



# **Sarvajnik College of Engineering and Technology**

**GUJARAT TECHNOLOGICAL UNIVERSITY  
SURAT**

Report on-

**“Heart Rate and SpO<sub>2</sub> Monitoring System”**

Under the subject of-  
**SENSOR AND TRANSDUCER**

**B. E. II, Semester – VI**  
**(Electronics & Communication Branch)**

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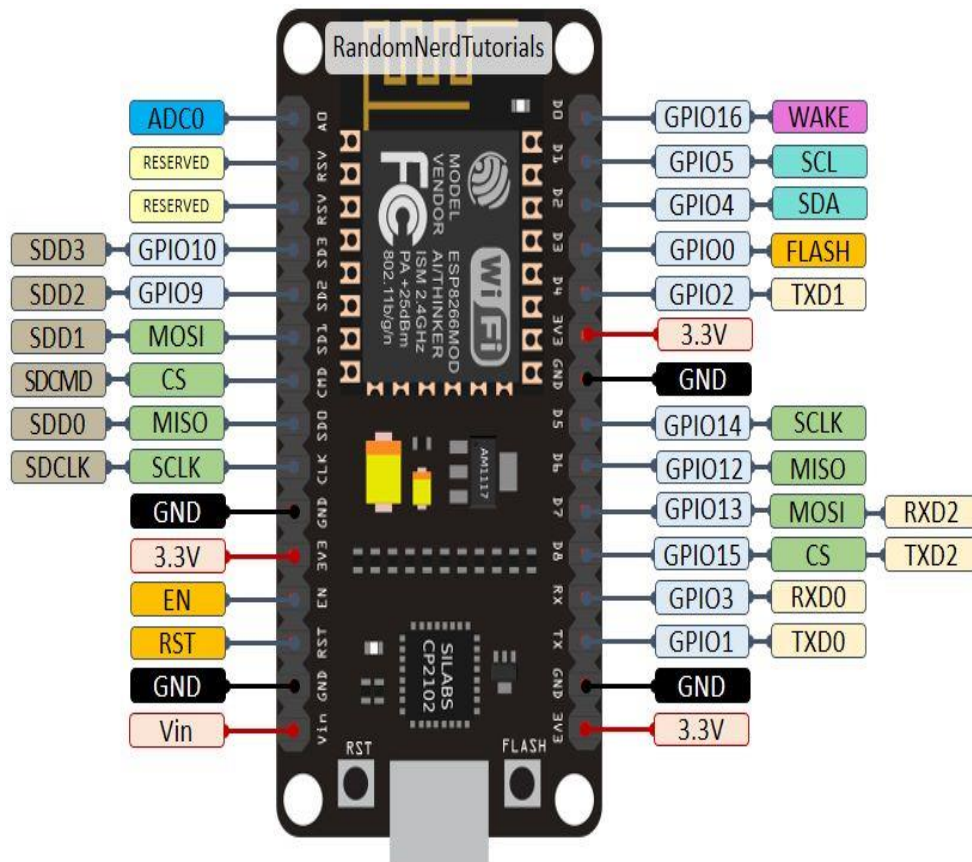
## INTRODUCTION

- Blood oxygen monitoring, heart rate monitoring, and temperature monitoring are all important in healthcare.
- Blood oxygen monitoring involves measuring the oxygen saturation level in a person's blood, which is a critical indicator of respiratory function.
- Heart rate monitoring involves measuring the number of times a person's heart beats per minute, which is a critical indicator of cardiovascular function.
- All Two monitoring techniques can help diagnose and monitor a wide range of medical conditions, and are important tools for healthcare professionals in providing effective treatment and care to patients.

## SYSTEM COMPONENTS

- ESP 8266
- MAX 30102
- OLED DISPLAY (0.98 INCHES)
- BREADBOARD
- JUMPER WIRES

## ESP 8266



- The ESP8266, which is a low-cost Wi-Fi module that is commonly used in Internet of Things (IoT) projects.
- The ESP8266 has a built-in Wi-Fi module and can be programmed using the Arduino IDE, With its small size, low power consumption, and Wi-Fi connectivity.
- The ESP8266 is an ideal choice for projects that require remote monitoring and control, such as home automation, smart appliances, and environmental sensing.

## I2C PROTOCOL

- I<sup>2</sup>C (I2C, IIC) is a serial 2-wire bus for communicating with various devices.
- ESP8266 chip does not have hardware I<sup>2</sup>C, so module uses software I<sup>2</sup>C driver. It can be set up on any GPIO pins including GPIO16
- This module supports :Master mode Multiple buses (up to 10) with different speeds on each bus Standard(Slow, 100kHz), Fast(400kHz)
- MAX 30102 supports up to fast (400kHz) I2C communication.
- MAX 30102 Sensor has I2C address 0x57.
- OLED has I2C address 0x3C

## MAX 30102

- Operating voltage: 1.8V to 5.5V
- Integrated photodiode and LED driver
- Low-power operation: 600 nA standby current, 4.4 mA active current
- Two LEDs for emitting light and one photodetector for measuring light intensity
- Digital output (I2C interface)
- Adjustable LED brightness for different skin tones and ambient light conditions



- Operating temperature range: -40°C to +85°C
- Size: 5mm x 6.4mm x 1.5mm

### MAX 30102



#### Pin Description

- VIN This pin is used to supply power to the sensor.  
This sensor powered on at 3.3-5V.
- SCL This is the I2C serial clock pin.
- SDA This is the I2C serial data pin
- INT This is the active low interrupt pin.  
It is pulled HIGH by the onboard resistor but when an interrupt occurs  
it goes LOW until the interrupt clears.
- IRD IR LED Cathode and LED Driver Connection Point
- RD Red LED Cathode and LED Driver Connection Point
- GND This is used for supplying ground to this sensor and  
it is connected to the source ground pin.

## OLCD DISPLAY

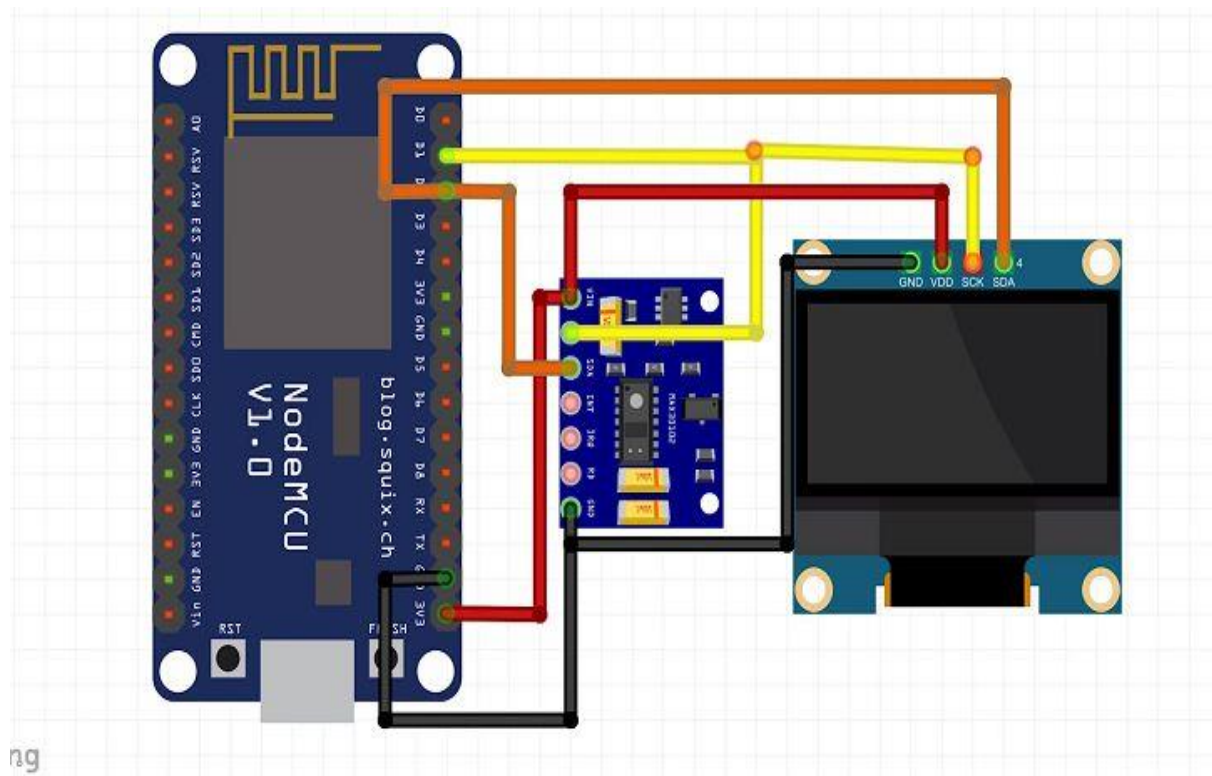


- 0.96-inch (1x1) inch display makes this one of our smaller versions;
- perfect for small projects, wearables, and other portables.
- It has a low, low 0.06W power consumption in regular working conditions.

### Specifications:

- Display Size: 0.96 inch
- Dimension: 26.3x26.1 mm
- Display area: 21.7x10.9 mm
- Display Driver IC: SSD1315
- Resolution : 128x64
- Port: IIC Operating
- Voltage: 3.3-5V
- Display color : Blue, White (Optional)

## CIRCUIT DIAGRAM



## ADVANTAGES

- Early Detection of Medical Conditions: Monitoring blood oxygen levels and heart rate can help detect medical conditions early, allowing for prompt diagnosis and treatment.
- Non-Invasive: Blood oxygen and heart rate monitoring can be done non-invasively, which means there is no need for needles or other invasive procedures
- monitor blood oxygen levels and heart rate using wireless devices. This allows for continuous monitoring of patients in real-time, even when they are away from the hospital or clinic.
- Cost-Effective

## DISADVANTAGES

- **False Readings:** Monitoring systems may occasionally provide inaccurate or false readings, which can lead to incorrect diagnoses and treatment plans.
- **Technical Difficulties:** Technical issues such as device malfunctions or software errors can cause monitoring systems to fail or provide incorrect data.
- **Privacy Concerns:** Wireless monitoring systems may raise privacy concerns, as they transmit sensitive patient information over the internet or other networks.

## APPLICATIONS

- **Medical Settings:** In hospitals and clinics, blood oxygen and heart rate monitoring systems are commonly used to monitor patients with respiratory and cardiovascular diseases.
- **Sports and Fitness:** Athletes and fitness enthusiasts use blood oxygen and heart rate monitoring systems to track their performance and training progress.
- **Aviation and Aerospace**
- **Military and Defense**

## REFERENCES

- <https://www.mouser.com/ProductDetail/Analog-Devices-Maxim-Integrated/MAXM86161EFD+T?qs=XeJtXLiO41T6hWnBlrpJ0w%3D%3D>
- <https://iotdesignpro.com/articles/esp32-data-logging-to-google-sheets-with-google-scripts>
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