

# **SMART ECG MONITORING SYSTEM**

**A**

## **MINOR PROJECT SYNOPSIS**

*Submitted in partial fulfillment of the requirements for the award of the degree*

*Of*

## **BACHELOR OF TECHNOLOGY**

*In*

## **ELECTRONICS & COMMUNICATION ENGINEERING**

*By*

**Gaurav Mittal**

**Enrollment No: 01215602821**

**Section: F4**

**Mobile No. 9873938494**

**Nandani**

**Enrollment No: 04615602821**

**Section: F4**

**Mobile No. 9311853694**

**Anand Rai**

**Enrollment No: 03615602821**

**Section: F4**

**Mobile No.7428771978**

*Guided by*

**Dr. Richa Malhotra, Professor, ECE Department**



**Department of Electronics & Communication Engineering**  
**DR. AKHILESH DAS GUPTA INSTITUTE OF PROFESSIONAL STUDIES**  
**(AFFILIATED TO GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY)**

**NEW DELHI – 110053**

**August- 2024**

# Contents

	<b>Page No.</b>
1. Introduction	1
2. Objective and block diagram of project	1
3. Methodology and Tool Used	3
4. Advantages and Application of the Project	4
5. References	5
6. Research paper related to project	5

# Introduction

The objective of the ECG Monitoring System project is to create a fundamental electrocardiogram (ECG) monitoring device that records and presents heart rate information in real-time. This system is intended to deliver an affordable and accessible solution for the assessment of cardiac health. Key components of the system consist of an ECG sensor, an Arduino microcontroller, and an LCD display. This project holds considerable importance in the medical domain, as it provides a straightforward approach for ongoing heart rate monitoring, which is essential for identifying and averting cardiac irregularities.

## Objectives of the ECG Monitoring System Project

### **1. Real-Time Heart Rate Monitoring**

- **Objective:** To capture and display heart rate data in real-time.
- **Details:** Real-time monitoring allows for immediate feedback on heart health, which is crucial for detecting arrhythmias or other cardiac issues. The system should continuously update the heart rate displayed on the LCD screen to ensure the user can monitor changes as they happen.

### **2. Accurate and Reliable Data Capture**

- **Objective:** Ensure the system provides precise and reliable heart rate data.
- **Details:** The ECG sensor must accurately capture the heart's electrical activity, and the Arduino must process this data correctly to determine the heart rate. The system should minimize noise and interference to provide consistent and trustworthy readings. This is essential for the device to be useful in both personal health monitoring and clinical settings.

### 3. Portability and Convenience

- **Objective:** To design a portable ECG monitoring system.
- **Details:** The device should be compact and lightweight, making it easy to transport and use in various locations, such as at home, in a clinic, or during travel. Battery operation should be considered to enhance mobility, ensuring the device can be used without needing a constant power supply.

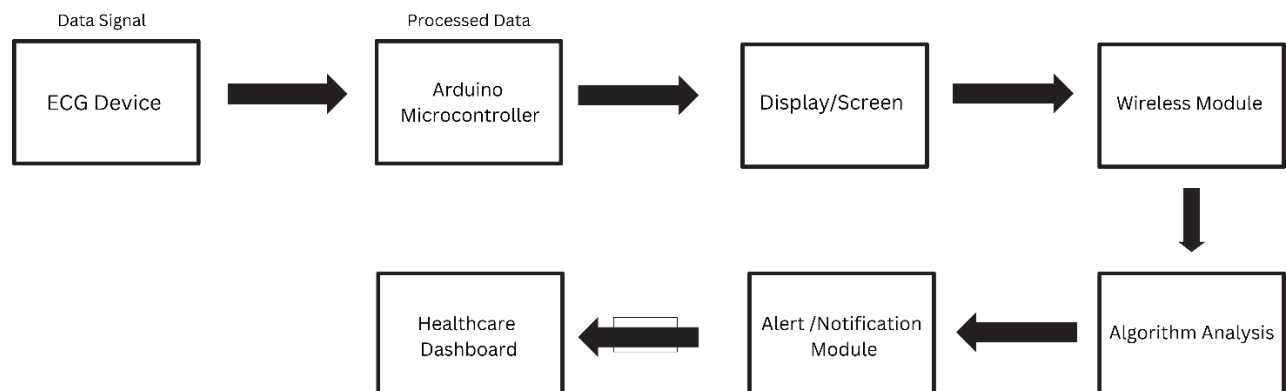
### 4. Real-time alert and notification

- **Objective:** To give real-time notifications about heart rate  
**Details:** Implement an intelligent alert system that triggers notifications upon detecting abnormalities or irregularities in the ECG readings.

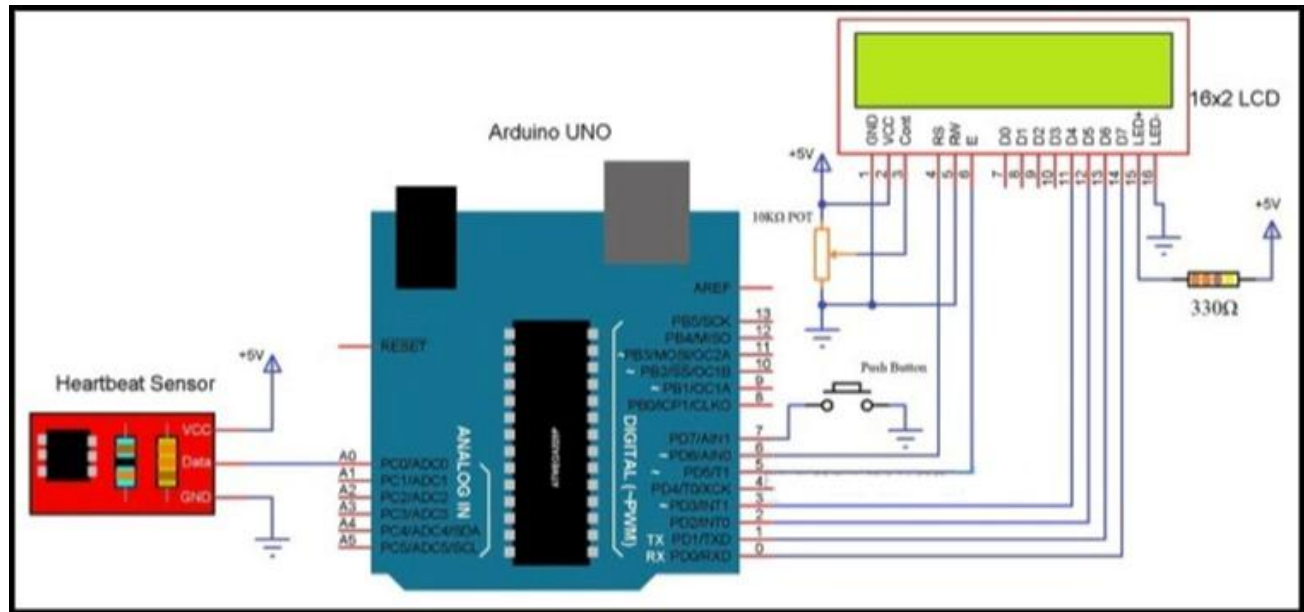
## WORKFLOW DIAGRAM

### Work Flow Diagram

#### ECG Monitoring System



# CIRCUIT DIAGRAM



# Methodology and Tools Used

## Methodology

### 1. Data Capture:

- The ECG sensor captures the electrical activity of the heart and converts it into a readable signal for the Arduino.
- Proper placement of ECG leads on the body ensures accurate readings.

### 2. Data Processing:

- The Arduino processes the raw ECG signals to extract heart rate information.
- The raw signal is filtered to remove noise and artifacts.
- Peak detection algorithms are used to identify the R-waves in the ECG signal, from which the heart rate is calculated.

### 3. Data Display:

- The processed heart rate data is sent to the display for real-time monitoring.
- The display shows the current heart rate in beats per minute (BPM).

## Tools Used

### • Hardware:

- Arduino Uno or Nano: A microcontroller board based on the ATmega328P.
- AD8232 ECG Sensor Module: An integrated signal conditioning block for ECG and other biopotential measurement applications.
- LED Display: A liquid crystal display that shows the output of the AD8232 ECG Sensor Module.
- Basic Electronic Components: Resistors, capacitors, breadboard, and wires for circuit construction.
- Transceiver: A device to send and receive notification

- Software:
  - Arduino IDE: An integrated development environment used for writing and uploading programs to the Arduino board.
  - Dashboard: web page or app to receive notification and alerts

## Advantages and Applications of the Project

### Advantages

- **Cost-effective:** The system is designed to be affordable, making it accessible for personal and educational use.
- **Real-time Monitoring:** Provides immediate feedback on heart rate, which is crucial for timely detection of abnormalities.
- **Portability:** The compact design allows for easy transportation and use in various settings.
- **User-friendly:** Simple interface and clear display make it easy for non-experts to use.

### Applications

- **Personal Health Monitoring:** Individuals can use the device to monitor their heart rate regularly, especially those with known heart conditions.
- **Fitness Tracking:** Athletes and fitness enthusiasts can use the system to track their heart rate during workouts.
- **Medical Use:** Can be used in clinics and hospitals for preliminary heart rate monitoring.
- **Educational Tool:** Useful for students and educators in the fields of biomedical engineering and health sciences to learn about ECG and heart rate monitoring.

# References

- Arduino Documentation: <https://www.arduino.cc/en/Guide>
- AD8232 ECG Sensor Module Datasheet:  
<https://www.analog.com/en/products/ad8232.html>
- Liquid crystal Library Documentation:  
<https://www.arduino.cc/en/Reference/LiquidCrystal>

## Research Papers Related to this project

1. **"Design and Development of ECG Monitoring System Based on Arduino"**
  - **Authors:** Hemlata Channe, Vinit Gautam, Swapnil Kale
  - **Publication:** International Journal of Engineering and Advanced Technology (IJEAT).
  - **Abstract:** This paper discusses the design and implementation of a cost-effective ECG monitoring system using an Arduino microcontroller.
2. **"Portable ECG Monitoring System Based on Arduino"**
  - **Authors:** Dan Liu, Qingxin Zhang
  - **Publication:** IEEE Access
  - **Abstract:** This research presents a portable ECG monitoring system using Arduino, which aims to provide accurate heart rate monitoring.



