Template for EDL Project Proposals (10 to 15 pages)

Project Title: Contactless Thermometer

**Group No. :** Tue-05

Student roll nos. and names:

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Abstract
Our motivation behind this project is to build a contactless thermometer for measuring temperatures of surrounding objects/surfaces without coming in direct contact with them. These thermometers can be used to measure temperatures of hot surfaces or objects which cannot be accessed by us directly. They would have a wide range and good precision. We aim to use an IR sensor (TS305-11C55) for sensing the temperature without direct contact by using the concept of black body radiation. Then we would apply further signal conditioning thereby converting the measured voltage into digital format. This signal would be given to the Arduino which would be connected to an LCD display board which would finally show us the measured temperature.

1. Block diagram
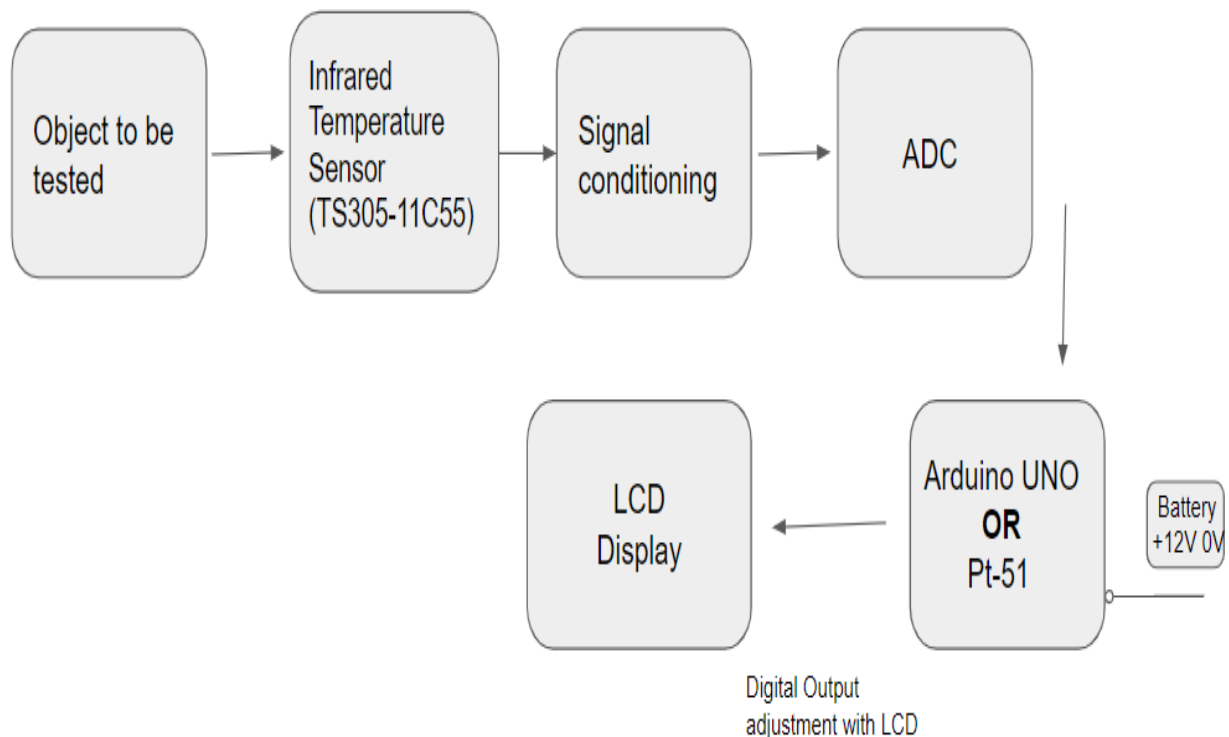
2. Project details

2.1 Project goal

Our goal is to make a working prototype of a contactless thermometer for measuring the temperature of surfaces without making direct contact with them. This thermometer is different from the normal body measuring thermometers and it will be capable of measuring temperature upto 100^0C. We plan to do so by integrating various components such as infrared sensors, wisely chosen Opamp, loop filters, microcontroller and various other subcircuits and finally doing the testing.

2.2 Project description and methodology (or approach)

1. The IR temperature sensor (TSC305-11C55) would sense the temperature of the human body/surface from a distance using the principle of the Stefan-Boltzmann law.
2. The output voltage level of Thermopiles is in the range of µV up to mV level. We need to amplify this signal using an Op-Amp with respect to the following parameters:
     • Low offset voltage, low offset voltage drift
     • Low leakage current, low leakage current drift
     • Low noise
   We have decided to use the TL081 Opamp.
3. The analog output of the temperature sensor would be fed to the 8bit / 12bit ADC to convert this analog voltage output into a digital reading.
4. This reading will then be passed to a microcontroller (Arduino UNO/ Pt-51) to convert it into an accurate temperature measurement which will then be displayed on the LCD connected to the microcontroller.
5. We plan to make the prototype as compact as possible so that it can be used on a day-to-day basis.
6. We will test the functionality and accuracy of the prototype using LM35.
7. Finally, we would prepare documentation for our project.

2.3 Project design

2.3.1   Sub system designs

1. **IR Temperature Sensor :**
   The TSC305-11C55 IR sensor used will sense the temperature and output a voltage corresponding to it. The IR rays would be focused appropriately on the sensor using an IR lens for better accuracy. We would apply signal conditioning to this for further processing.

2. **8 bit/12 bit ADC Unit :**
   The ADC Unit takes a continuous analog signal as input and gives a discretized   digital output in bits. These bits can be adjusted with the levels of an analog signal. The output bits are given to the LCD with some adjustments to display the temperature.

3. **Arduino UNO :**
   This is used to accurately measure the temperature as output taking in the digital signal as input.

4. **LCD Unit :**
   This is the last sub-system of our model. An LCD connected to the Arduino would display the temperature precisely.

3. Project Work plan

Week 1 (Feb 8 - Feb 15) :
Testing of each individual component to ensure if it's working correctly. Mayur and Rushikesh will check the components available at WEL and Siddhant will proceed with the procedure to order the required components online.

● Milestone 2 : Feb 14 (Mon)/ Feb 15 (Tue) – Evaluation – 1

Week 2 (Feb 28 - Mar 6) :
This week, we will work on the calibration of our TSC305-11C55 IR Sensor. Siddhant and Mayur will work on the offset due to dark current whereas Rushikesh will monitor it's outputs.

Week 3 (Mar 7 - Mar 13) :
In Week 3, we will work on the circuit designing. Siddhant and Rushikesh will work on the PCB designing and circuit interfacing. Mayur will check the components needed.

● Milestone 3 : March 14 (Mon)/ March (Tue) – Evaluation – 2

Week 4 (Mar 14 - Mar 20) :
In this week, we will work on the ADC – Arduino – LCB interfacing. Mayur and Rushikesh will work on the calibration on ADC for correct digital output to the Arduino and Siddhant will work on the Arduino – LCD interfacing part.

Week 5 (Mar 21 - Mar 27) :
In this week, we will work on the physical design of our project. We all will try to fill the whole PCB design into a compact and usable mechanical framework.

Week 6 (Mar 28 - Mar 31) :
This week will be our buffer week incase any part of work does not go as planned. We all will also write a detailed report consisting of all the aspects of our project work.

● Milestone 4 : March 31 (Thu) – Final EDL Project Report submission

4. Project Implementation

i) **BOM or Bill of Materials**

Component	Price	Quantity
TSC305-11C55 IR Sensor	500/-	1
Arduino UNO	WEL	1
Power supply	150/-	1
LCD display	250/-	1
ADC	450/-	1
8051 (if required)	100/-	1
LM35	60/-	1
Approximate Total	1510/-	

Other than these components, we will use some basic electrical components which are available in WEL.

ii) Testing :
We will test the circuit made on a breadboard with an LCD display and compare the results of using an LM35 sensor. We will demonstrate the working of our prototype using some common well known objects such as human body and boiling water. We will try to minimize the risk involved in the testing as much as possible.

iii) Demonstration :

After Week 4 (Mar 14 - Mar 20), we will demonstrate the working of our Thermometer without mechanical framework, on PCB board.

In the final demo, we will demonstrate the readings of our contactless thermometer on an LCD display. We will try to make our device to take reading of any real world object. We will try to design the device which can be used to check the temperatures on daily basis.

5. Project Milestones

- Milestone 1 : January 31 (Mon) – Detailed Project proposal submission

- Milestone 2 : Feb 14 (Mon)/ Feb15 (Tue) – Evaluation – 1 (30% of your project should be ready)
- Milestone 3 : March 14 (Mon)/ March (Tue) – 60% of your project should be ready

- Milestone 4 : March 31 (Thu) – Final EDL Project Report submission – 90 to 95% of your project should be ready; should have done proper prototyping.

- Weekly Progress Reports : due every Sunday, 8pm - for monitoring progress; will be evaluated by the TAs/RAs and Faculty mentor. Brief report – 2 or three pages.

Final Evaluation
- EDL PPT presentations : April 4 (Mon) and April 5 (Tue)
- EDL Project Demos : April 11 (Mon) and April 12 (Tue)

Last day of instruction: April 15 (Fri)

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