperature	36.1 C to 37.2 C or more 97 F to 99 F or more

The average height for Indian men is 5.8 feet (177 cm), and that for women is 5.3 feet (162 cm).
The average body temperature is 98.6 F (37 C). But normal body temperature can range between 97 F (36.1 C) and 99 F (37.2 C) or more. So considering this data design of walk through is done.

Project Design

Temperature Conversions:

Conversion of Temperature From	Formulas
Celsius to Kelvin	$K = C + 273.15$
Kelvin to Celcius	$C = K - 273.15$
Fahrenheit to Celsius	$C = (F - 32)\frac{5}{9}$
Celsius to Fahrenheit	$F = C\frac{9}{5} + 32$
Fahrenheit to Kelvin	$K = (F - 32)\frac{5}{9} + 273.15$
Kelvin to Fahrenheit	$F = (K - 273.15)\frac{9}{5} + 32$

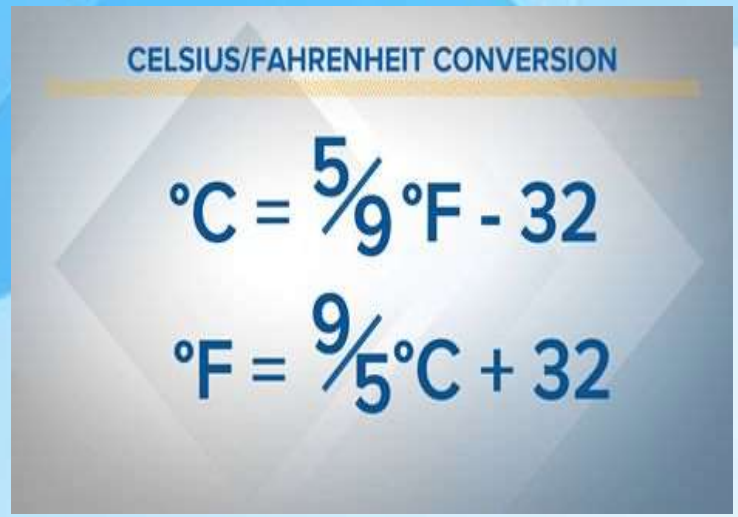
Project Design

MATHEMATICAL FORMULATION OF CONTACT TEMPERATURE MEASUREMENT

Voltage to Temperature Conversion

$$temperature = \left[\left(vout * \left(\frac{5}{1024}\right) - 0.5\right] * 100\right.$$

$$temperature = [(vout * 0.0048828125) - 0.5] * 100$$



Electromechanical Design

1. MLX90614 module would be detecting the temperature of human body in non contact manner. Temperature would be detected at the forehead.

2. LM35 is at height where a human can place their hands easily. LM35 is used for contact temperature detection.

3. LCD Display is at top to display the detected temperature of human being.

4. The buzzer would generate a sound or alarm if the body temperature of the person is high

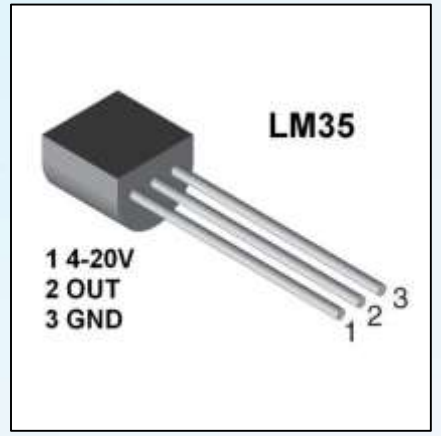
Component Selection

1. MLX90614:

The MLX90614 is an infrared thermometer for non-contact temperature measurements. The MLX90614 sensor uses non-contact temperature sensing to collect temperature information without touching any specific surface. ranges: -40 to 85°C for the ambient temperature and -70 to 382.2°C for the object temperature.

2. LM35:

The LM35 sensor is moderately precise and its robust construction makes it suitable for various environmental conditions. Additionally, you don't need any external component to calibrate this circuit and it has a typical accuracy of ±0.5°C at room temperature and ±1°C over a full −55°C to +155°C temperature range.



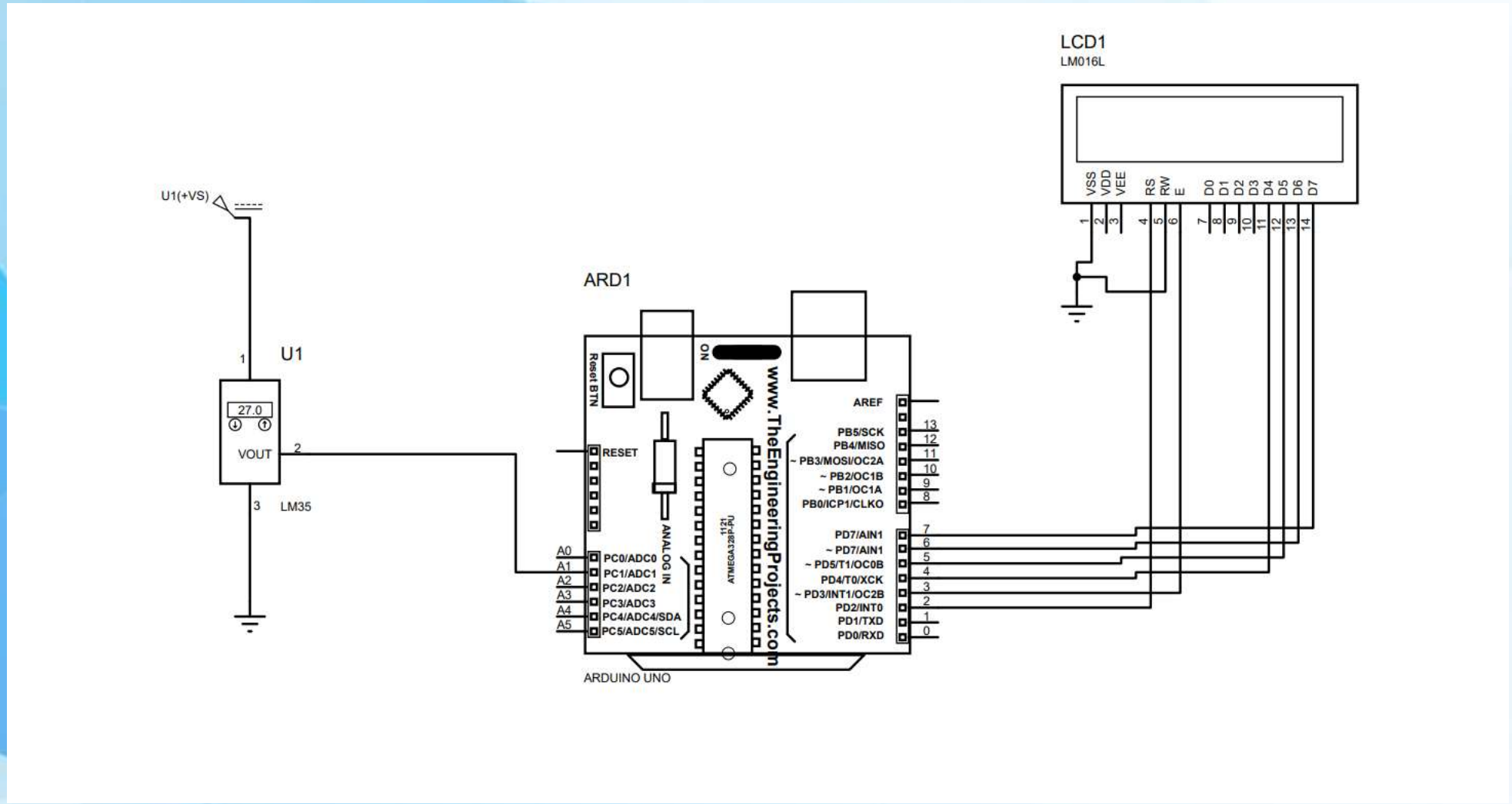
3. LCD Display :

A liquid crystal display (LCD) has liquid crystal material sandwiched between two sheets of glass. Without any voltage applied between transparent electrodes, liquid crystal molecules are aligned in parallel with the glass surface.

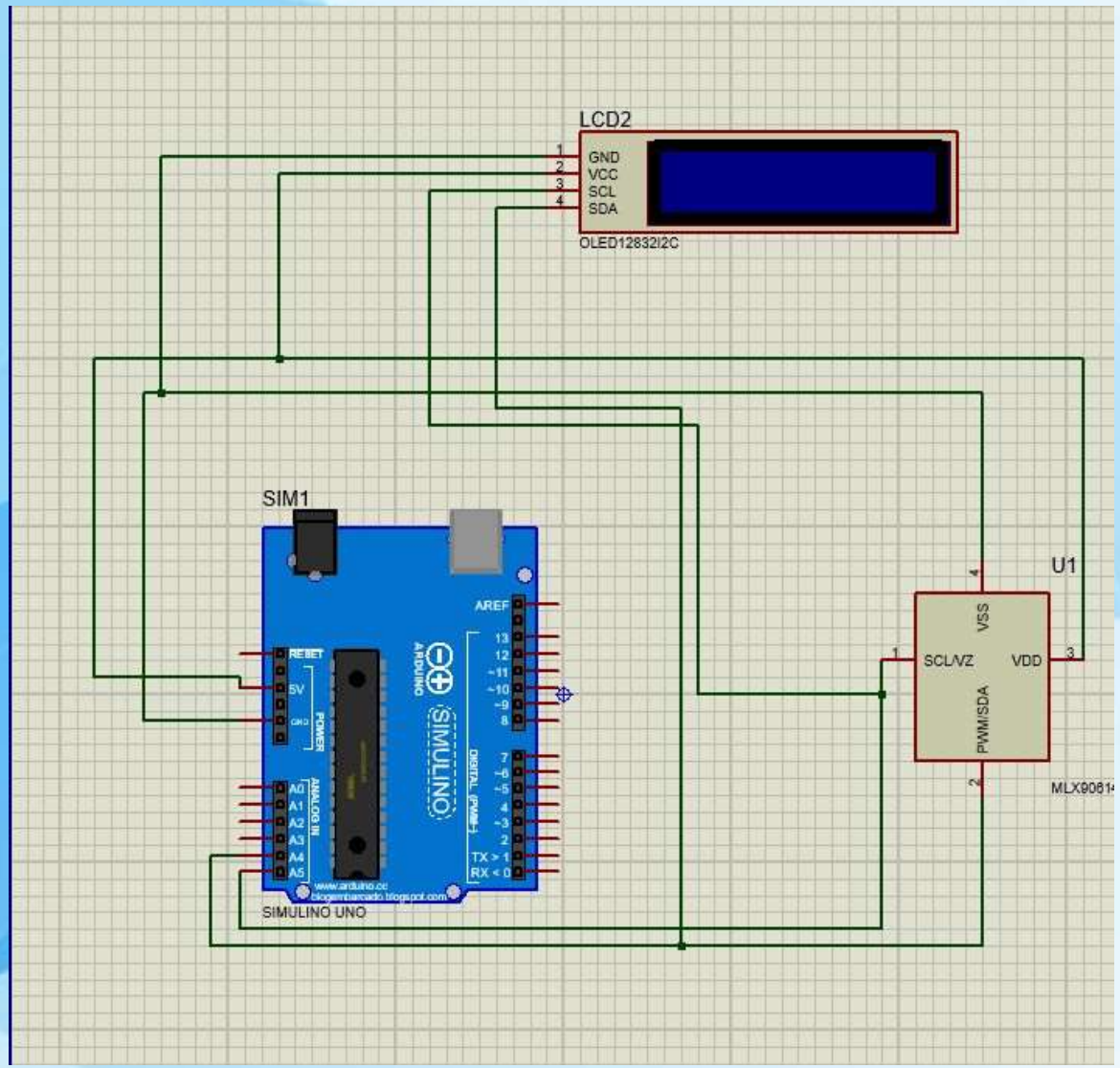
2. Arduino UNO:

Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

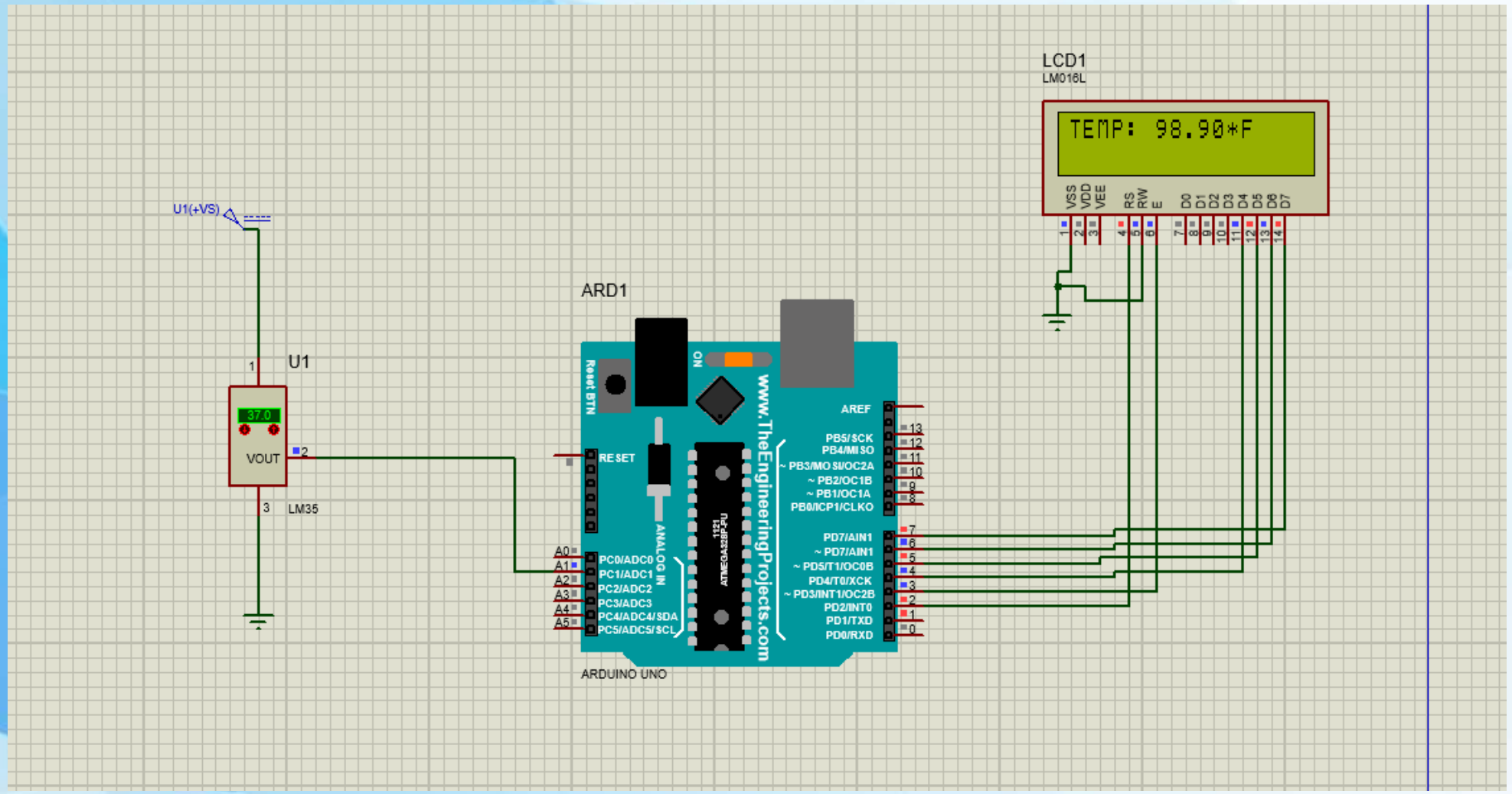
Circuit Diagram



Circuit Diagram



Circuit Simulation Results



Circuit Simulation Results

- ALGORITHM OF CONTACT TEMPERATURE DETECTION

Step 1: Start

Step 2: Include Liquid crystal Library of Arduino for interfacing LCD

Step 3: Initialize the variables like rs,en,d4,d5,d6,d7

Step 4: void setup() function

Step 5: Initialize lcd.begin(16,2)

Step 6: Initialize void loop() function

Step 7: Take analog input as voltage variable name – temp from analog pin A1

Step 8: Convert voltage input to temperature in degree Celsius and degree Fahrenheit

Step 9: Display output as temperature

Step 10: End

Circuit Simulation Results

- ALGORITHM OF NON-CONTACT TEMPERATURE DETECTION

Step 1: Start

Step 2: Include wire.h and AdaFruit.h Library

Step 3: void setup() function

Step 4: mlx.begin() begin the connection pointing to Wire instance

Step 5: void loop() function

Step 6: mlx.readAmbientTempC() reads Ambient temperature in Celsius

Step 7: mlx. readObjectTempC() reads Body temperature in Celsius

Step 8: mlx. readAmbientTempF() reads Ambient temperature in Fahrenheit

Step 9: mlx. readObjectTempF() reads Body temperature in Fahrenheit

Step 10: Display output

Step 11: End

System Test Parameters

MLX90614

- The MLX90614 sensor is a contactless temperature sensor, in which to measure the temperature of an object, the sensor does not require direct contact with the object.
- The MLX90614 sensor is simply pointed at the object you want to measure the temperature .
- The working principle of the MLX90614 sensor is that this sensor works by absorbing infrared light emitted by an object.
- Since this sensor is not in physical contact with the object being measured, it has a wide measurement range from -70°C to +380°C.
- The MLX90614 sensor is specifically designed to detect infrared radiation energy and has been automatically designed so that it can calibrate infrared radiation energy into a temperature scale.

System Test Parameters

LM35

- Using LM35 we will detect the temperature of human body
- The LM35 device is rated to operate over a **–55°C to 150°C** temperature range

HEIGHT

- LM35 is at height where a human can place their hands easily. LM35 is used for contact temperature detection.

Supporting References

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