RSET
RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

*MINI PROJECT REPORT ON*

# SOLDIER'S HEALTH AND POSITION TRACKING SYSTEM

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

## Bachelor of Technology

*in*

## *ELECTRONICS AND COMMUNICATION ENGINEERING*


**By**

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**MAY 2024**

# CERTIFICATE

*This is to certify that the project report/seminar report entitled* ***"SOLIDER HEALTH AND POSITION TRACKING SYSTEM"*** *is a bonafide record of the work done by* ***ALKA DENNY (U2101023), ANITHRA ROSS AJITH (U2101035), ANNA JOJU (U2101039), ANU XAVIER (U2101042)****, submitted to the Rajagiri School of Engineering & Technology (RSET) (Autonomous) in partial fulfillment of the requirements for the award of the degree of* ***Bachelor of Technology (B. Tech.)*** *in* ***ELECTRONICS AND COMMUNICATION*** *during the academic year 2023-2024.*

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# RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## Institute Vision

To evolve into a premier technological institution, moulding eminent professionals with creative minds, innovative ideas and sound practical skill, and to shape a future where technology works for the enrichment of mankind.

## Institute Mission

To impart state-of-the-art knowledge to individuals in various technological disciplines and to inculcate in them a high degree of social consciousness and human values, thereby enabling them to face the challenges of life with courage and conviction.

## Department Vision

To become a centre of excellence in Computer Science and Engineering, moulding professionals catering to the research and professional needs of national and international organizations.

## Department Mission

To inspire and nurture students, with up-to-date knowledge in Computer Science and Engineering, ethics, team spirit, leadership abilities, innovation and creativity to come out with solutions meeting societal needs.

## Program Educational Objectives (PEOs)

**PEO 1:** Graduates shall have sound knowledge of the fundamental and advanced concepts of electronics and communication engineering to analyze, design, develop and implement electronic systems or equipment.
**PEO 2:** Graduates shall apply their knowledge and skills in industrial, academic or research career with creativity, commitment and social consciousness.
**PEO 3:** Graduates shall work in a team as a member or leader and adapt to the changes taking place in their field through sustained learning.

## Programme Outcomes (PO)

Engineering Graduates will be able to:
**1. Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**2. Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**3. Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and

environmental considerations.

**4. Conduct investigations of complex problems**: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**5. Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**6. The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**7. Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**8. Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**9. Individual and Team work**: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

**10. Communication**: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

**11. Project management and finance**: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

**12. Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

## Programme Specific Outcomes (PSO)

**PSO 1:** Demonstrate their skills in designing, implementing and testing analogue and digital electronic circuits, including microprocessor systems, for signal processing, communication, networking, VLSI and embedded systems applications.

**PSO 2:** Apply their knowledge and skills to conduct experiments and develop applications using electronic design automation (EDA) tools.

**PSO 3:** Demonstrate a sense of professional ethics, recognize the importance of continued learning, and be able to carry out their professional and entrepreneurial responsibilities in electronics engineering field giving due consideration to environment protection and sustainability.

## Course Outcomes (CO)

After the completion of the course the student will be able to

**CO 1:** Be able to practice acquired knowledge within the selected area of technology for project development.

**CO 2:** Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach.

**CO 3:** Reproduce, improve and refine technical aspects for engineering projects.

**CO 4:** Work as a team in development of technical projects.

**CO 5:** Communicate and report effectively project related activities and findings.

# Abstract

The soldiers play a crucial role in modern warfare and thus their safety is of utmost importance. As a result it is imperative for authorities to keep track of a soldier's whereabouts and health status when necessary. This program will prove to be beneficial for soldiers engaged in special missions or trips. By utilizing the Global Positioning System (GPS) this system enables the exact tracing of these soldiers. Furthermore it falls under the category of Mobile Health (MHealth) which refers to the use of mobile computing medical sensors and healthcare communication technology. Through this vital health parameters such as body temperature and heart rate are continuously monitored and transmitted to the military headquarters via a Global System for Mobile Communication (GSM) modem. When deployed in enemy territory soldiers are not only susceptible to physical dangers but they also face exhaustion and fatigue due to long hours and inadequate sleep. Hence it is crucial to equip distant soldiers with a means to monitor their well-being for security purposes. This project incorporates the use of biosensors to track a soldier's health and a Global Positioning System to determine their location accurately. Additionally the use of a GSM modem makes the system wireless enhancing its compatibility. Our module focuses on the development of a soldier tracking and positioning tool during times of war.

# Contents

# List of Figures

# Chapter 1

# Introduction

## 1.1 Overview

The Military Health and Position System helps authorized stations to track the current military position of the Global Positioning System and monitor the health of the soldiers including their temperature and heart rate. The program also contains an additional feature with the help of that soldier who can ask for help by need. The GPS modem conveys the latitude and longitude along with a link pattern. It is also helpful in getting the health conditions of the soldiers and providing necessary assistance and actions. Our soldiers are always protecting our country and they play a very important role. When the soldier is in a warzone it will be difficult for the base station to be in contact with them. Hence several sensors are used to measure their temperature,oxygen level and other conditions. There is also a GSM module that will help to connect the nearest station and the message will be sent to the registered phone number when an emergency button is pressed regarding the current location and the health conditions. Each soldier will have a personal GSM module which helps to contact the base station through the communication channel. In case of an emergency situation the temperature, heart beat, oxygen levels and the tower location will be transmitted. This integrated approach , of using sensors,communication modules, increases the capability for health monitoring and location based assistance, contributing to the overall effectiveness of the health monitoring system.

# Chapter 2

# Literature Survey

- "Implementation of soldier tracking and health monitoring system" [1]

This study mainly focussed on the implementation of soldier tracking and health monitoring systems. The paper provided knowledge in using biosensors for the purpose of monitoring health. The concepts provided in this paper served as a foundation for our project's development and progress. The primary goal of this soldier tracking is to improve the health and position tracking of Soldiers during the war zones and battlefield.Adding GSM module makes the system compatible and wireless. The aim of this system is to improve low cost,low power ,reliable features.

- "Cost Efficient Location Tracking and Health Monitoring System for Soldier Safety" [2]

This study mainly focuses on the cost efficient location tracking and health monitoring system for soldier safety. This paper will develop a GSM based monitoring and tracking system for the person at the battlefield. This proposed section can be set up on a soldier's body to look for his well being and current status using GPS. The proposed section makes it feasible to implement economically affordable circuits to save the lives of precious soldiers on and in the battlefield.

- "Soldier's Health and Position Tracking System" [3]

This proposed section integrates the GPS module into the system. This enhancement will enable real-time location tracking, providing commanders with a comprehensive picture of their troops whereabouts.The combined health and location data will empower informed decision-making, optimize operational strategies, and ensure the safety and well-being of our soldiers.The developed soldier health and position monitoring system demonstrated its effectiveness in providing real-time monitoring of vital signs and location data. The system accurately captured and transmitted sensor readings, including heart rate, body temperature, and GPS coordinates. The push button function and emergency alert system functioned as intended, providing a reliable mechanism for triggering emergency response.

# Chapter 3

# Methodology

## 3.1 Problem statement

The problem at hand is unsafe environment surrounding the soldier at war zones or any regions that require rescue operations .Through this project ,we try to resolve this problem in the most economic way possible to deliver accurate data with minimum delay using which concerned authorities can dispatch a rescue team for the soldier. We have tried to achieve this by integrating the already existing technologies such as heartbeat sensor ,pulse and oxygen sensor as well as a location tracker. It continuously monitors the soldier's health parameters and location but only sends these data to the authorities when the SOS button is pressed.

## 3.2 Block Diagram

The block diagram represents the soldier position and health tracking system .The device having esp32 connected to various sensors help rescue the soldier at the time of an emergency. These sensors are attached to the soldier so as to read their real time pulse ,oxygen ,temperature and location .The pulse oximeter ,thermistor are the health sensors that read their health levels and check if it goes to an abnormal state .The GPS module ,GSM module and Radio frequency transmitter receiver are employed to track their location as well as to send and receive data at low range .It also has a LCD display that displays the readings taken from the sensors as well as location from the GPS module .In case of an emergency ,ie , if the SOS button is then the base station gets a notification regarding the location of the soldier along with their vitals indicating whether their levels are abnormal or not and they get to decide the next course of action.

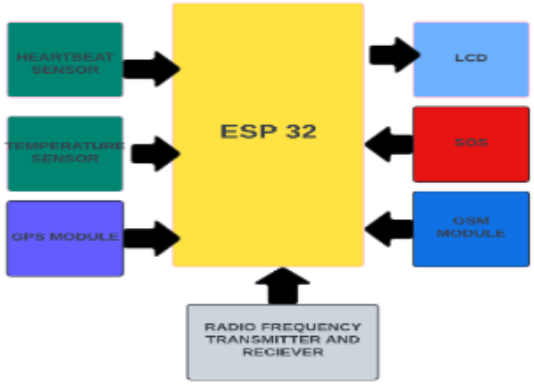
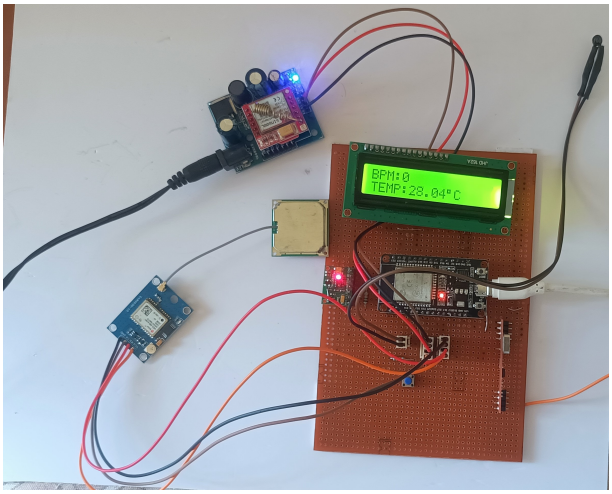



Figure 3.1: Block Diagram

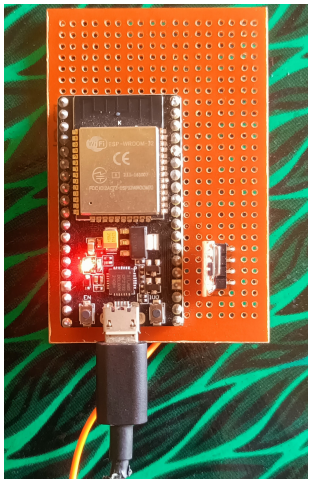
## 3.3 Implementation

### 3.3.1 Circuit diagram

This figure shows the connections of various sensors(pulse oximeter ,thermistor) ,modules(GSM module ,GPS module ,RFTR) and a LCD display to ESP32.




(a) Transmitter ciruit



(b) Receiver circuit

Figure 3.2: Circuit setup

### 3.3.2 Flowchart

This flowchart below illustrates the process of using a soldier health and position tracking system to read their health levels and track their location .The soldiers are equipped with a system having ESP 32 connected to various sensors to read their vitals and modules to track their location and send messages. Once the device is turned on the GSM and GPS modules are initialized .They start tracking the location using the GPS module .Along with the initialization of both the modules, the sensors (pulse oximeter ,thermistor) are also configured .In the case of the sensors ,if the temperature is not between 35 degrees celsius and 37 degrees celsius or if the pulse is not between 60bpm and 100bpm it will read as abnormal however it will provide real-time data to the base station .The base station only gets a notification via SMS when the SOS button is pressed .Ultimately the project aims to ensure the safety of the soldiers.

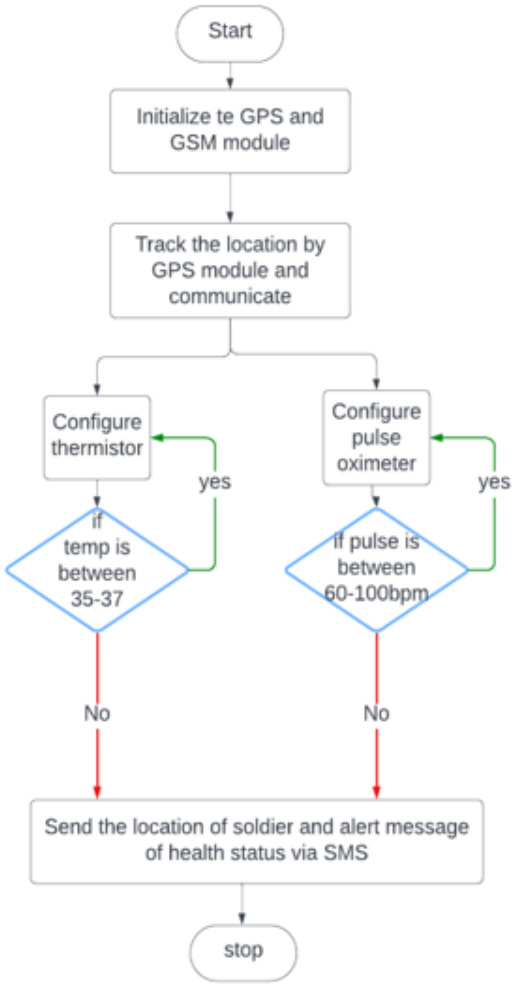



Figure 3.3: Flowchart

### 3.3.3 Experimental Setup

The experimental setup of the soldier position and health tracking system includes a device having an ESP32 connected to a LCD display ,various modules and sensors .This device reads the vitals of the soldier continuously such as temperature ,pulse and oxygen levels .This device also has an additional feature known as a SOS button .This button is provided for the soldier in case of an emergency .Once the button is pressed for a minimum of 5 seconds a notification will forwarded via SMS to their respective authorities with their vitals.

# Chapter 4

# Hardware and Software Details

## 4.1 Hardware Details

### 4.1.1 ESP32 Wroom

The ESP32 Wroom is an affordable and powerful microcontroller that enables comfortable prototyping. It provides easy programming options through LuaScript or Arduino IDE and features a breadboard-compatible design. With dual-mode WiFi and Bluetooth connectivity, operating at 2.4 GHz, this board allows seamless wireless communication. Moreover, it incorporates 512 KB SRAM, 448 KB ROM, and 4MB Flash memory into its development board. The board offers 21 interface pins, including I2C, SPI, UART, DAC, and ADC, enabling communication with various external devices. Its built-in WiFi capability facilitates smooth data transmission and seamless interaction with user applications. The power supply can be either 5V via USB or an external power source with suitable voltage regulation.

Figure 4.1: ESP32 Wroom

### 4.1.2 Pulse oximeter MAX30100

The MAX30100 is a device that combines pulse oximetry and heartrate monitoring functions into one sensor. The device integrates two light-emitting diodes, a light-sensing device, carefully designed optics, and low-noise analog signal processing to identify pulse oximetry and heart-rate signals. The MAX30100 can run on power supplies ranging from 1.8V to 3.3V and can be turned off using software, which minimizes standby power consumption, allowing the power supply to stay connected continuously. The sensor has two light-emitting diodes that produce red and infrared light of different wavelengths. The wavelengths selected are specifically picked because at these wavelengths, the absorption of oxygenated and deoxygenated hemoglobin is significantly different. The sensor consists of two components, a light source and a detector. The finger is required to maintain a steady position as the photodiode emits light. The oxygenated blood absorbs the light, and the remaining light passes through the finger and is detected by a microcontroller, which processes and reads the data. The pulse oximeter employs an I2C communication protocol to interact with the microcontroller.

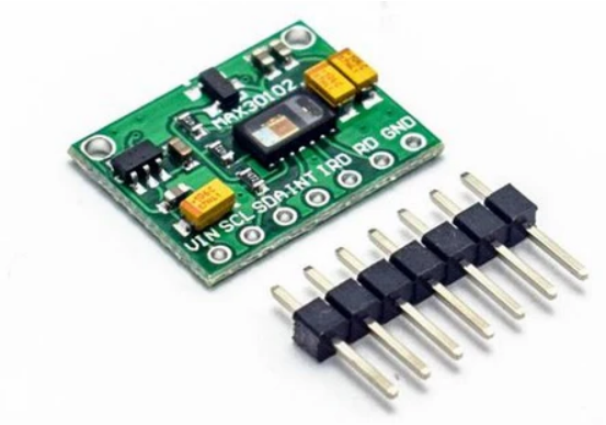



Figure 4.2: Pulse oximeter MAX30100

### 4.1.3 NTC Thermistor

The 10K Ohm NTC Thermistor is a unique resistor that alters its value with changes in temperature. It is composed of a combination of various metal oxides and falls under the category of NTC (Negative Temperature Coefficient) thermistors. As the temperature increases the resistance decreases and vice versa making it a valuable tool for temperature measurement. This high-quality thermistor maintains a constant resistance of 10K ohm at a standard temperature of 25° C and has a measurement range of -55°C to 125°C. Its affordability makes it a popular choice for various applications such as freezers, air conditioners, fire alarms, battery charging systems and engine temperature control etc. The NTC thermistor has a superior thermal cooling time constant of less than or equal to 20 seconds in the air. With a tolerance of ±1% and a maximum power of 75mW this thermistor is a reliable and efficient device for temperature sensing.


Figure 4.3: NTC Thermistor 10K Ohm

### 4.1.4 Radio frequency transmitter and receiver-433MHz

The 433MHz RF Transmitter Receiver Wireless Module offers a comprehensive solution for wireless communication featuring both a transmitter and receiver module. This versatile device allows for data transmission of up to 3KHz from any standard CMOS/TTL source. The transmitter is user-friendly and boasts low power consumption typically only 11mA. It can receive data directly from a microprocessor or encoding device effectively reducing the number of components needed and keeping hardware costs to a minimum. The RX – ASK an ASK Hybrid receiver module is included in this module package. With a frequency of 433MHz and a Superheterodyne receiver structure it utilizes OOK (On-Off keying) to process received signals. Once a signal is received it outputs a TTL signal to an external decoder IC for further decoding. The operating voltage range for this module is between 1.5 to 5V and it has a remarkable sensitivity of 110dBm. As such it offers an economical solution for utilizing 433 MHz signals. Its advanced features make it suitable for a wide range of applications including Automation Systems, Wireless Security Systems, Sensor Reporting, Car Security Systems and Remote Keyless Entry among others.

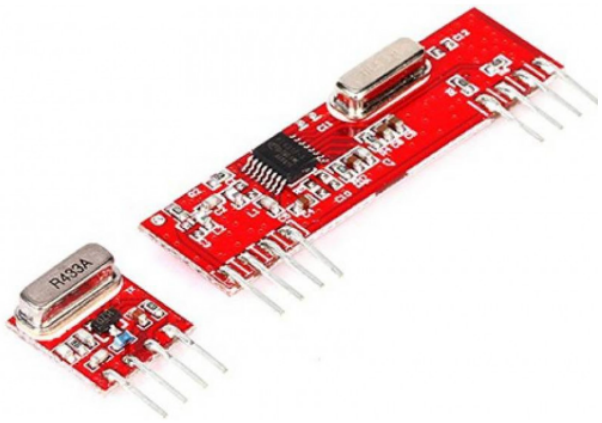



Figure 4.4: Radio frequency transmitter and receiver-433MHz

### 4.1.5 I2C LCD Display

The LCD 16x2 also known as a liquid crystal display is a type of screen that can show up to 16 characters per line and has 2 lines. These displays are commonly used in various applications such as presenting information or data in electronic projects. The functionality of the LCD is managed by an integrated controller that can interpret and execute a range of instructions. These instructions allow for tasks like adjusting the position of the cursor, erasing the display and controlling the display's on/off state. The LCD 16x2 is a frequently utilized tool in electronic projects particularly for displaying text or data. It is often preferred over other options such as multi-segment light-emitting diodes and seven segments. The LCD 16x2's pin diagram comprises power pins including VSS VDD and VEE as well as data pins like RS R/W E and DB0-DB7. The power pins supply the necessary power for the device to operate while the data pins transmit instructions and data to and from the LCD. Some key advantages of utilizing this module include its affordability and ease of programming ability to display custom characters and special graphics and even animations.


Figure 4.5: I2C LCD Display

### 4.1.6 UBLOX NEO-6M-0-001 GPS Module

The compact and versatile NEO-6M GPS Module with EPROM is a multifaceted device that combines a GPS receiver and EPROM memory for storing configuration settings or other important data. This all-in-one GPS module measuring at 25 x 25 x 4mm comes equipped with a high-performance ceramic antenna that enables exceptional satellite search capabilities. Its power and signal indicators allow you to easily monitor its status while the built-in backup battery ensures that your data remains intact even in case of accidental power shutdowns. With a wide range power supply of 3 to 5V and a default baud rate of 9600 bps this module is highly adaptable to various devices. It operates using the u-blox NEO-6M GPS receiver chipset which effectively receives signals from multiple satellites to accurately determine your position, time and velocity. Utilizing serial communication typically through the UART (Universal Asynchronous Receiver-Transmitter) protocol the module seamlessly communicates with your host device. This versatile module finds practical application in navigation, geolocation tracking and outdoor positioning systems.

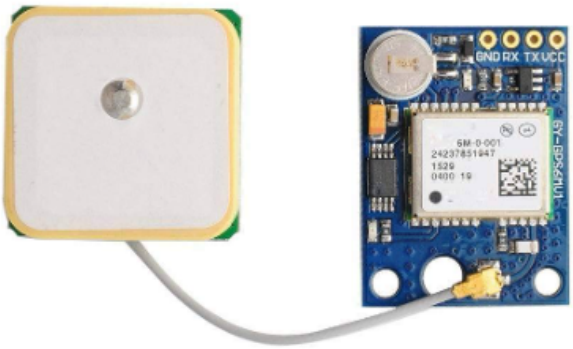



Figure 4.6: UBLOX NEO-6M-0-001 GPS Module

### 4.1.7 SIM800L GSM Module

The SIM800L is a compact cellular module that enables GPRS transmission SMS sending and receiving and voice call functionality. Its affordability and small size as well as its support for quad band frequencies make it an ideal solution for a wide range of projects requiring long-distance connectivity. Upon powering on the module automatically boots up and searches for a cellular network to log into. With a maximum UART voltage of 2.8V the operating voltage of the chip falls within the range of 3.4V to 4.4V. The SIM800L supports various baud rates from 1200 bps to 115200 bps with the added convenience of automatic detection. As a GSM module it uses a serial interface and requires an external antenna to establish a network connection compatible with any 2G Micro SIM card. In addition to its messaging and phone call capabilities it also has the capability to connect to the internet and receive FM signals. To integrate with a microcontroller the SIM800L can be connected through the serial UART interface. Commonly used for applications such as home automation emergency systems remote sensing and communication this versatile module offers reliable functionality in a compact form.

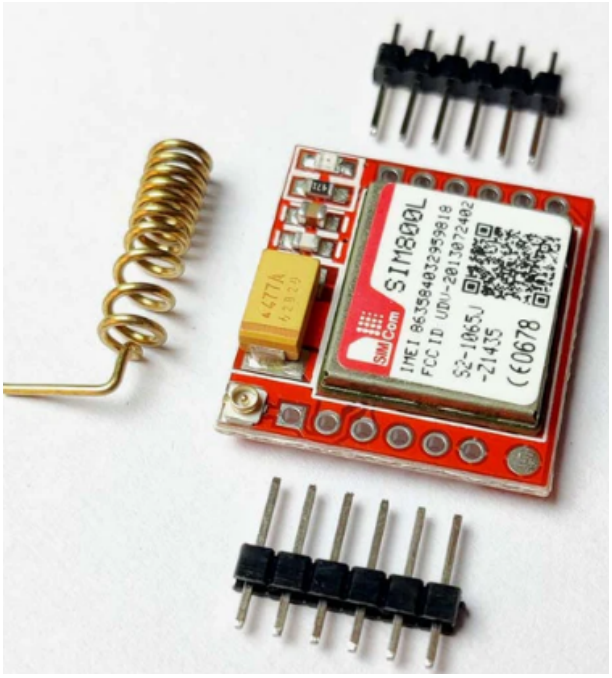



Figure 4.7: SIM800L GSM Module

## 4.2 Software Details

### 4.2.1 Arduino IDE

The Arduino Integrated Development Environment (IDE) also known as the Arduino Software offers a comprehensive platform for programming and interacting with Arduino hardware. This versatile tool includes a text editor, message area, text console and toolbar with various functions as well as a range of menu options. It facilitates communication with the Arduino device allowing users to upload programs and receive real-time feedback. With its cutting and pasting capabilities and advanced search and replace features the editor is a user-friendly space for coding. The message area offers updates on program saving and exporting and displays any errors encountered. The console provides a detailed log of all output from the Arduino Software including error messages and other important information. Additionally the bottom right corner of the window displays the current board and serial port configurations. The toolbar boasts quick access to frequently used functions such as program, verification, sketch, creation and management and the serial monitor. The Arduino IDE is a free open-source software that can be utilized on multiple operating systems including Windows, Mac OS X and Linux. It supports the use of C and C++ programming languages making it a versatile and accessible option for developers. As its name suggests the IDE is an all-encompassing environment for developing and uploading code to Arduino boards. The act of creating and uploading code within the Arduino Software is referred to as sketching. In order to successfully upload a sketch the Genuino or Arduino board must be connected to the IDE. These sketches are written and saved in the text editor with the .ino file extension. In essence the Arduino IDE serves as a powerful and essential tool for programming and managing Arduino projects.

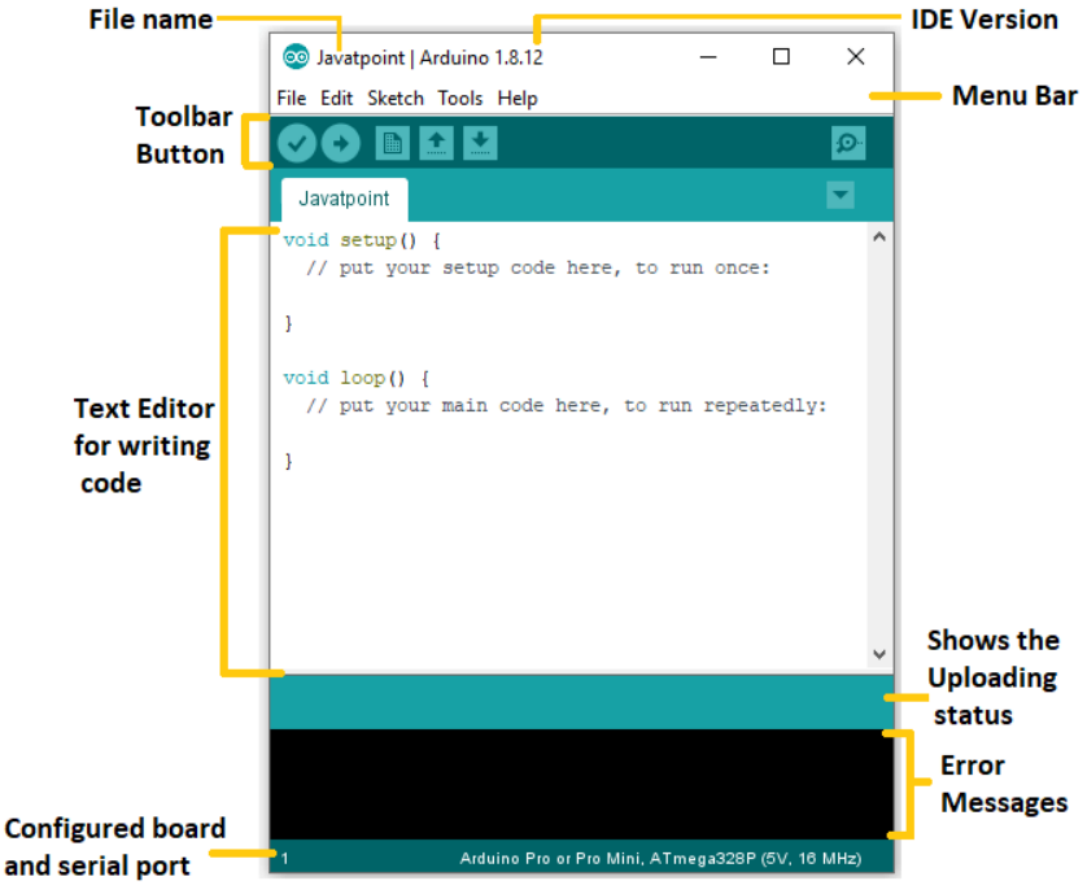



Figure 4.8: Arduino IDE

### 4.2.2 Programming language used

#### 1. C++

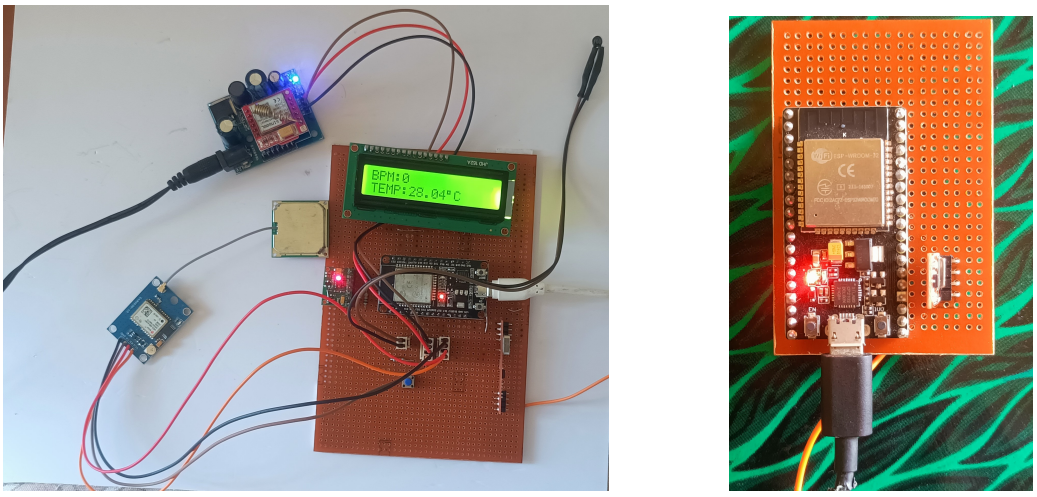
C++ is a widely acclaimed object-oriented programming (OOP) language known for its ability to create large-scale applications. This language is an extension of the C programming language. Another popular programming language Java is heavily influenced by C++ but is optimized for the distribution of program objects on networks like the internet. Although Java is considered to be simpler and easier to grasp than C++ it also offers distinct advantages over its predecessor. Despite this both languages demand a significant amount of time and effort to master. One of the key features of C++ is its support for custom data types which can be manipulated using functions and methods. It also allows for low-level programming and direct access to memory resulting in swift and efficient code execution. Furthermore C++ enables generic programming through the use of templates allowing for code to be written in a generalized form and utilized for various data types. Due to these capabilities C++ is widely used in numerous fields including system software game development embedded systems scientific computing and high-performance applications. Moreover the C++ standard library provides a vast array of coding utilities and functions making it simpler to develop intricate software systems. Additionally C++ is a versatile language that can run on multiple platforms such as Linux, Mac and Windows. In conclusion C++ is a powerful and flexible language that offers numerous benefits making it a top choice for developers working on complex projects.

# Chapter 5

# Results

Figure 5.1 shown below is the circuit connection of the soldier position and health tracking system at the transmitter side where the ESP 32 is connected to a LCD display ,various sensors , various modules and a RF transmitter.

Figure 5.2 shown below is the circuit connection of the soldier position and health tracking system at the receiver side where the ESP 32 is connected to the RF receiver.




(a) Transmitter circuit (b) Receiver circuit

Figure 5.1: Circuit setup

## 5.1 Test cases

A SMS will received by the authorities from the soldier when the SOS button is pressed.The SMS will contain information regarding the temperature, pulse , oxygen and location. The temperature between 35 -37 degrees celsius is considered normal whereas a pulse between 60 – 100 bpm is considered normal.If the readings are not within the specified range it will specify the respective parameter as abnormal at the top of the SMS as shown in the

test cases below.The location will be provided as a link at the end of the SMS which can be clicked to track the position.

### 5.1.1 Case 1: When the SOS button is pressed and both the sensors read abnormal values.

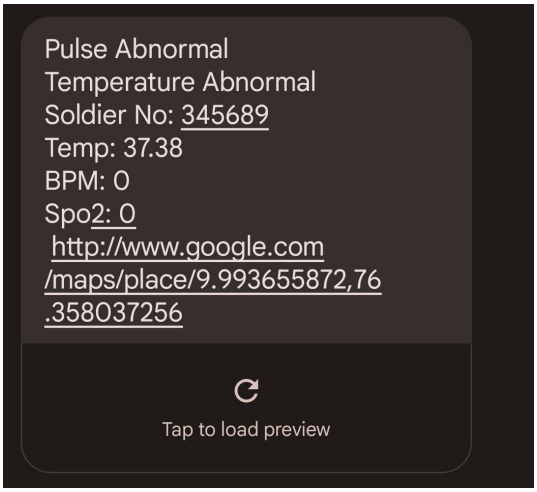
Here the received SMS indicates that both the pulse and temperature are abnormal .Both the readings taken are not within the normal range, ie ,the pulse is not between 60bpm – 100 bpm and in the case of temperature is above 37 degrees celsius .

### 5.1.2 Case 2: When the SOS button is pressed and the pulse is abnormal

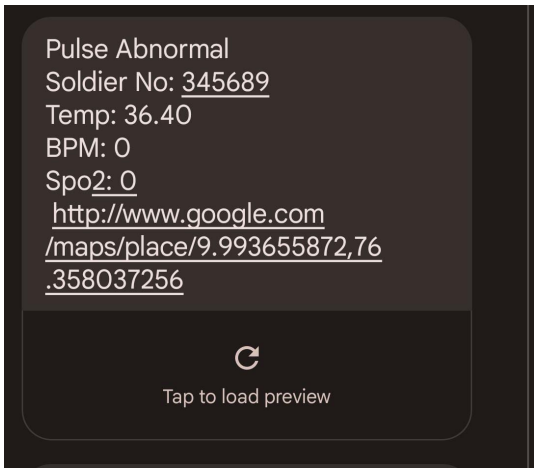
Here the SMS received shows that the temperature is 36.40 degrees celsius which is normal however the pulse is 0bpm which is abnormal.

### 5.1.3 Case 3:When the SOS button is pressed but the temperature is abnormal.

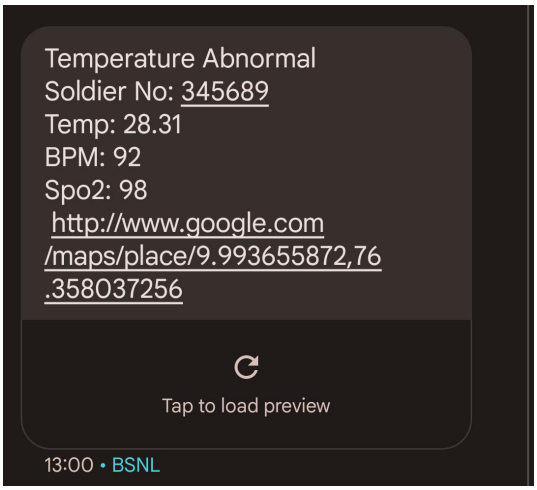
Here the SMS received shows that the pulse is 92bpm which is a normal reading however the temperature is 28.91 degrees celcius which is an abnormal reading.




(a) SMS received for case 1




(b) SMS received for case 2




(c) SMS received for case 3

## 5.2 Advantages

- Enhanced situational awareness
- Improved safety
- Efficient resource allocation
- Enhanced communication
- Accurate record keeping
- Improved training programs
- Improved emergency Response

- Boosted morale
- Enhanced command control

### 5.3 Disadvantages

- Privacy concerns
- Security risks
- Technical failures
- Potential false alarms
- Ethical concerns
- Complexity and training requirements

# Chapter 6

# Conclusions & Future Scope

## 6.1 Conclusion

Our proposed concept plays a crucial role in improving the effectiveness of military operations and safeguarding the health and safety of soldiers. It provides real-time insights into the well-being of troops and their whereabouts empowering commanders to make well-informed decisions promptly. Through the integration of cutting-edge technologies such as GPS and biometric sensors this system offers a comprehensive approach to monitoring vital signs and identifying potential health problems at an early stage thus facilitating swift emergency response. Moreover it enhances situational awareness by constantly tracking the positions of soldiers and improving coordination among them. Overall implementing a soldier health and position tracking system is a significant measure in ensuring both the operational efficiency and the protection of military personnel.

## 6.2 Future Scope

The implementation of breath sensors, gas detectors and bomb detection systems can greatly enhance the safety of soldiers. These sensors allow the base station to closely monitor the physical condition of personnel and effectively address potential threats. Development in sensor technology will facilitate more advanced biometric monitoring such as ongoing monitoring of essential indicators like vital signs, hydration levels, oxygen saturation and even biochemical markers. This will provide real-time updates on the health and wellness of soldiers. In the future the focus will be on shrinking tracking devices and seamlessly integrating them into soldiers' attire or gear resulting in less obtrusive and more comfortable wear for extended periods.

# Chapter 7

# Mapping CO and Project Objectives with PO-PSO

The mapping for different program outcomes, program educational objectives and program specific outcomes to the project work outcomes are shown in this chapter. **The course outcomes are as the following:**

CO 1: Be able to practice acquired knowledge within the selected area of technology for project development.

CO 2: Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach.

CO 3: Reproduce, improve and refine technical aspects for engineering projects.

CO 4: Work as a team in development of technical projects.

CO 5: Communicate and report effectively project related activities and findings

**Mapping :**

The following tables shows the mapping for course outcome for PO,PEO and PSO.The mapping specification are as follows,

1-Low,2-Medium,3-High

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 |
|---|---|---|---|---|---|---|
| 1 | 3 | 3 | 3 | 2 | - | 3 |
| 2 | 3 | 3 | 3 | 2 | - | 3 |
| 3 | 3 | 3 | 3 | 2 | - | 3 |
| 4 | - | - | - | - | - | - |
| 5 | - | - | - | - | - | - |

Table 7.1:Mapping of course outcomes for PO1-PO6.

| CO | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|
| 1 | 3 | 3 | 3 | 2 | - | 3 |
| 2 | 3 | 3 | 3 | 2 | - | 3 |
| 3 | 3 | 3 | 3 | 2 | - | 3 |
| 4 | - | - | - | - | - | - |
| 5 | - | - | - | - | - | - |

Table 7.2:Mapping of course outcomes for PO7-PO12.

| CO | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|
| 1 | 2 | 1 | - |
| 2 | 2 | 2 | - |
| 3 | 2 | 2 | - |
| 4 | 2 | 1 | 1 |
| 5 | 2 | 1 | 1 |

Table 7.3:Mapping of course outcomes for PSO1-PSO3

**Mapping and justification of project objectives /outcomes with PO and PSOs**:The table 4 shows mapping of project objectives with POs and PSOs.Tables 5 and 6 shows the justification of project outcome mappings with POs and PSOs respectively.

| CO | PROJECT OBJECTIVES | POs | PSOs |
|---|---|---|---|
| 1 | System provides real time continuous monitoring of soldier's health parameter. | 2 | 2 |
| 2 | It tracks soldier's current location using GSM and GPS module | 3 | 3 |
| 3 | In emergency situation it helps the soldier by providing a panic button | 2 | 3 |
| 4 | The project is low power,reliable and non-disruptive. | 3 | 2 |
| 5 | Optimized Design and user comfort. | 3 | 3 |

Table 7.4:Mapping of Project Objectives with POs and PSOs

CO - PO Mapping

| Project Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | Justification |
|---|---|---|---|---|---|---|---|---|
| Learned how to use Latex software | 2 | 3 | 1 | 1 | 3 | 1 | 2 | Acquired skills in Latex |
| Learnt how to use ESP-32 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | Acquired skills in ARDUINO UNO IDE coding and interfaced with ESP-32 |
| Hardware implementation | 3 | 2 | 3 | 2 | 1 | - | - | Acquired skills to work in tech-related groups. |
| Documentation and presentation | - | - | - | - | 2 | - | - | Preparing the project report and presenting our findings helped us enhance our presentation and communication skills |

Table 7.5: Justification for mapping Project outcomes with POs

CO - PO Mapping

| Project Outcomes | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | Justification |
|---|---|---|---|---|---|---|
| Learned how to use Latex software | 2 | 3 | 3 | 3 | 3 | Acquired skills in Latex |
| Learnt how to use ESP-32 | 2 | 3 | 2 | 3 | 3 | Acquired skills in ARDUINO UNO IDE coding and interfaced with ESP-32 |
| Hardware implementation | - | 3 | 2 | 2 | 3 | Acquired skills to work in tech-related groups |
| Documentation and presentation | - | - | 3 | - | 2 | Preparing the project report and presenting our findings helped us enhance our presentation and communication skills |

Table 7.6: Justification for mapping Project outcomes with POs

| Project Outcomes | PSO 1 | PSO 2 | PSO 3 | Justification |
|---|---|---|---|---|
| Learned how to use Latex software | 2 | 3 | 3 | Acquired skills in Latex |
| Learnt how to use ESP-32 | 3 | 2 | 3 | Acquired skills in ARDUINO UNO IDE coding and interfaced with ESP32. |
| Hardware implementation | 3 | 3 | 3 | Acquired skills to work in technical environment |
| Documentation and presentation | - | 2 | 3 | Preparing the project report and presenting our findings helped us enhance our presentation and communication skills |

Table 7.7: Justification of mapping of Project Outcomes with PSOs

# Bibliography

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# Appendix A

# Questions and Answers

1)Why did we use ESP 32 in the project?

ESP 32 is having  lower power consumption,wireless with built in Wifi and Bluetooth connectivity,offers rich set of interface(ADC,DAC,SPI,12C,UART),Integrated development environment, Real time data collection, analysis and transmission.

2)Why did we use RFTR in the project?

Real time position tracking,maneuvering in challenging environments, Long range communication, Low power consumption,stealth capabilities,integration with control and command systems, Security made the use of RFTR better.

3)How does this system ensures the privacy and security of the soldier data?

This system enables robust encryption protocols and access controls to protect sensitive health and location data.Only authorized personnel have access to the data and strict compliance with privacy regulation is ensured.

4)What protocols are in place for responding to alerts or emergencies detected by this system?

The system is equipped with automated alerting system like SMS that notify the commanders and medical personnel in real time when critical health issues or emergencies are detected,enabling prompt response and intervention.

5)How is this system circuitry optimized for power efficiency to prolong battery life?

Low-power design techniques such as duty cycling,sleep modes and efficient power management algorithms are implemented to minimize power consumption and extend battery life in wearable sensors.