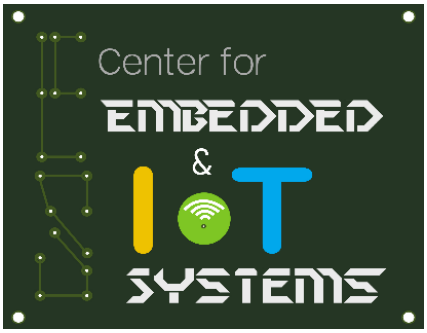
# PATIENT HEALTH MONITORING SYSTEM




A project report submitted in partial fulfilment of requirement for the course

On

**Fundamentals of IoT**

By

**MOHAMMAD BASHAR HASSAN** **(2005A41009)**

**TAZKIA SULTANA** **(2005A41019)**

**AVULA SAHITHI REDDY** **(2005A41020)**

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Under the guidance of

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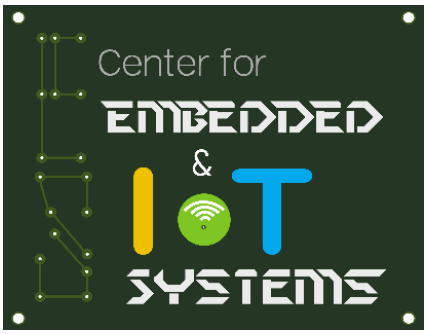


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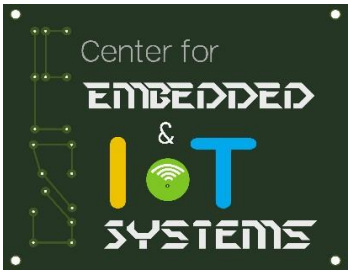


# CERTIFICATE

This is to certify that the course project entitled **"PATIENT HEALTH MONITORING SYSTEM"** is the bonafide work carried out by MOHAMMAD BASHAR HASSAN (**2005A41009**), TAZKIA SULTANA (**2005A41019**), AVULA SAHITHI REDDY (**2005A41020**) and AFIFA AIMAN (**2105A41L01**) in the partial fulfilment of the requirement for the award of course Fundamentals of IoT during the academic year 2022-2023 under our guidance and Supervision.

**Mr. Rajeshwar Rao Arabelli**

Asst. Prof. & Director, Centre for Embedded Systems and IoT,

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# Abstract

Healthcare technology is rapidly being revolutionized with the help of the Internet of things (IoT). Monitoring the health status of a covid patient was a hard task during Pandemic time and mostly, the elderly covid patients should be monitored periodically. So, we thought of an Innovative system to automate the task. Not only for the covid patients it is useful to even monitor patient when we are busy with our schedules. This device uses an ESP32 webserver to track patient health using this monitoring system. Hence, patient health parameters such as body temperature, heart rate(BPM), blood oxygen levels(spO2) as well as room temperature and humidity can be monitored from any device(like smartphone, PC, Laptop, Smart TV,) That support browsing capabilities.

# CONTENTS

# 1. INTRODUCTION

It is important to monitor some health parameters like body temperature, Heart rate and blood oxygen levels as they may indicate a precaution before any illness. Specially old age people health should be monitored regularly as their immunity weakens with increasing age.

Due to work and busy schedule many people don't have time to track their health status, so for taking these scenarios into consideration we have come up with an idea of patient health monitoring system using IoT which can sense and monitor few important health parameters at home or work.

Internet of things is used to monitor all patients at any situation. Health play's important role in our life. Since from decade the health care has draw significant amount of attention the patients who are suffering from chronical diseases, they need to take check up daily.

Manually it is very difficult to keep track on the heart beat abnormalities of the patient. A normal heart rate for adults ranges from 60-100 beats per minute while for above or below this range of heart beat leads to heart attack and the normal body temperature is ranges from 97 degrees F(36.1 deg C) to 99 degree F(37.2 deg C). A temperature over 100.4-degree F (38 deg C) it means a person is suffering from fever caused by an infection or illness.

The patients are not well known with the manual treatment which doctors usually prefer for checking the heart beat there are several devices with many limitations in the maintenance due to the size of the device, heavy cost and the portability of the device. So, in patient health monitoring system we are designing a small size, Low cost and a portable device in order to provide a continuous monitoring of the patient's health.

So, in our IoT project we are interfacing few sensors with ESP32 microcontroller such as DS18B20 water proof temperature sensor, MAX30100 heart rate and pulse oximeter sensor module and DHT22 temperature and humidity sensor.

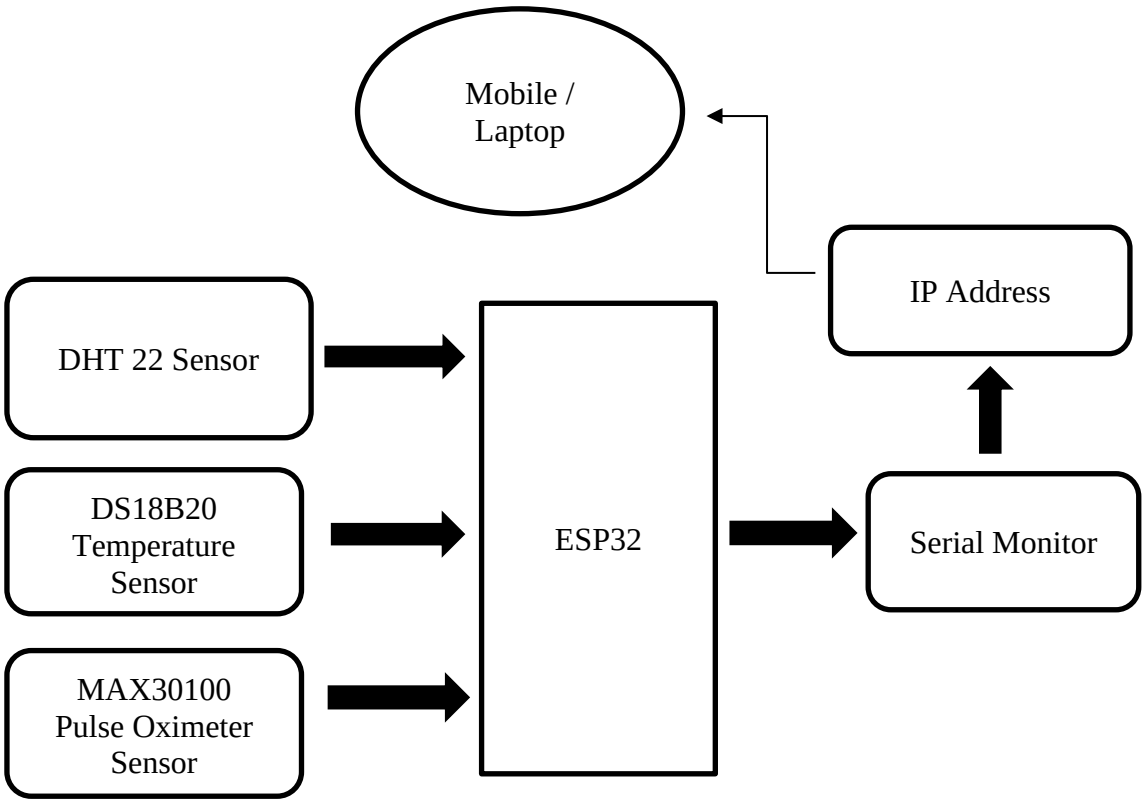
# 2. SYSTEM DESCRIPTION

The below block diagram of patient health monitoring system using Internet of things (IoT). In this system we are monitoring the patient's health parameters such as body temperature, Heart rate (BPM), blood oxygen levels as well as room temperature and humidity. All the sensors are interfaced to ESP32.

The sensors used in this project are DHT22 temperature and humidity sensor, DS18B20 temperature sensor, MAX30100 pulse oximeter sensor. DHT22 sensor is used for sensing the patients room temperature and humidity. DS18B20 sensor is used to measure the body temperature of the patient. MAX30100 sensor is used to measure the heart rate and blood oxygen level of the patient.

The output data is interfaced with the ESP32 Wi-Fi module. The ESP32 will connect to the wi-fi network. Once connected it will display all the data along with the ESP32 IP address. This IP address be copied on any web browser mobile, PC to monitor the patient health data.

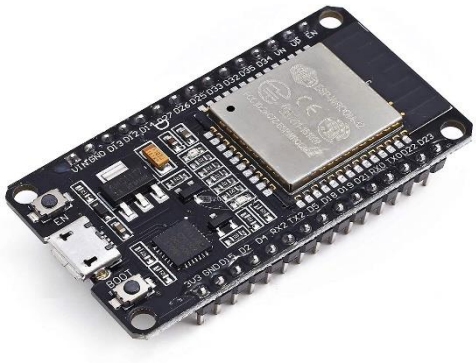
## 2.1 block diagram



# 3.Hardware & Software Tools

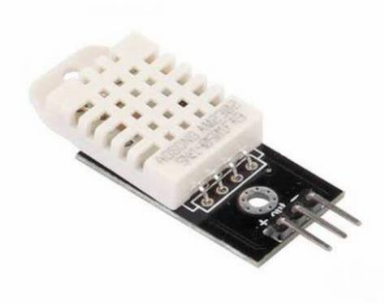
## Hardware Tools:

### 1. ESP32



ESP32 is a series of low-cost, low-power system on a chip microcontroller with integrated Wi-Fi and dual-mode Bluetooth. With high withstand of temperatures between -40°C to +125°C. It totally has 36 GPIO (General purpose input output) pins. It also has 18 channels of 12-bit ADC (Analog to digital converters), Two channels for 8-bit DAC (Digital to analog converters). With an output voltage of 3.3v and 5.0v.

### 2. DHT22 Sensor



The DHT22 digital temperature and humidity sensor is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin. Weather stations also use these sensors to predict weather conditions. The humidity sensor is used as a preventive measure in homes where people are affected by humidity.

## 3. DS18B20 Temperature Sensor

One- wire temperature sensors like DS18B20 are devices that can measure temperature with a minimal amount of hardware and wiring. These sensors use a digital protocol to send accurate temperature readings directly to your development board without the need of an analog to digital converter or other extra hardware.

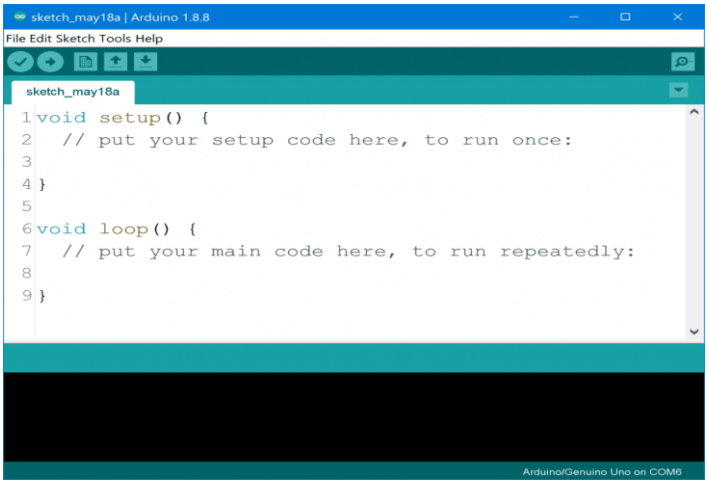
## 4. Max30100 Pulse Oximeter Sensor


MAX30100 Pulse oximeter is integrated pulse oximetry and heart rate monitor sensor solutions. It operates with 1.8v to 3.3v power supply. Also, it can be powered down using software with negligible standby current. Its main is to read the absorption levels for both light sources and store them in a buffer that can be read via I2C.

## Software Tools:

### 1. Arduino IDE

An Arduino ide is an open software used for coding for most of the basic microcontrollers like Arduino UNO, ESP 32 and most of the other boards. This supports C/C++ Language to code for sensors. The source code for IDE is released under the GNU General Public License.




Boards are connected to the pc via required USB cables and code is uploaded through the app. Along with uploading we can use Arduino ide for monitoring of the sensor data. The Arduino software is easy to use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows and Linux.

# 4.IMPLEMENTATION

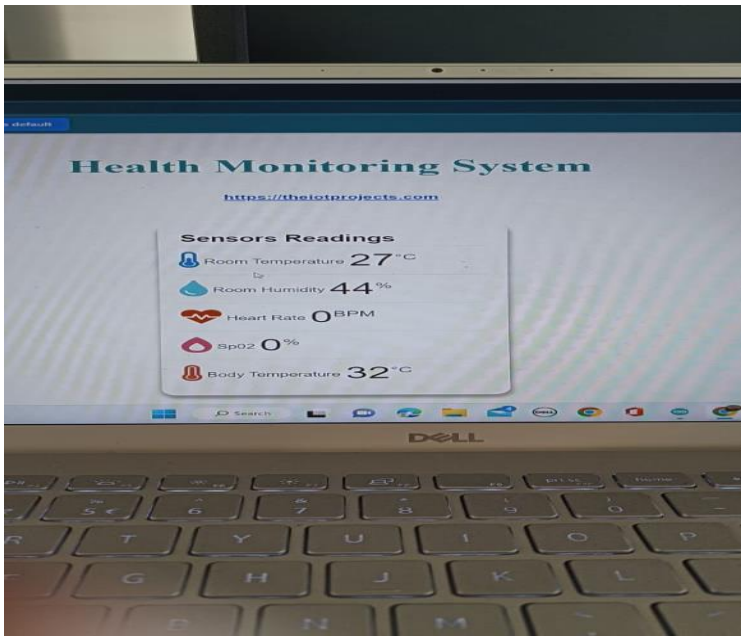
**FLOWCHART:**

## Description:

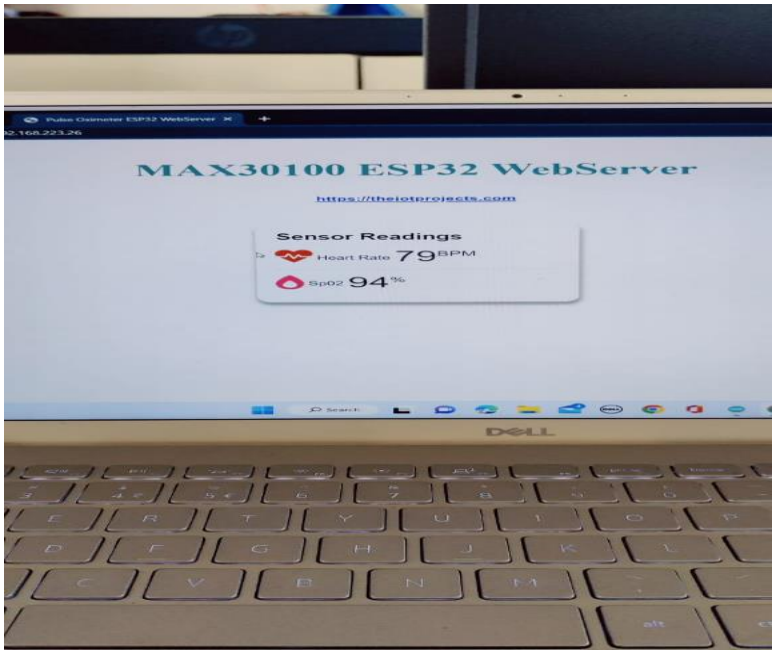
All the sensors can work at 3.3V VCC. So connect their VCC to 3.3V power supply. Connect the GND to GND. MAX30100 is an I2C sensor, so connect its SDA and SCL pin to GPIO21 and GPIO22. Connect its INT pin to GPIO19 of ESP32. The output pin of DHT22 is connected to GPIO4 of ESP32. Similarly, the output pin of DS18B20 is connected to GPIO5 of ESP32. A 4.7k pull-up resistor is connected between output pin and vcc pin of DS18B20.

Once the esp32 is connected to the wi-fi all the parameters are displayed along with the IP address on serial monitor. Now, browse the IP address on mobile or PC to know the health status of the patient.

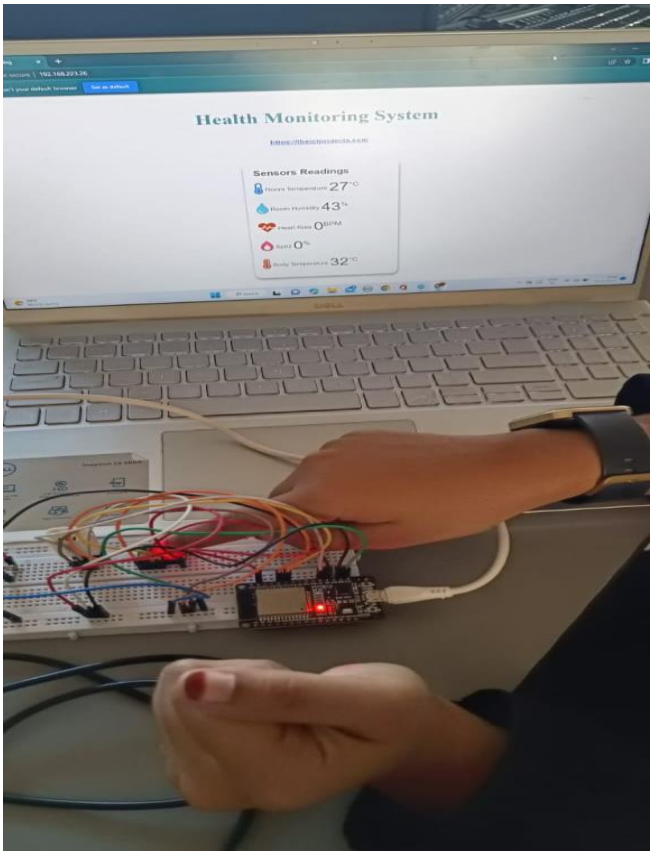
# 5.RESULTS




This figure shows the working of patient health monitoring system. The patient's health condition such as body temperature, heart rate, blood oxygen level, room temperature and room humidity are monitored by the sensors.




This figure shows the working of MAX30100 pulse oximeter sensor for which the heart rate is 79BPM and blood oxygen levels (SPO2) is 94%.




The above image is the view of patient health status on laptop. Copy the ESP32 IP address from the serial monitor of Arduino IDE and paste it on any web browser of any device. It will display all the health parameters of the patient.

# 6.CONCLUSION

Health conditions are monitored by using sensors and that sensors information is displayed on Smartphone, Laptop through IP Address. patient health monitoring will reduce the time consuming in gathering of patient’s data. Patient's data information gathered from sensors is more accurate than manually data gathering. The proposed system can be used at home and hospital.

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