

PROJECT REPORT ON

## HEALTH MONITORING SYSTEM

Submitted by

Sr. No.	Name	Exam Seat No.
1	RAKSHA MAHAJAN	C22018111079
2	SAKSHI DIGHADE	C22018111084
3	RUTUJA SARAFDAR	C22018111089
4	JANVI PATNI	C22018771839

In partial fulfillment for the award of the degree of

Bachelor of Technology in  
**ELECTRONICS AND TELECOMMUNICATION of**  
**SAVITRIBAI PHULE PUNE UNIVERSITY**

under the guidance of  
**Dr. Anita Patil**

**Sponsored by : - Emprotek Solutions**



**MKSSS's CUMMINS COLLEGE OF ENGINEERING FOR WOMEN ,**  
**KARVENAGAR,PUNE -411052**

( An Autonomous Institute affiliated to SAVITRIBAI PHULE PUNE UNIVERSITY )  
**2021-2022**

**Project title : HEALTH MONITORING SYSTEM**

**Subject area : Internet of Things**

**Nature of the Project : Hardware + Software**

## **CERTIFICATE**

This is to certify that

Sr. No.	Name	Exam Seat No.
1	RAKSHA MAHAJAN	C22018111079
2	SAKSHI DIGHADE	C22018111084
3	RUTUJA SARAFDAR	C22018111089
4	JANVI PATNI	C22018771839

have successfully completed the work on their Project Topic

## **HEALTH MONITORING SYSTEM**

in partial fulfillment for the award of the degree of

**Bachelor of Technology in ELECTRONICS AND  
TELECOMMUNICATION of SAVITRIBAI PHULE PUNE UNIVERSITY,**

**in**

**CUMMINS COLLEGE OF ENGINEERING FOR WOMEN  
KARVENAGAR ,PUNE-52**

( An Autonomous Institute affiliated to SAVITRIBAI PHULE PUNE UNIVERSITY )

Internal Guide  
Dr. Anita Patil

Head of the Department  
Dr.Prachi Mukherji

Principal  
Dr.M.B.Khambete

# SPONSORSHIP LETTER



+91 777 600 7628

info@emprotek.com

www.emprotek.com

Date : 1 Sept 2021

To,

**Dr. Prachi Mukherjee**

HOD, Electronics and Telecommunication Dept.

Cummins College of Engineering for Women Karvenagar, Pune - 411052

**Subject: Sponsorship letter for B.Tech Project.**

**Mode of Sponsorship: Only Technical Guidance.**

Dear Madam,

This letter is to confirm that our company, EMPROTEK Software Solutions Pvt Ltd, will be sponsoring technical guidance on a project for three students namely:

1. Raksha Mahajan - 4225
2. Janvi Patni - 4845
3. Rutuja Sarafdar - 4253
4. Sakshi Dighade - 4248

from Final Year, B.Tech, Cummins College of Engineering for Women, Pune will be pursuing as Project Interns with EMPROTEK Software Solutions Pvt Ltd Ltd. under the guidance of Mr. Shriram Kulkarni.

**Title of the project:** Health Monitoring System.

**Subject area of project:** A.I. / Deep Learning / Machine Learning

**Nature of the project:** Hardware & Software

We hereby confirm our consent to demonstrate this project during exams, project competitions on/off-campus and publish it.

Sincerely yours,

Shriram Kulkarni



Emprotek Software Solutions Pvt. Ltd.

## **ACKNOWLEDGEMENT**

We would like to express our sincere gratitude towards our internal guide Dr. Anita Patil Ma'am and external guide Dr. Nitin Palan Sir for their constant encouragement and valuable guidance during the completion of the project work.

We would also like to thank Dr. Prachi Mukherjee ma'am for her support, valuable suggestions and precious time in every possible way throughout our project activity.

We take this opportunity to express our sincere thanks to Mr. Shriram Kulkarni Sir of Emprotek Solutions for his expert guidance in technical fields as well as continuous support throughout the project.

We thank all the staff members of the Electronics and Telecommunication Department for their help wherever required.

Finally, we express our sincere thanks to all those who helped us directly or indirectly in many ways in completion of this project. I express my thanks to all staff members and friends for all the help and co-ordination extended in bringing out this project successfully in time.

Thanking You

Sr. No.	Name	Exam Seat No.
1	RAKSHA MAHAJAN	C22018111079
2	SAKSHI DIGHADE	C22018111084
3	RUTUJA SARAFDAR	C22018111089
4	JANVI PATNI	C22018771839

# **ABSTRACT**

Health monitoring systems can help us better our lives in many ways by gathering real-time information over the internet collected from a smart network of devices. During the covid pandemic situation, there was a lack of doctors and nurses to monitor post covid patient. This is the motivation behind our project, to implement a system for a non-serious recovering patient whose health parameters still need to be monitored from time to time without being in his physical contact.

Health Monitoring System is an Internet Of Things project with an aim to design and implement a low-cost system that makes use of various sensors to collect data from patients and the internet to transmit that data to a cloud platform for reviewing.

This system can be used for diseases where human-to-human contact is to be avoided and remote treatment is to be provided hence could also serve the purpose of effective health monitoring of the Covid-19 isolated patients.

# Table Of Contents

<b>1. INTRODUCTION</b>	<b>1</b>
<b>2. LITERATURE SURVEY</b>	<b>2</b>
<b>3. MARKET SURVEY</b>	<b>3</b>
<b>4. SPECIFICATIONS</b>	<b>4</b>
<b>5. METHODOLOGY</b>	<b>5</b>
5.1 Real Life View Of The System	5
5.2 Block Diagram	6
<b>6. DETAIL DESIGN</b>	<b>7</b>
6.1.Hardware	7
6.2.Software	8
<b>7. RESULTS</b>	<b>8</b>
<b>8. CONCLUSION</b>	<b>11</b>

## LIST OF FIGURES

Figure No.	Name	Page No.
1.	Equipment Beside Patient	5
2.	Zoomed View Of The Equipment	5
3.	Dashboard Viewed On A Laptop	6
4.	Monitoring Data On The Dashboard	6
5.	Technical Block Diagram	6
6.	Circuit Schematic	7
7.	Temperature Readings on Serial Monitor	9
8.	Heart Rate Readings on Serial Monitor	9
9.	SPO2 Readings on Serial Monitor	9
10.	ThingSpeak Dashboard View	10
11.	Work Plan	13



## LIST OF TABLES

Table No.	Name	Page No.
1.	Literature Survey	2
2.	Market Survey	3
3.	Project Expenses	14

# 1. INTRODUCTION

The situation in the past, during the pandemic is the motivation behind our project. Even after the critical phase has passed, there is a need to keep monitoring parameters of patients for their well-being. The expensive equipment for the same is unaffordable by most of the population giving rise to the problem of increased health risk for patients due to inefficient ways of monitoring.

Health Monitoring System is an Internet Of Things project with an aim to design and implement a low-cost system that makes use of various sensors to collect data from patients and the internet to transmit that data to a cloud platform for reviewing.

The sensors for measuring the parameters like body temperature, heart rate, blood oxygen levels are used in the system. The sensors are connected to a wifi module, the data from them would be sent to a cloud platform where it can be reviewed by the healthcare professionals as well as family members. This system can be used for post covid monitoring of a patient as this system collects information on temperature, Spo2, and heart beats per minute.

## 2. LITERATURE SURVEY

Sr. No.	Title of the Research Paper	Authors	Name of the Journal / Conference in which the Paper is published	Year of Publication	Hyperlink ( or Weblink ) to open the Soft-Copy of the Paper
1.	Performance assessment of MAX30100 spO2/heart rate sensor	Kerim Bedri Saçan, Gökhan Ertaş	Medical Technologies National Conference (TIPTEKNO)	2017	<a href="https://ieeexplore.ieee.org/document/8238126">https://ieeexplore.ieee.org/document/8238126</a>
2.	Integration for measuring blood pressure & Body temperature sensors using mobile applications	Abburu Prasanna Kumar, M. Jubaidah, Yeddula Lalitha Reddy, P. Srinivasan	International Journal of Engineering Research & Technology (IJERT)	2020	<a href="https://www.ijert.org/integration-for-measuring-blood-pressure-and-body-temperature-sensors-using-mobile-application">https://www.ijert.org/integration-for-measuring-blood-pressure-and-body-temperature-sensors-using-mobile-application</a>
3.	Blood Pressure Monitoring System using Wireless technologies	Bharat Singh, Shabana Urooj, Sakshi Mishra, Surojeet Haldard	Procedia Computer Science	2019	<a href="https://www.sciencedirect.com/science/article/pii/S1877050919306684">https://www.sciencedirect.com/science/article/pii/S1877050919306684</a>

*Table 1: Literature Survey*

### 3. MARKET SURVEY

Sr. No.	Name of the existing Product	Specifications & Features	Place where it is in-use	Cost	Link of its website
1.	Multi brand Multipara Monitor	Parameters: ECG, SPO2 (0 to 100 %), Temperature, RESP, NIBP LCD display.	Hospitals / Health Centers	₹ 28,000	<a href="https://www.indiamart.com/proddetail/5-para-multipara-monitor-23804293573.html?pos=6&amp;pla=n">https://www.indiamart.com/proddetail/5-para-multipara-monitor-23804293573.html?pos=6&amp;pla=n</a>
2.	Contec Multipara Monitor CMS8000	Parameters : ECG, RESP, SPO2, Temperature, NIBP.  100-240V AC, 50/60 Hz power supply	Hospitals / Health Centers	₹ 35,500	<a href="https://respbuy.com/product/contec-multipara-monitor-cms8000-12-1-display/?attribute_pa_probe=default&amp;gclid=EAIAIQobChMI8D6ttaL9QIVQZlmaH2mwQAYEAYBYABEgIQ1vD_BwE">https://respbuy.com/product/contec-multipara-monitor-cms8000-12-1-display/?attribute_pa_probe=default&amp;gclid=EAIAIQobChMI8D6ttaL9QIVQZlmaH2mwQAYEAYBYABEgIQ1vD_BwE</a>
3.	RMD 5 Parameter Monitor	Parameter ECG, TEMP, RESP Operating Time Max 6 hour operating time Resolution 1 bpm Sensitivity Greater than 200(uVp-p)	Hospitals / Health Centers	₹ 45,000	<a href="https://www.indiamart.com/proddetail/5-para-meter-monitor-9614665612.html">https://www.indiamart.com/proddetail/5-para-meter-monitor-9614665612.html</a>

Table 2: Market Survey

There are various existing products of different brands which monitor single or multiple parameters, of which the most common are – ECG, blood pressure, the blood oxygen level and temperature. But they have either single functionality or are huge and bulky, no provision for data storage and they are too expensive.

## 4. SPECIFICATIONS

### 1]MAX30205 for body temperature

Operating Supply Voltage	2.7-3.3 V
Operating Supply Current	600 uA
Temperature Range	0 - 50 *C

### 2]MAX30102 Heart Rate and Oxygen Saturation

Operating Supply Voltage	1.8-3.3 V
Operating Supply Current	600 uA
Temperature Range	-40 to -85 *C
Accuracy	+ -1 *C

### 3] Node MCU WiFi Module

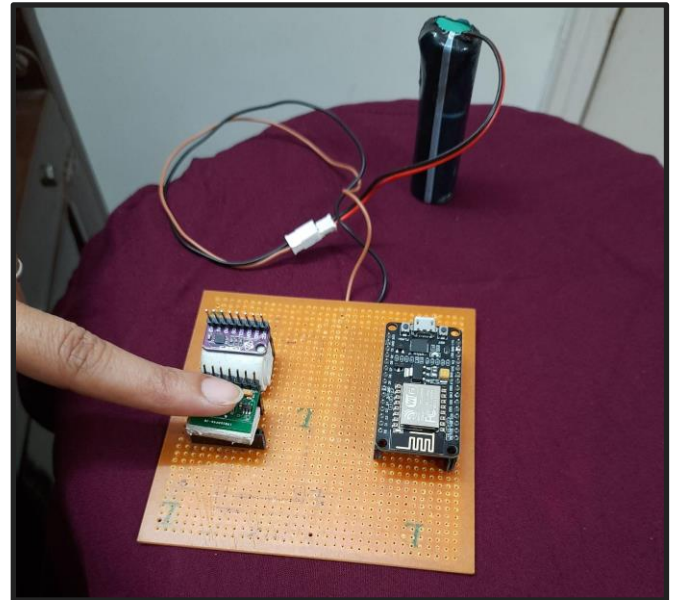
Microcontroller	ESP8266
Operating Supply Voltage	3.0-3.6V
Operating Supply Current	80mA
Frequency range	2.4-2.5 GHz

## 5. METHODOLOGY

### 5.1 Real Life View Of The System



*Fig 1. Equipment Beside Patient*



*Fig 2. Zoomed View Of The Equipment*

The real life view pictures help us visualize how the entire system can be put to use by people. The equipment can be placed near the patient for easy access. Simply by a finger contact with the sensors he can get the instantaneous data of his health parameters which he may view on his phone.

As the data is being recorded on a cloud platform, a health professional can access the dashboard remotely and keep a check on his patient.

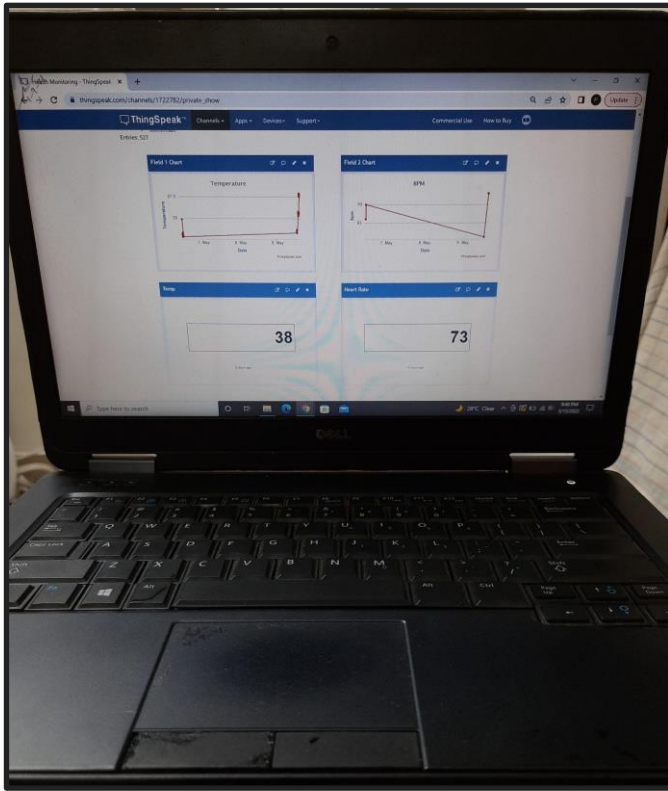


Fig 3. Dashboard Viewed On A Laptop

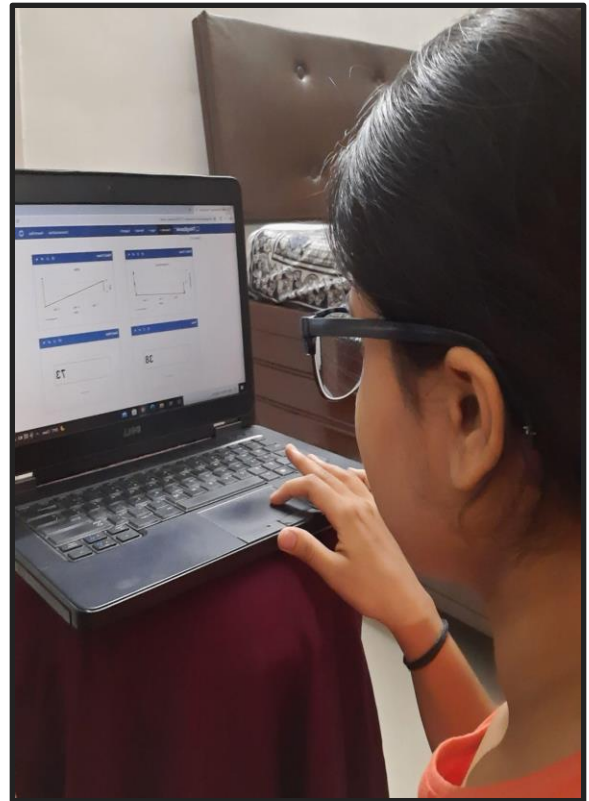


Fig 4. Monitoring Data On The Dashboard

## 5.2 Block Diagram

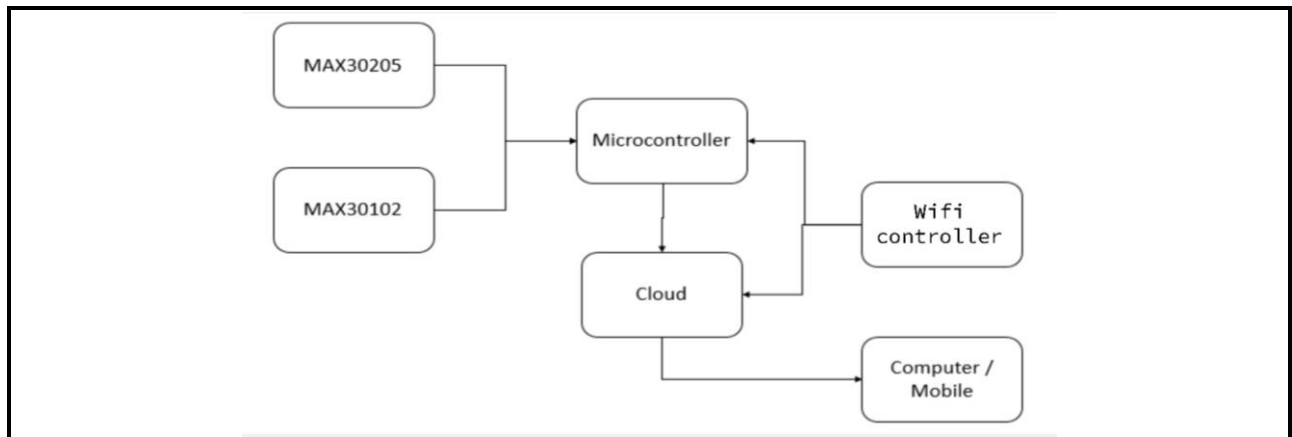


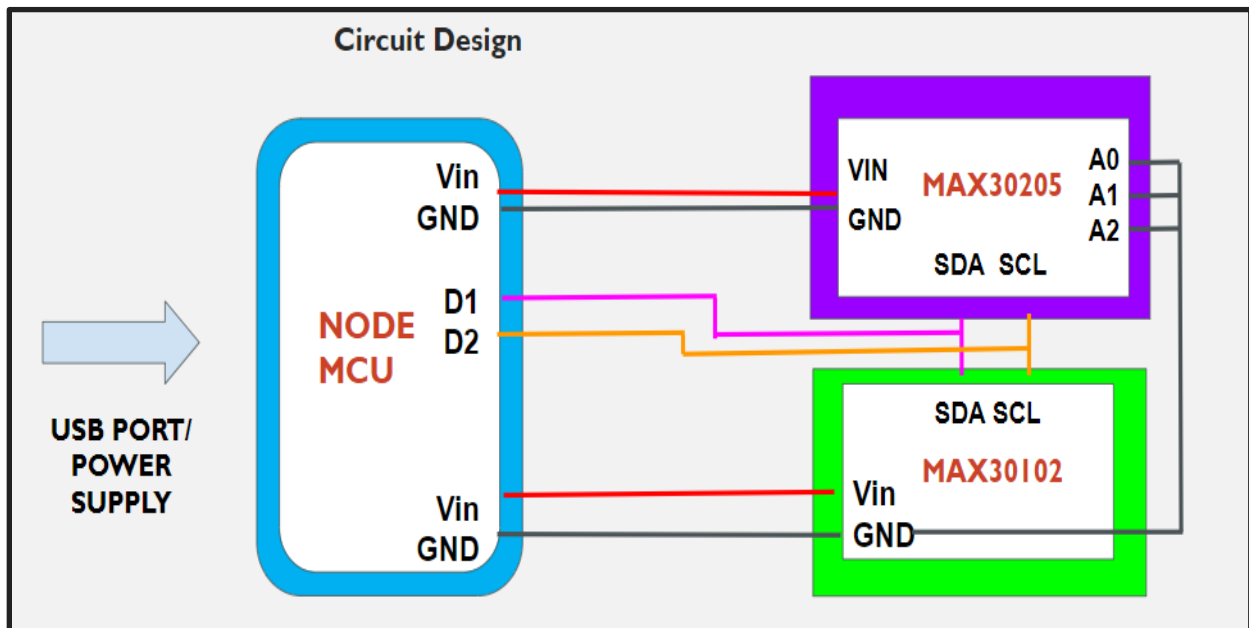
Fig 5. Technical Block Diagram

## 6. DETAIL DESIGN

### 6.1. Hardware

The components used in our project are Node MCU Wi-Fi module, MAX30205 sensor, MAX30102 sensor and a battery.

The MAX series is specially recommended for medical purposes. The MAX30205 sensor is used for measuring body temperature. The MAX30102 sensor is used for measuring both heart rate and blood oxygen saturation level. So, its dual functionality has made the system cost effective. Thus, the overall system is feasible.



*Fig 6. Circuit Schematic*



## 6.2. Software

### A. Algorithm

1. The input is information about health parameters, it will be taken through the above mentioned sensors and fed to the WiFi Module.
2. This input data will be operated on as needed.
3. Using the NodeMCU Wifi Module connected to the internet, this data will be sent to a Cloud platform.
4. The data can be remotely accessed using any Desktop or mobile device.
5. Display of the data log can be in the form of a graph to keep a track of previous data as well as instantaneous values.

### B. Cloud Provision

1. Arduino IOT Cloud Platform: It was used to program the Node MCU and obtain sensor readings on the serial monitor.
2. Thingspeak IOT Cloud: ThinSpeak IOT provides a cloud nature of Software as a Service (Saas). It uses an API to store and retrieve data from things using the HTTP protocol.

## 7. RESULTS

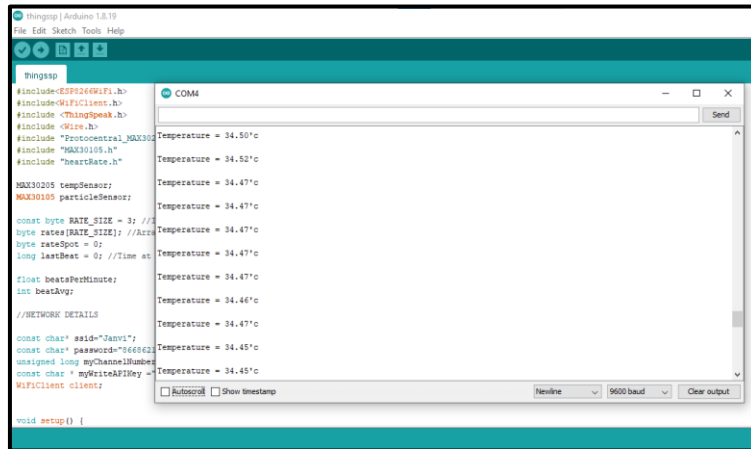


Fig 7. Temperature Readings on Serial

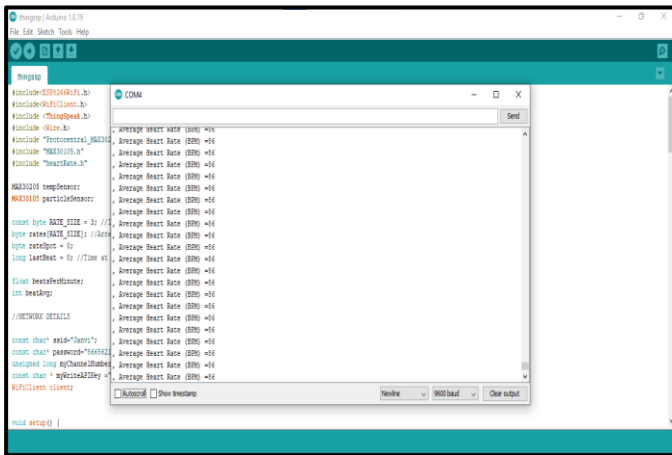


Fig 8. Heart Rate Readings on Serial

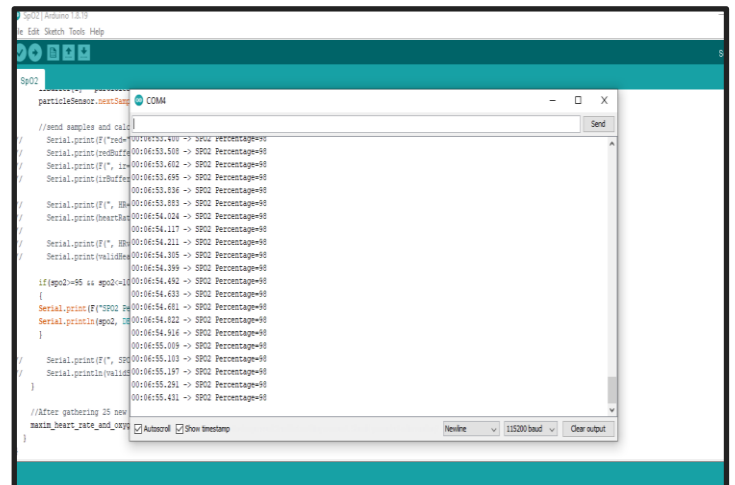
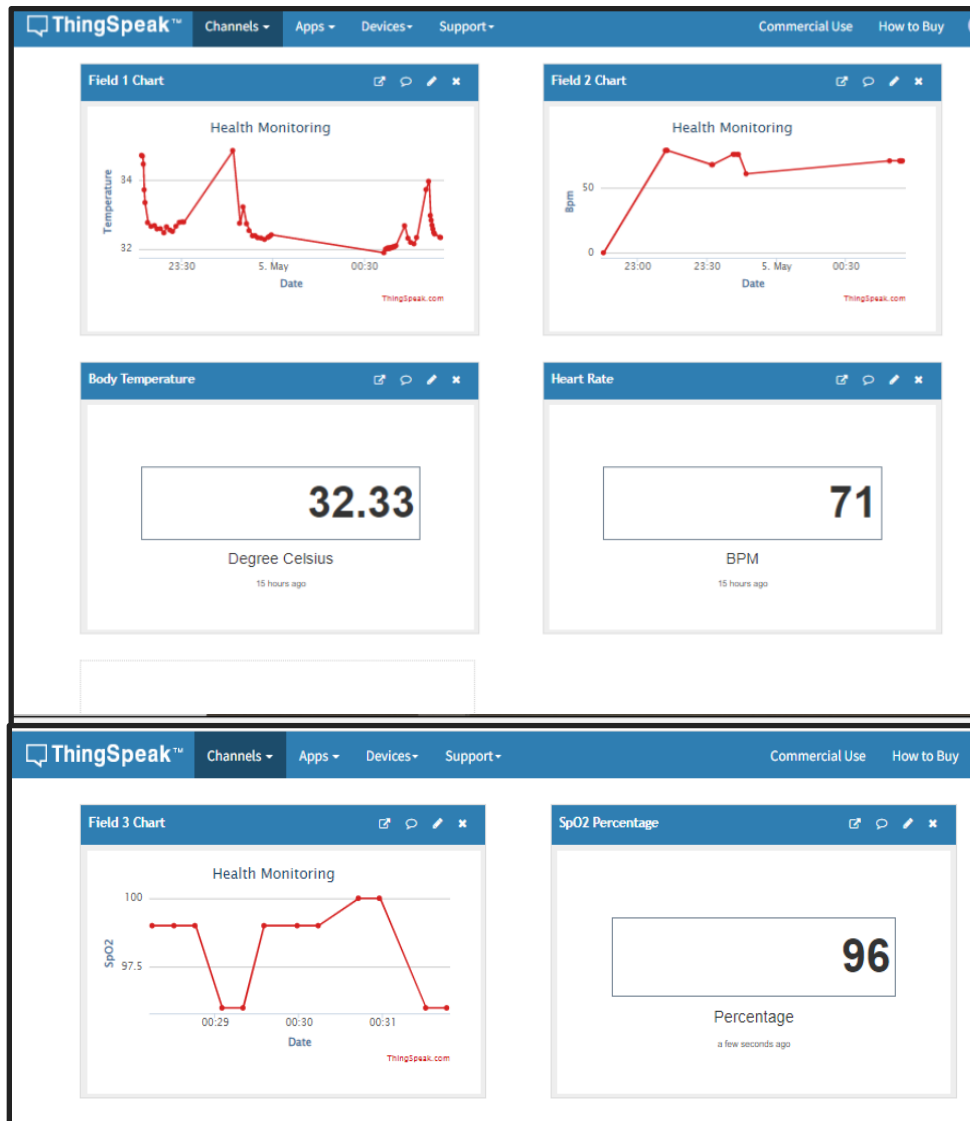


Fig 9. SPO2 Readings on Serial Monitor

ESP8266 was programmed using Arduino IDE. The outputs for individual parameters were separately obtained and verified on the serial monitor first, the codes were then combined and the WiFi aspect was added.



*Fig 10. ThingSpeak Dashboard View*

The three parameters of body temperature, heart rate and SpO2 are viewed on the ThingSpeak IOT Cloud in the form of graph as well as instantaneous values along with their respective units.

The values obtained from each of the sensors were verified with commercially available equipments. The percent error for each parameter was calculated and it was found that for the overall system the least error was 1% while maximum obtained error was 10%.

## **8. CONCLUSION**

- An IoT-based smart health monitoring framework runs through an arrangement of sensors, cloud and application. Hence, people can utilize this framework viably from any place .
- The system is cost-effective, non invasive, and flexible in nature.
- System will have applications for threatening viral diseases where human to human contact is to be avoided. Also, for the monitoring of elderly people who mostly live in non-self-governing areas in today's times.

### **Future Scope**

- In the long run, more sensors can be included in this framework to screen more physiological parameters like blood pressure.
- This project can be built further to have a monitoring system for than single patient on one platform and a database can be created of patients which can be viewed as an when required by concerned healthcare professionals.

# REFERENCES

- Adebayo Oluwafemi (June 2016) - A Cloud Based framework for Remote Healthcare Monitoring, Researchgate.net.
- Cheng Ming Lan, Wen Feng Liu (June 2013) - Structural Health Monitoring Cloud and its Applications for Large-Scale Infrastructures, Scientific.net,.
- Nasir Mahmood (February 2018) - Internet of Things based Health Monitoring System, Researchgate.net.
- Xuefeng Zhao, Yan Yu, Mingchu Li, Jingping Ou (September 2015) - Cloud Structural Health Monitoring Based on Smartphones, JVEJournals.com

# APPENDICES

## A. Work Plan

Month & Week no.	Sign.	Sign.																	
	of Int.	of the C	Nov	Nov		Dec	Dec	Dec	Jan	Jan	Jan	Jan	Feb	Feb	Feb	Feb	Mar	Mar	Mar
Task / Module	Guide				Nov														
			2	3	4	1	2	3	1	2	3	4	1	2	3	4	1	2	3
1. Literature Survey & Concept development																			
2. Specifications of ENTIRE SYSTEM																			
3. System-level design (Block Schematic)																			
4. Real-life Layout of the System																			
5. Hardware Components Selection & Procurement																			
6. Detail design (Hardware Design / Software Programming of each Block																			
a) Hardware Connections																			
b) Programming																			
c) Cloud Provision																			
7. Validation of each module's Design (Hardware & or Software)																			
8. Seminar Report																			
9. Internal Seminar																			
10. P.C.B. design (for Hardware Part)																			
11. P.C.B. / Hardware Assembly																			
13. Integration & Testing of the Complete System																			
14. Internal Project Demo.																			
15. Project Report																			

Fig 11. Work Plan

## B. Project Expenses

Sr. No.	Name of the Component / Device	Specifications	Qty.	Cost
1.	MAX30205	Temperature Sensor	1	750 /-
2.	MAX30102	Heart rate & SpO2 Sensor	1	250 /-
3.	Node MCU	Wifi Module	1	272 /-
4.	Battery	3.7 Volt DC	1	170 /-
5.	PCB	4 x 4	1	40 /-
	Total	-	-	1482 /-

*Table 3: Project Expenses*

## C. Data Sheets

**Node MCU ESP8266 :**

[https://www.espressif.com/sites/default/files/documentation/0a-esp8266ex\\_datasheet\\_en.pdf](https://www.espressif.com/sites/default/files/documentation/0a-esp8266ex_datasheet_en.pdf)

**MAX30205 Temperature Sensor :**

<https://datasheets.maximintegrated.com/en/ds/MAX30205.pdf>

**MAX30102 Heart Rate and SpO2 Sensor :**

<https://datasheets.maximintegrated.com/en/ds/MAX30100.pdf>