United International University

QUEST FOR EXCELLENCE

Project Report

Project Title: Electronic Heartbeat Reader

Course Code: EEE 2104

Course Title: Electronics Laboratory

Submitted to:

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Submitted by:

Group- Amplifier

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❖ Introduction:

A heartbeat sensor is a device that can be used to measure the heart rate of a person. There are many different types of heartbeat sensors available, but they all work on the same basic principle. The sensor detects the vibrations caused by the heartbeat and converts them into an electrical signal. This signal can then be amplified and displayed on a monitor or other device. In this project, we will build an electronic heartbeat reader using a microphone, amplifier, low pass filter. The microphone will be used to detect the vibrations caused by the heartbeat. The amplifier will then amplify this signal and then the low pass filter will remove any unwanted noise from the signal. Finally, we will see the heart rate on a display.

❖ Description of the project

1. It is cheaper and easy to build.
2. It can be used to measure the heart rate of a person in real time.
3. It is portable and can be used anywhere.
4. This makes it a valuable tool for medical monitoring, fitness tracking, and research.

Components Required:

- IC LM741 Op-amp
- Capacitors
- Resistors
- LED
- OLED graphic display module
- 9V Battery
- IC holder
- Stethoscope
- Microphone Condenser
- Arduino UNO
- Veroboard

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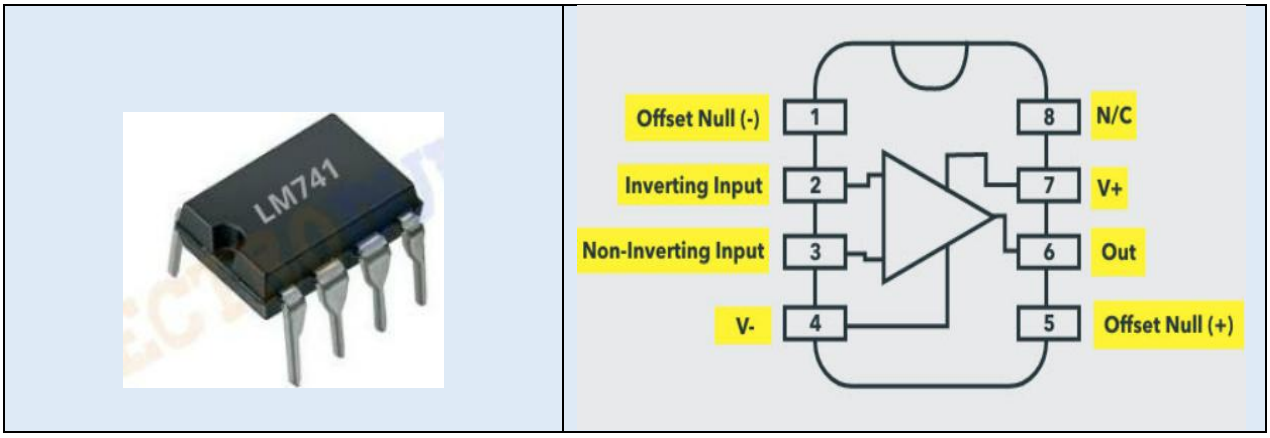


General Specification

Parameter	Value
Minimum Power Consumption	±10v
Normal Power Consumption	±15v
Maximum Power Consumption	±22v
Supply current	1.7 to 2.8mA
Input Impedance range of about	2 megaohms
Output Impedance range of about	75 ohms
Operating temperature	-50 to 125 ˚C
Soldering pin temperature	▪ PDIP package – 260 ˚C (for 10 seconds – prescribed) ▪ TO-99 and CDIP – 300 ˚C (for 10 seconds – prescribed)

OLED Graphic Display Module:

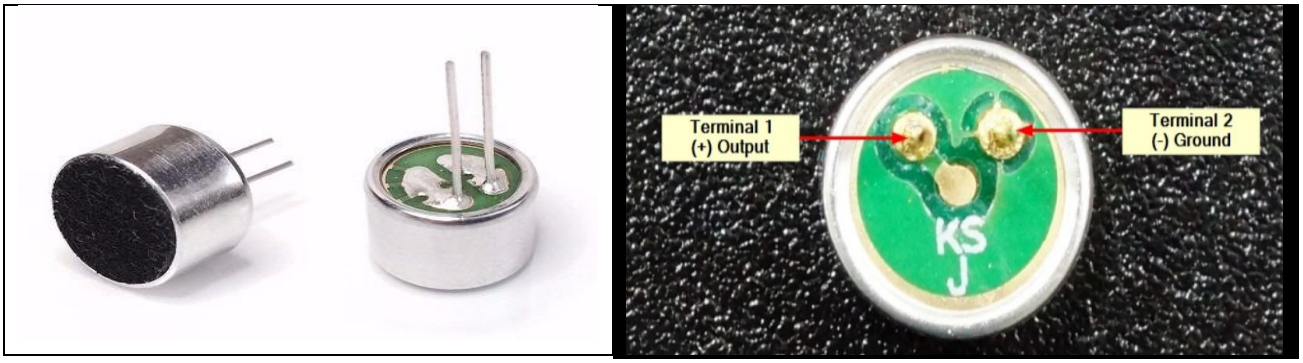
An OLED display that can be used to see your heartbeat is a heart rate monitor. It uses a pulse sensor to detect the amount of blood flow through your body and then uses an OLED display to show your heart rate in beats per minute (BPM).

General Specification

Display Technology	OLED (Organic LED)
MCU Interface	I2C / SPI
Screen Size	0.96 Inch Across
Resolution	128×64 pixels
Operating Voltage	3.3V – 5V
Operating Current	20mA max
Viewing Angle	160°
Characters Per Row	21
Number of Character Rows	7

Microphone condenser:

A condenser microphone can be used to receive the sound from the heart when connected to a stethoscope. Condenser microphones are sensitive to sound and have a wide frequency response, which makes them ideal for capturing the subtle sounds of the heart.

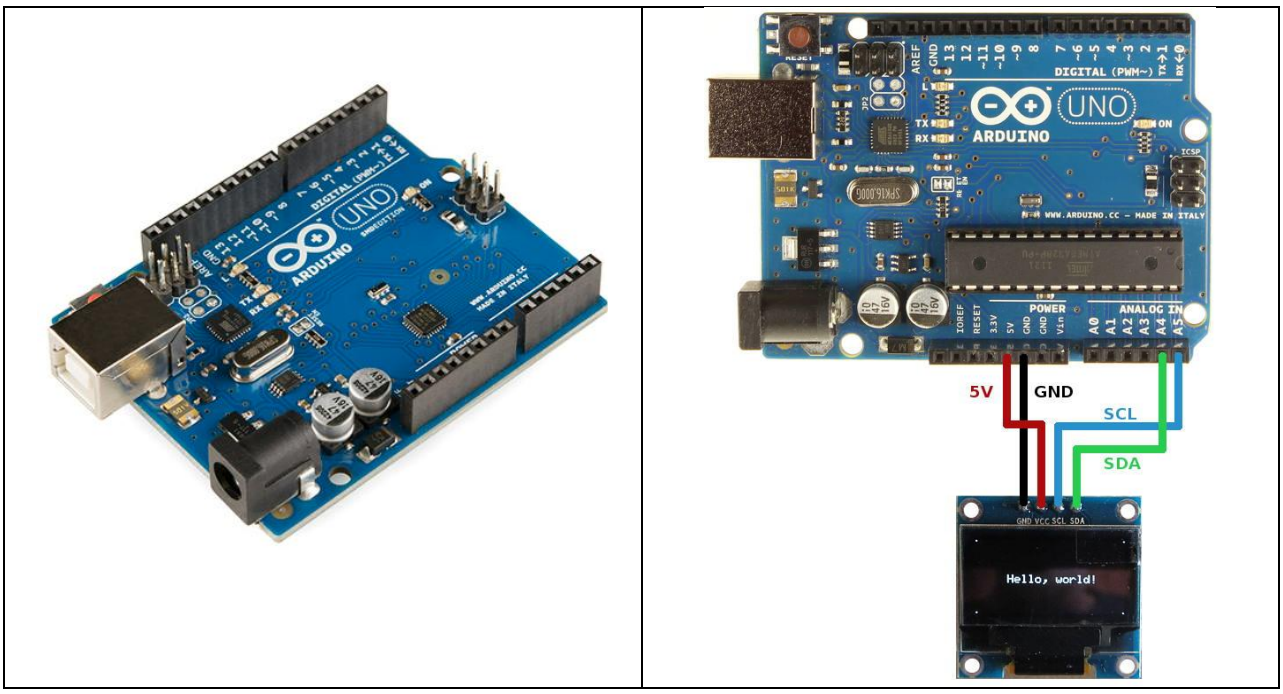


General Specification

Frequency	100Hz-20kHz
Directivity	Omnidirectional
Sensitivity	-42dB ± 3dB
Operating Voltage	2V typical, 10V max
Output Impedance	2.2k Ohm

Arduino UNO:

Arduino Uno is an important component in a project to see your heartbeat on the display. It is a microcontroller board that can be programmed to read signals from sensors and control outputs.



General Specification

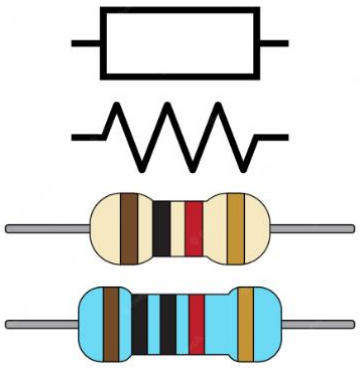
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 Ma
DC Current for 3.3V Pin	50mA
Flash Memory	32 KB of which 0.5KB
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz
Length	68.6 mm
Weight	25g

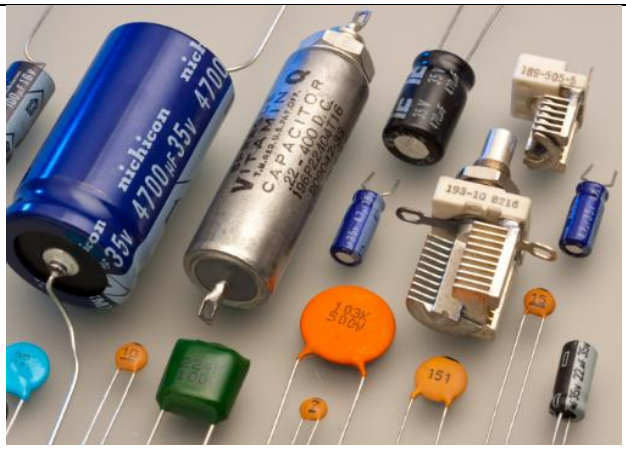
Stethoscope:

This is one of the main component in our device. It takes the heartbeat vibrations as input and converts it into an electrical signal. Then other components do rest of the work.

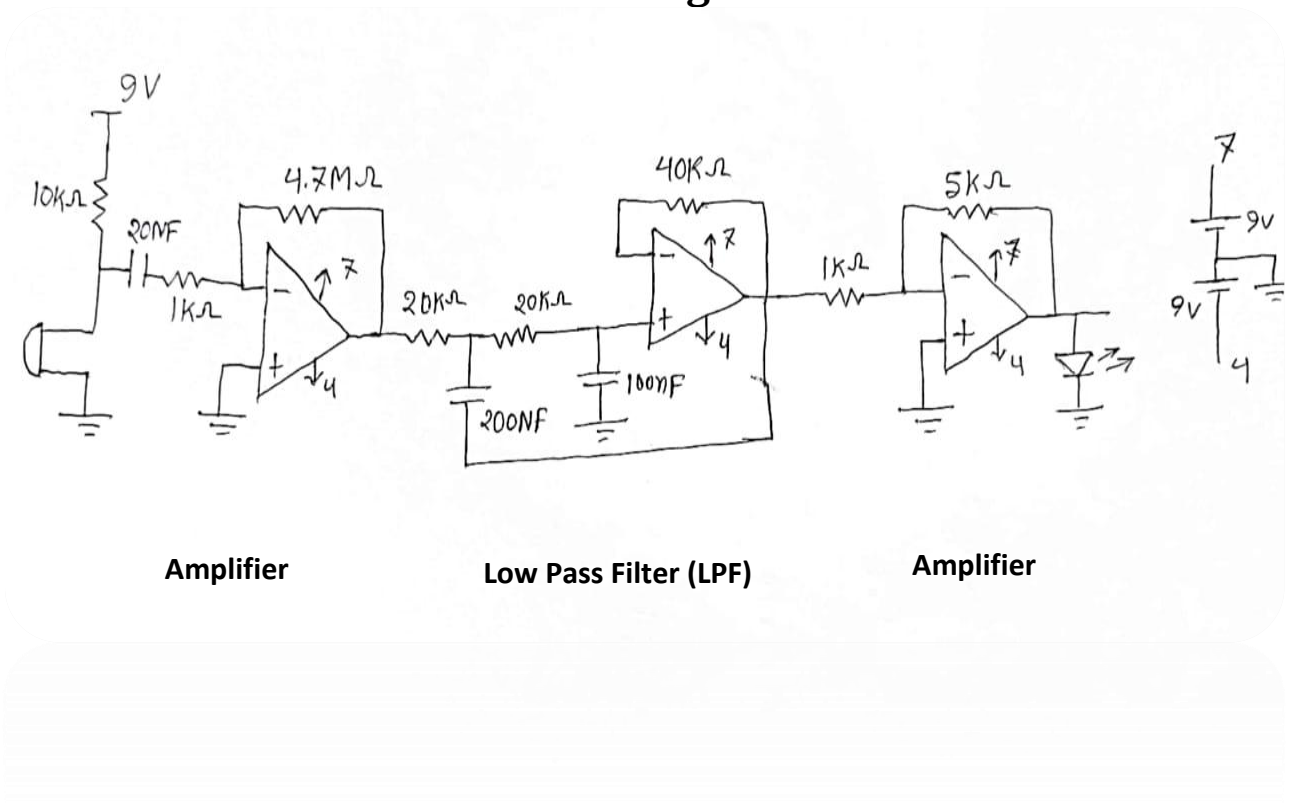
Resistor and capacitor:

This are the basic components of the circuit. Here this are mainly used to control amplification, to control frequency filter, to block the DC signal, to divide the voltage.





❖ Circuit Diagram



Amplifier **Low Pass Filter (LPF)** **Amplifier**

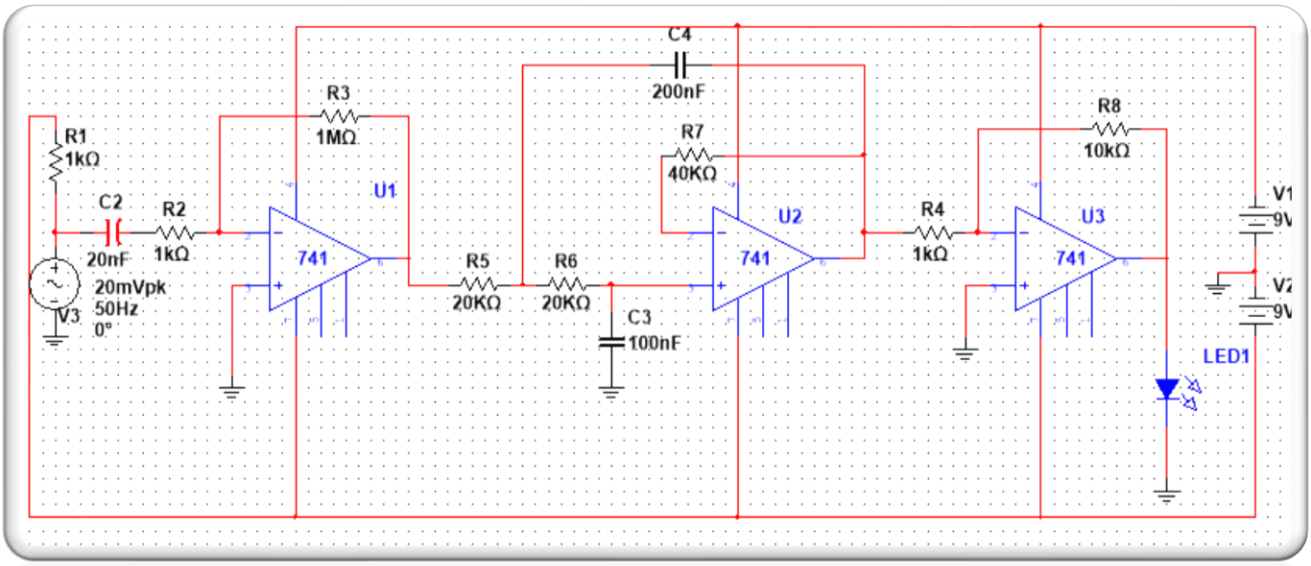
❖ Circuit Diagram Explanation:

The circuit diagram consists of three main parts: the amplifier, the low pass filter, and the second amplifier. The amplifier is used to amplify the sound signal from the microphone. The low pass filter is used to remove the high-frequency noise from the signal.

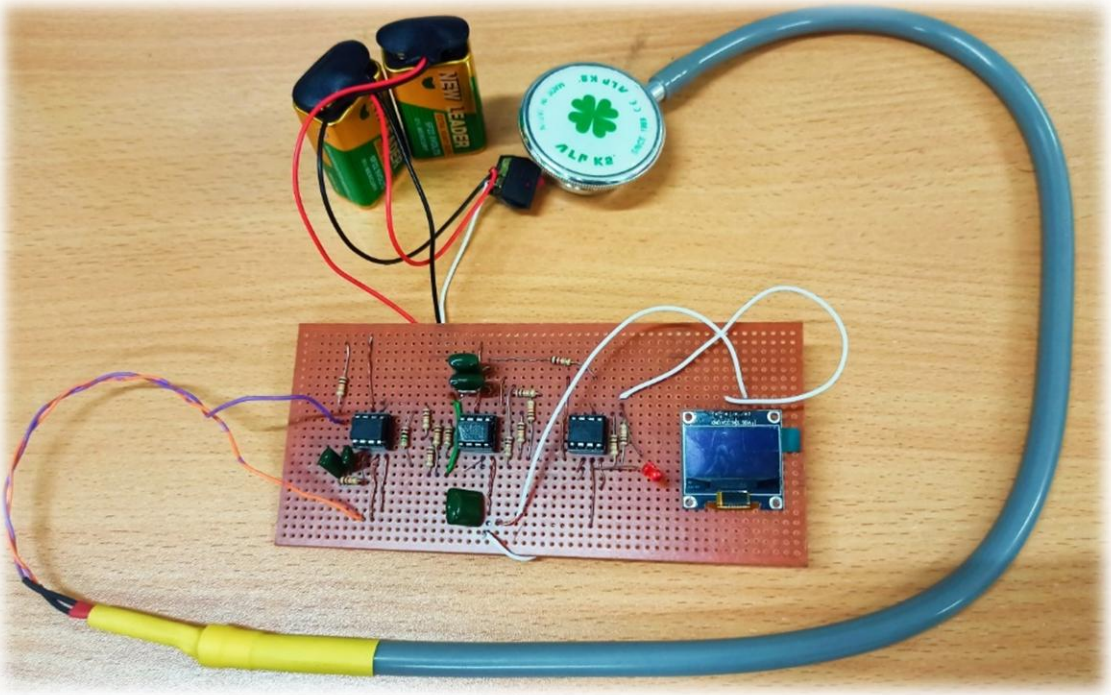
The microphone is connected to the input of the amplifier. The output of the amplifier is connected to the input of the low pass filter. The output of the low pass filter is connected to the input of the second amplifier. The output of the second amplifier is connected to the display.
The sound from the heart is received by the microphone and amplified by the first amplifier. The low pass filter removes the high-frequency noise from the signal, leaving only the low-frequency heartbeat signal. The second amplifier amplifies the signal again and sends it to the display.

The display can be a digital display or an analog display. The digital display will show the heart rate in beats per minute. The analog display will show the waveform of the heartbeat signal.

❖ Simulation Result:



❖ Picture of the project:



❖ Results:

The heartbeat signal as final output on the display. Also,

1. BPM 60-80 (according to medical report, also this may vary person to person).
2. BPM 60-70 (according to our device, also this may vary person to person).

❖ Cost Estimation:

The total cost of the project is estimated to be 1500 BDT. This includes the cost of the electrical components, labor, transportation, and other expenses. The project is considered to be low-cost and can be easily replicated by others. The project uses readily available components, making it easy to obtain the necessary parts. The project is relatively simple to assemble, making it accessible to people with limited technical skills.
The project can be used to educate people about heart health and the importance of regular monitoring.

❖ Conclusion:

In conclusion, this project has successfully designed and implemented an electronic heartbeat reader. The circuit diagram is relatively simple and can be implemented using commercially available components. The project can be improved by using a better microphone and a more sensitive amplifier. The project can also be extended to include other features, such as the ability to store and display heart rate data. The project report also discusses the challenges and limitations of the project, as well as future directions for improvement.

- The advantages of the electronic heartbeat reader include its portability, affordability, and ease of use.
- The electronic heartbeat reader can be used to monitor heart rate in a variety of settings, such as at home, in the doctor's office, or in the hospital.
- The electronic heartbeat reader can be used to track heart rate over time, which can be helpful for detecting changes in heart health.
- The electronic heartbeat reader can be used to monitor heart rate during exercise, which can be helpful for ensuring that the heart is not working too hard.