ECE4003 – EMBEDDED SYSTEM DESIGN
J-COMPONENT REVIEW
Winter 2020-2021

BIOMETRIC ATTENDANCE SYSTEM

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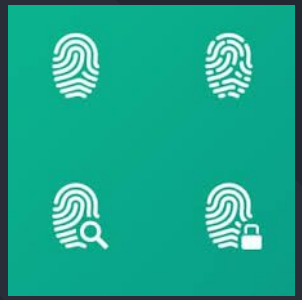
Presented to : Dr. V. Prakash, AP, SENSE, VIT Chennai

OBJECTIVE OF THE PROJECT

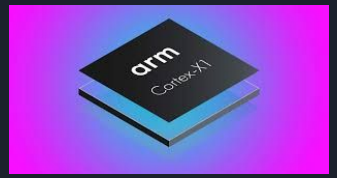


- The main motive of this project is to create a Portable Biometric based Attendance System that inscribes all the information to a website using a Fingerprint Input.
- The Biometric Attendance system has been the most secure way to keep a record since it is impossible to forge or misuse a fingerprint. All the data entered through the system (i.e through the embedded system setup) is stored in a safe and secure website which can later be accessed for validation purposes.
- The system records the name, gender, in-time, out-time, and date.

EMBEDDED SYSTEM DESIGN

Requirement

Specification



Architecture Design

Software and Hardware Design

System Integration

REQUIREMENTS

- The Model should be able to register new fingerprints by recording the biometric data and use the same to verify it with the database (whether if it exists already) and create a new one.
- It should be able to generate an entry and exit process. (i.e in time and out time).
- The Model should display the Registration confirmation and other details on screen.
- It should be portable and also chargeable (easy to access and requires low power requirement).
- The website must be secure and encrypted to avoid data leak or theft.

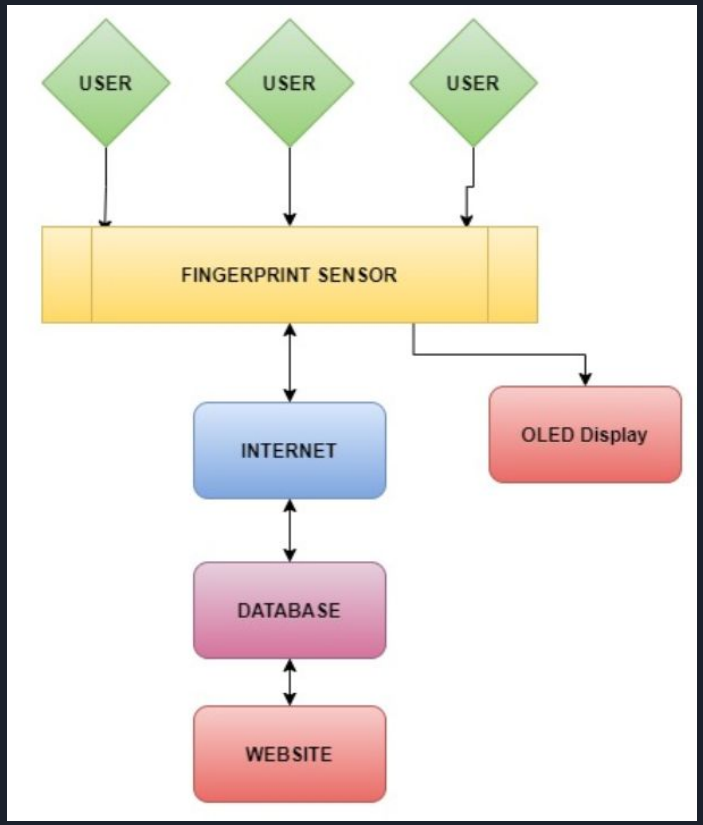
COMPONENT SPECIFICATIONS

- **Fingerprint Sensor** is used to integrate with the arduino and pass on the data to the server through SQL
- **SQL database** is used for storing the data to the website
- The **Arduino(Node-MCU)** is programmed in way that it checks with browser for existing data and then proceeds to make a new entry to the website
- For incorporating the database into the website , we are using **XAMPP** framework along with **PHP** language.
- An **OLED Display** is used to show whether that fingerprint has been registered (already existing) or not registered.
- A **Li-ION battery** is used making it portable (18V, 2500mAh), so that it can moved around as per convenience
- A **Battery Charger (Module - TP4056)** - for charging the battery so that it can be reused accordingly , thus reducing the total cost.
- **MT3608 Boost Converter -** It is used to step up the input voltage to a higher value as per the load requirement.
- A **Switch** is used to trigger the ON - OFF operations after being verified by the system.
- **XAMPP** is also used to make sure that all the interactions are user friendly.

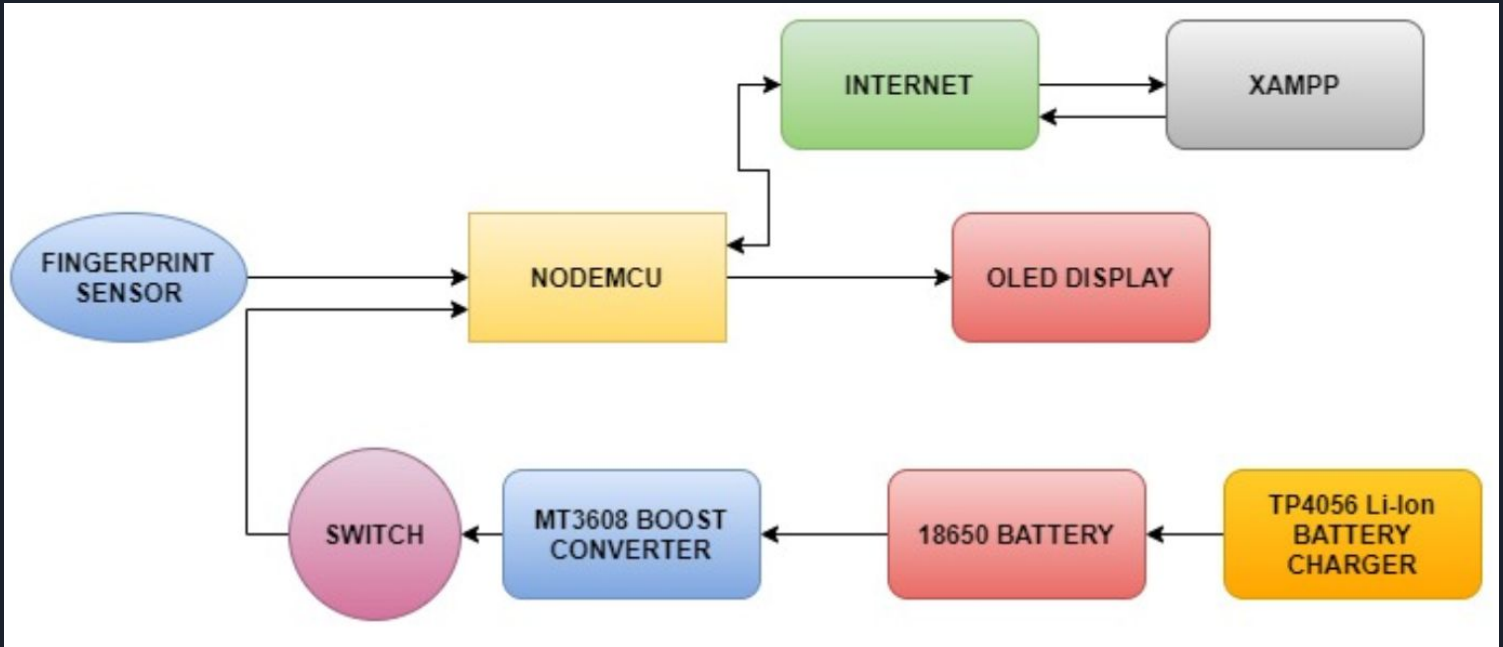
TECHNICAL SPECIFICATIONS

Power	DC 3.6v - 6.0V	**Interface**	UART
Working Current	Typical: 100mA	**Matching Mode**	1:1 and 1:N
Baud Rate	(9600*N)bps; N=6	**Character File Size**	256 bytes
Image Acquiring Time	<0.5s	**Template Size**	512 bytes
Storage Capacity	120/375/880	**Security Level**	5 (1,2,3,4,5(highest)
False Acceptance Rate	<0.001%	**False Rejection Rate**	<0.1%
Average Searching TIme	<0.8s	**Window Dimension**	18mm*22mm
Working Environment	Temp: -10°C to +40°C RH: 40%-85%	**Storage Environment**	Temp: -40°C to +85°C RH: <85%

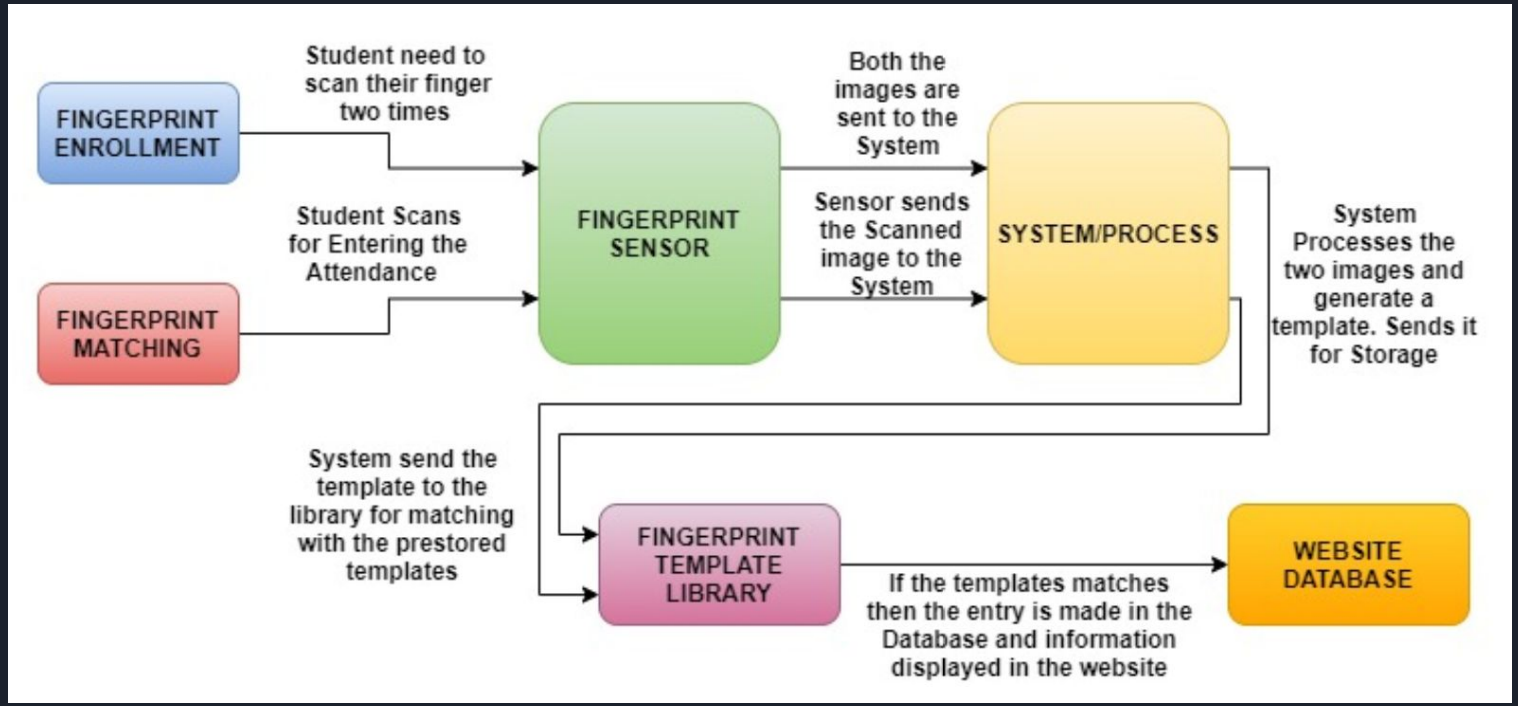
ARCHITECTURE



HARDWARE DESIGN



SOFTWARE DESIGN



SYSTEM INTEGRATION *- Top Down Approach*

Hardware System Integration:

- From the OLED Display, Connect the **Vcc, GND, SCL, SDA** pins to NodeMCU ‘s **3V3, GND, D1, D2** digital pins, respectively.
- For the Fingerprint Sensor, Connect **GND, 5V Vin, Tx, Rx** to NodeMCU ‘s **GND**, **Vin**(also in vin switch), **D5, D6**, respectively
- Concerning the Switch, Connect the **Vin** of the Switch to NodeMCU ’s **Vin** and Connect the **Acc** of Switch to MT3608 ‘s **Vout+**, respectively.
- For MT3608 Boost Converter, Connect the **Vout-** to **GND** in NodeMCU, **Vin-** to Battery’s to **-Ve Terminal** of Battery & in **BAT-** of TP4065, **Vin+** to **+Ve Terminal** of Battery & **BAT+** of TP4065, respectively.

SYSTEM INTEGRATION *- Top Down Approach*

Software System Integration:

- First the website will ask the user whether he/she is a new user or whether we need to manage users based on the need of the technical specialist.
- Next If it's a new user, then with the help of Fingerprint Scanner, we will scan the fingerprint (need to give fingerprint input twice) and input the New User's Credentials.
- For Recording, if the fingerprint is given once, then website takes it as an Entry and records the in-time and if the same fingerprint is given once again later that day, the website takes it as an Exit and records the out-time.

TOOLS REQUIRED

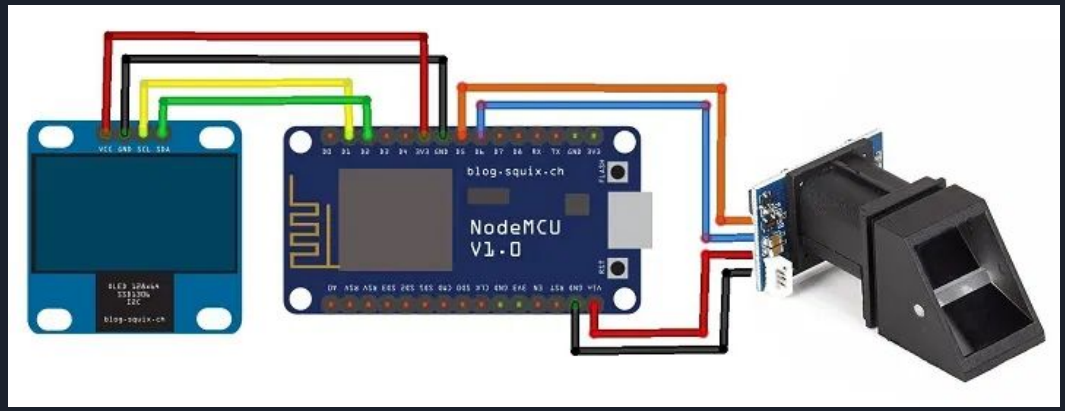
Hardware Required:

- NodeMCU
- R307 Fingerprint sensor
- 0.96" OLED Display
- Li-Ion Battery (18650)
- TP4056 Li-Ion Battery Charger
- MT3608 Boost Converter
- On/Off switch
- Breadboard
- Connecting Wires

Software Required:

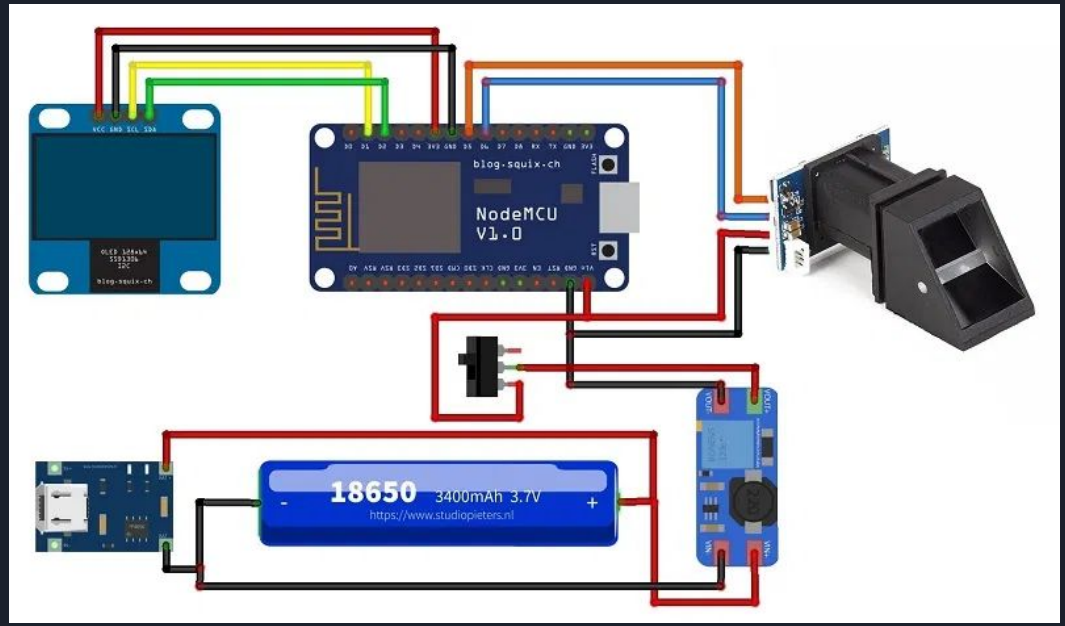
- XAMPP
- PHP
- HTML
- Arduino IDE

CIRCUIT DIAGRAM



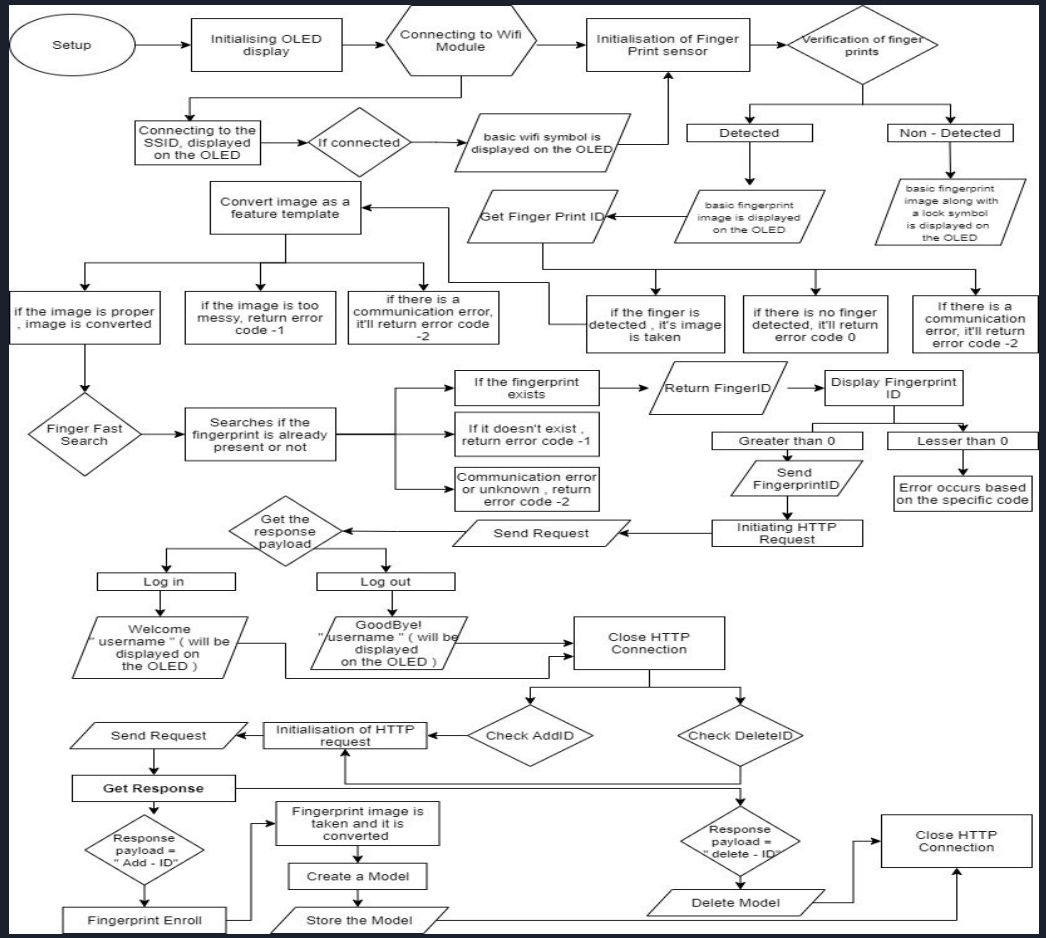
Prototype Implementation of the Biometric FIngerprint Attendance System

CIRCUIT DIAGRAM

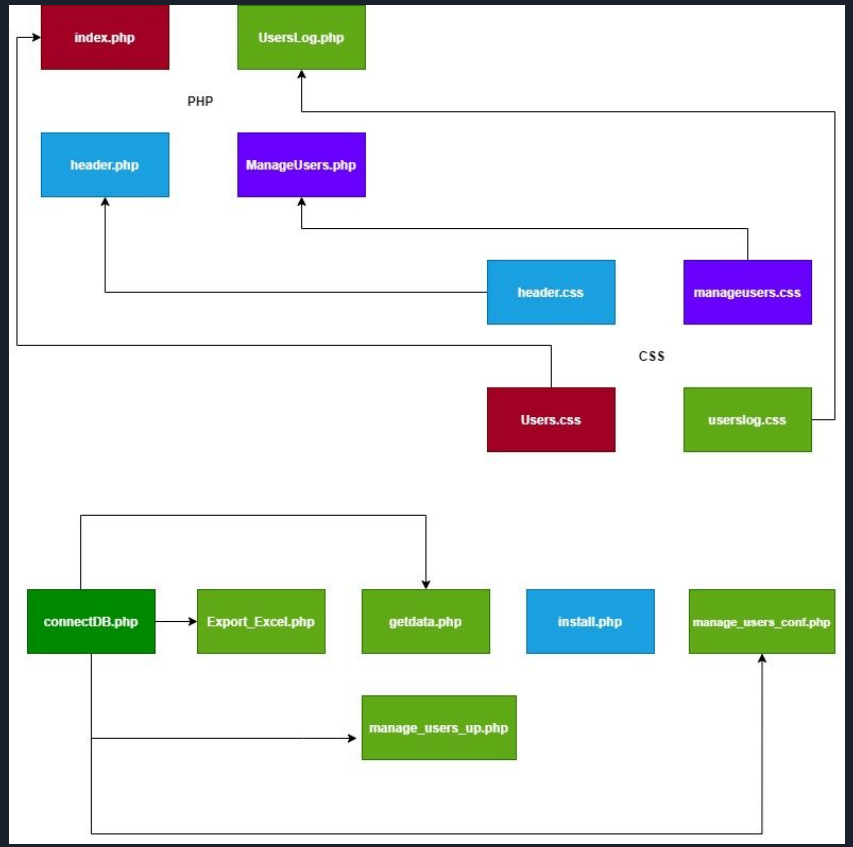


Real Time Implementation of the Biometric FIngerprint Attendance System

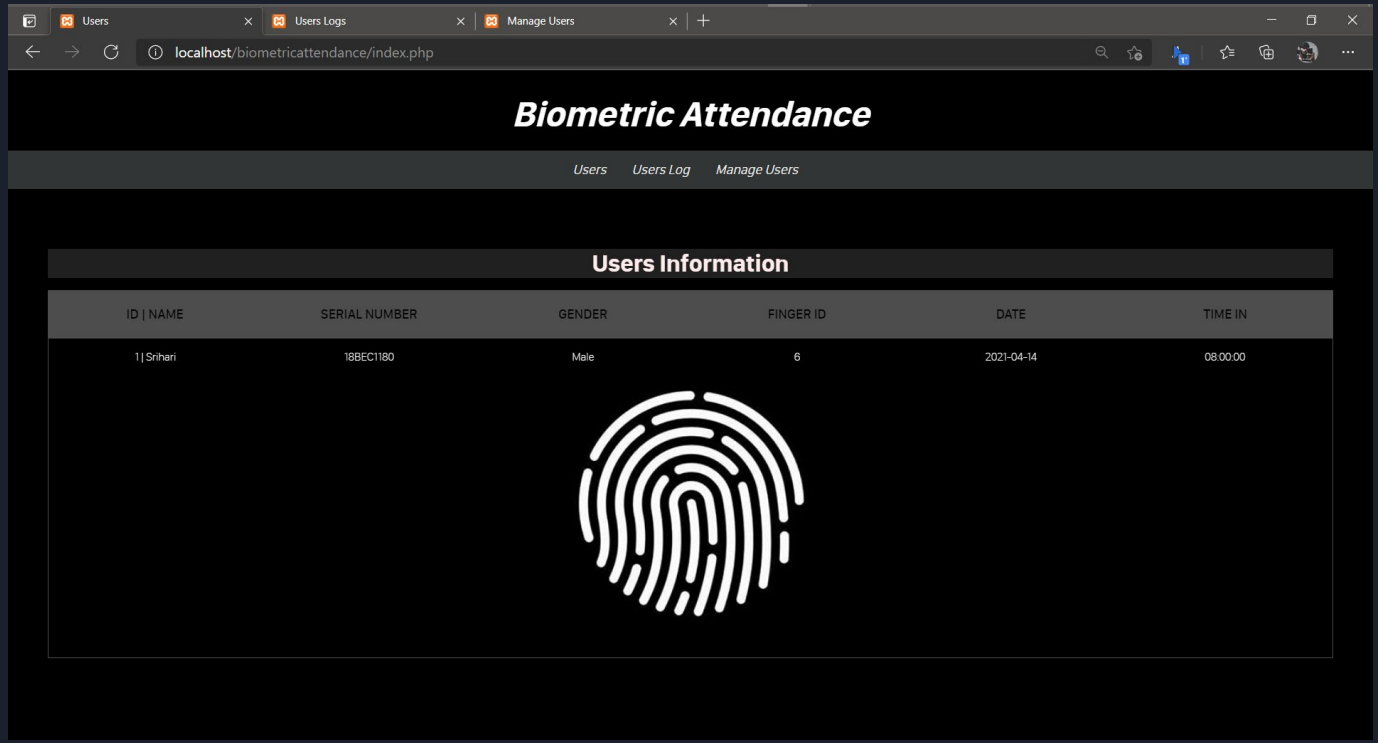
ALGORITHM - ARDUINO



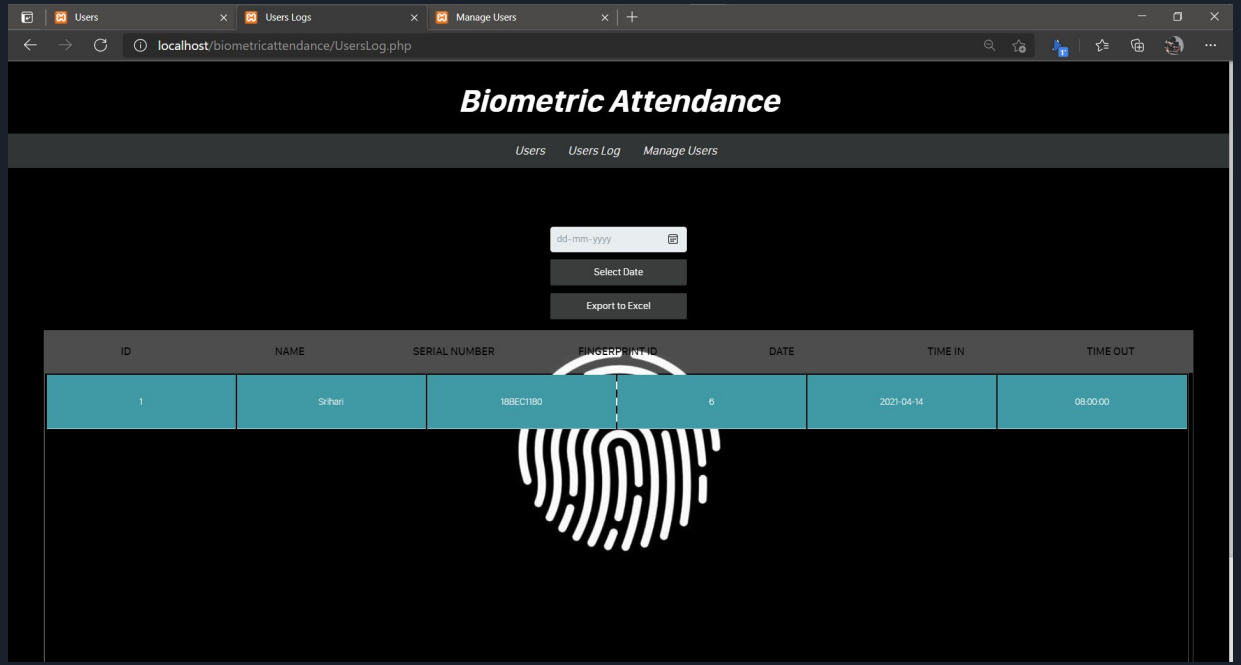
ALGORITHM - PHP, HTML & CSS



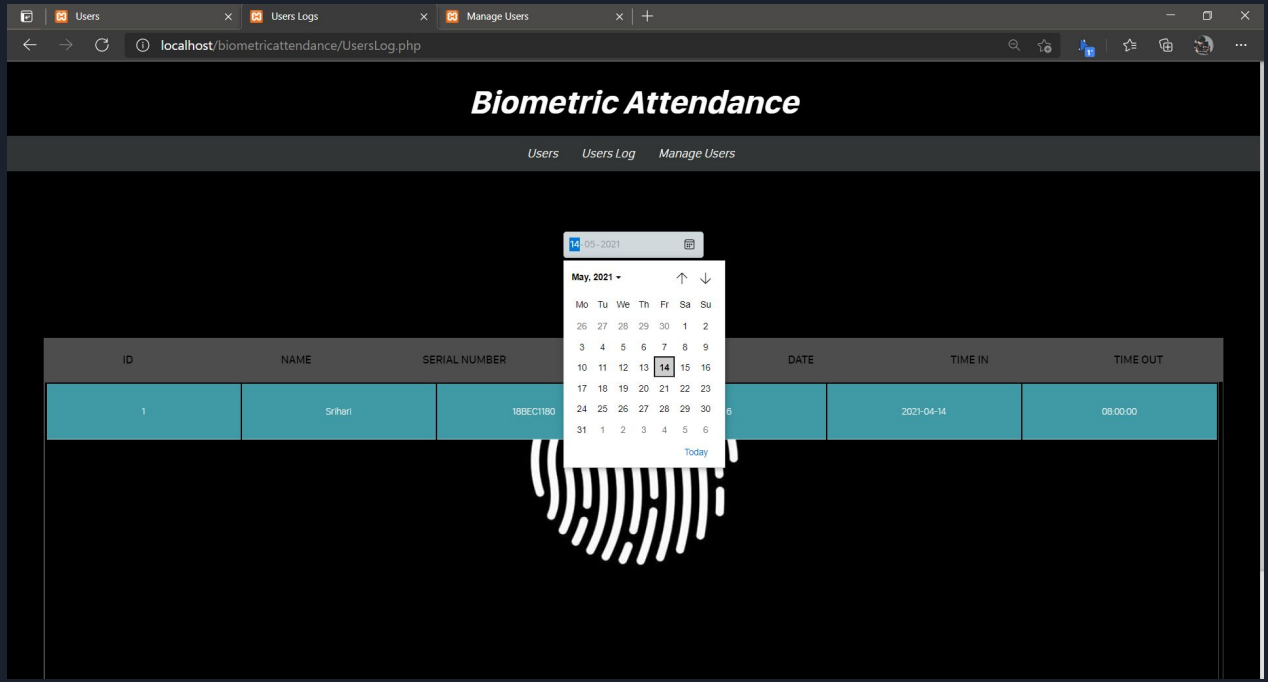
SOFTWARE IMPLEMENTATION



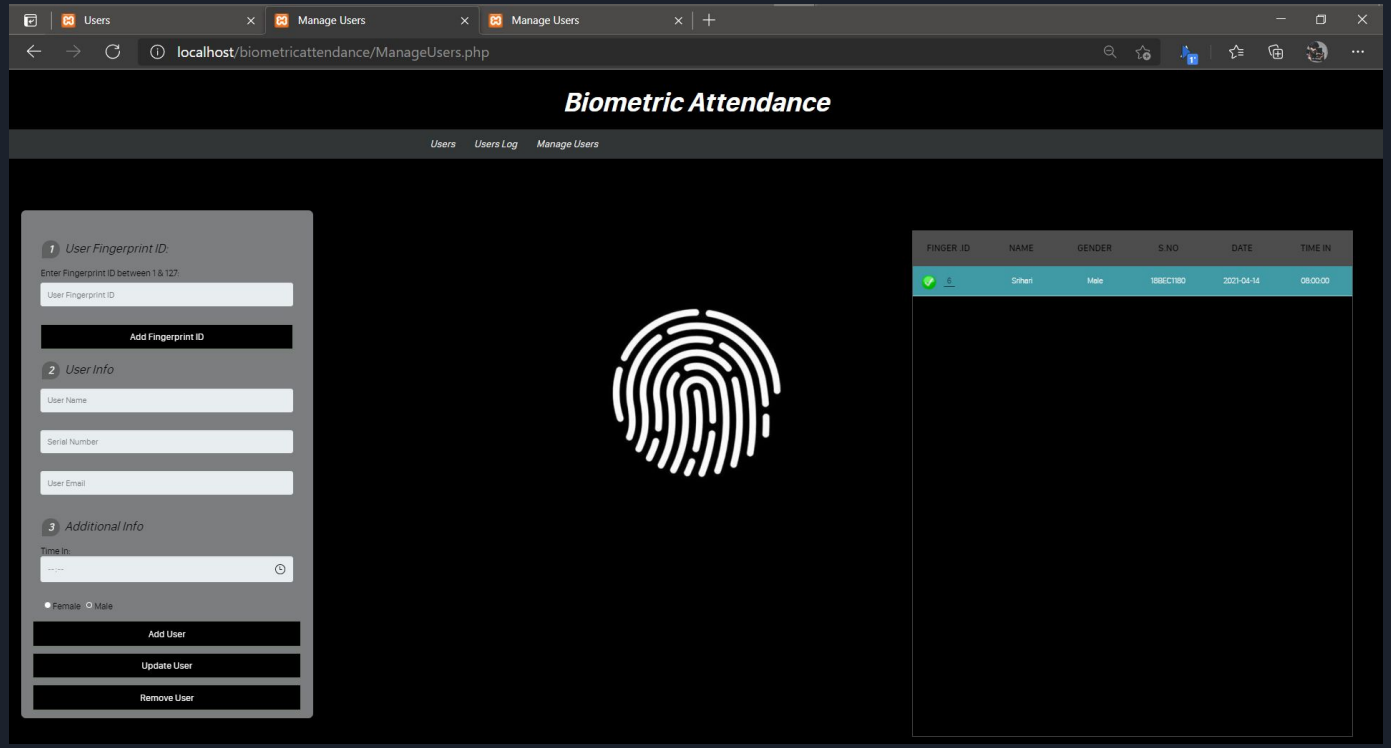
SOFTWARE IMPLEMENTATION



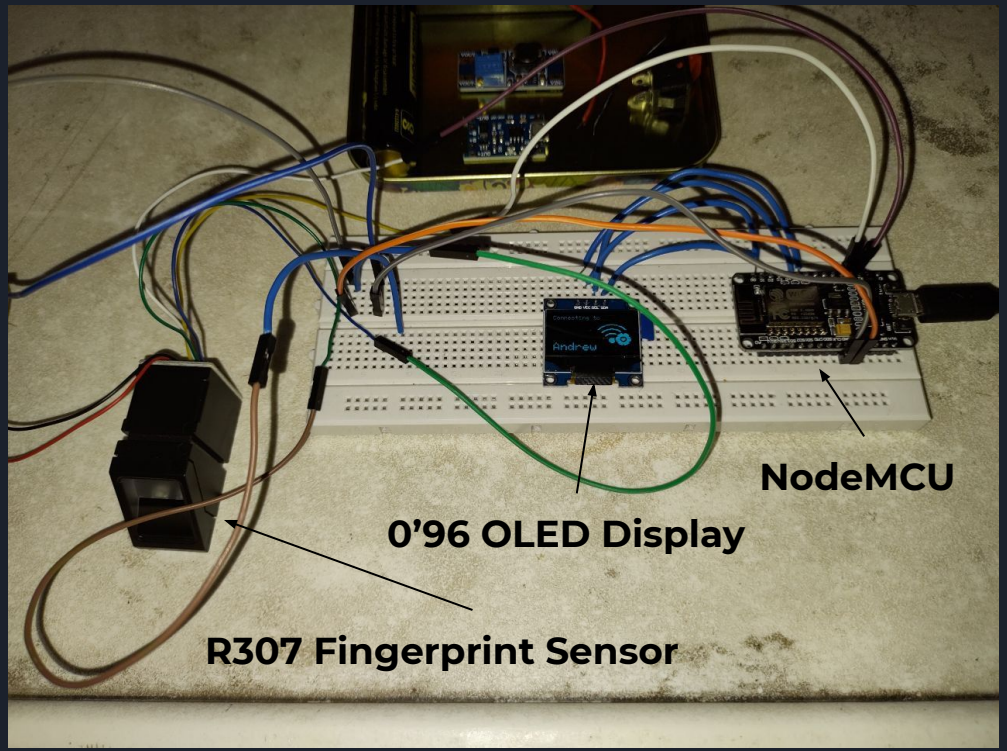
SOFTWARE IMPLEMENTATION



SOFTWARE IMPLEMENTATION

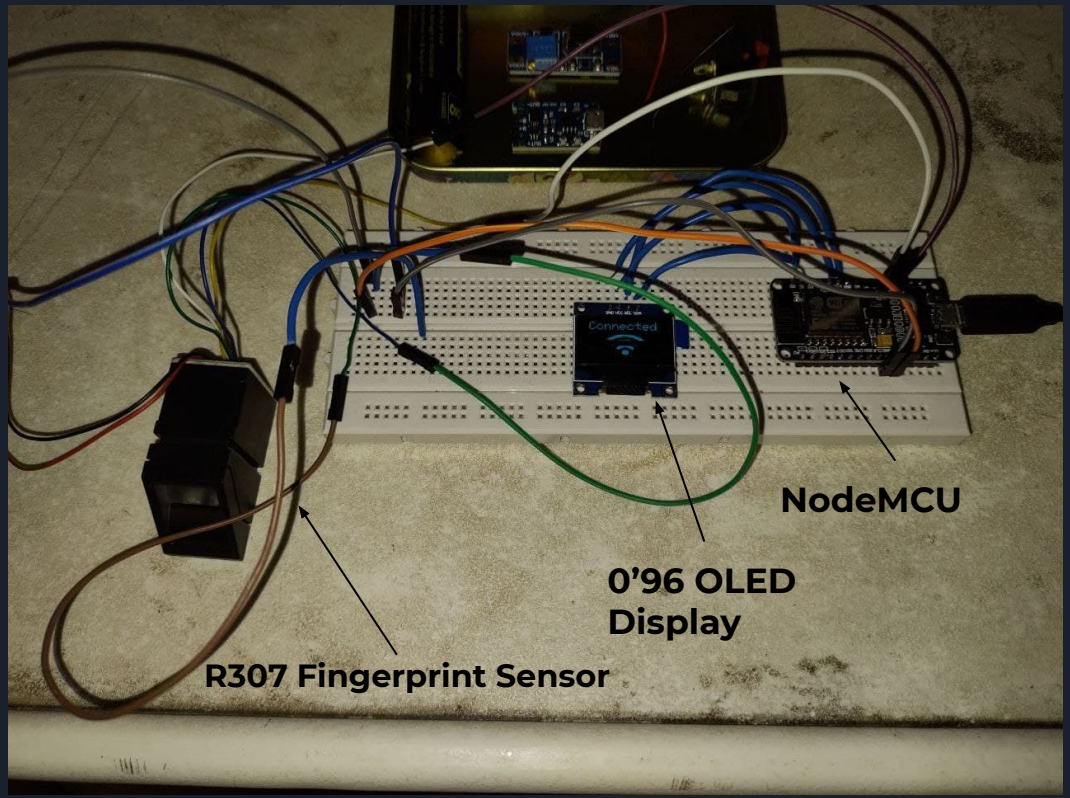


HARDWARE IMPLEMENTATION



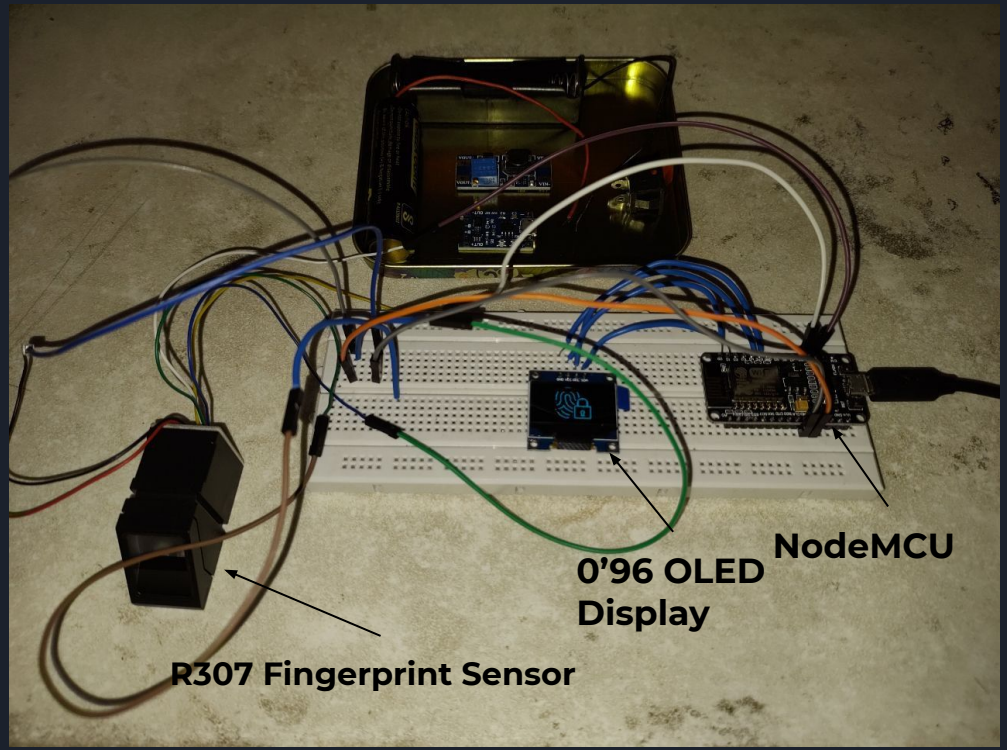
Scanning WIFi for Connection

HARDWARE IMPLEMENTATION



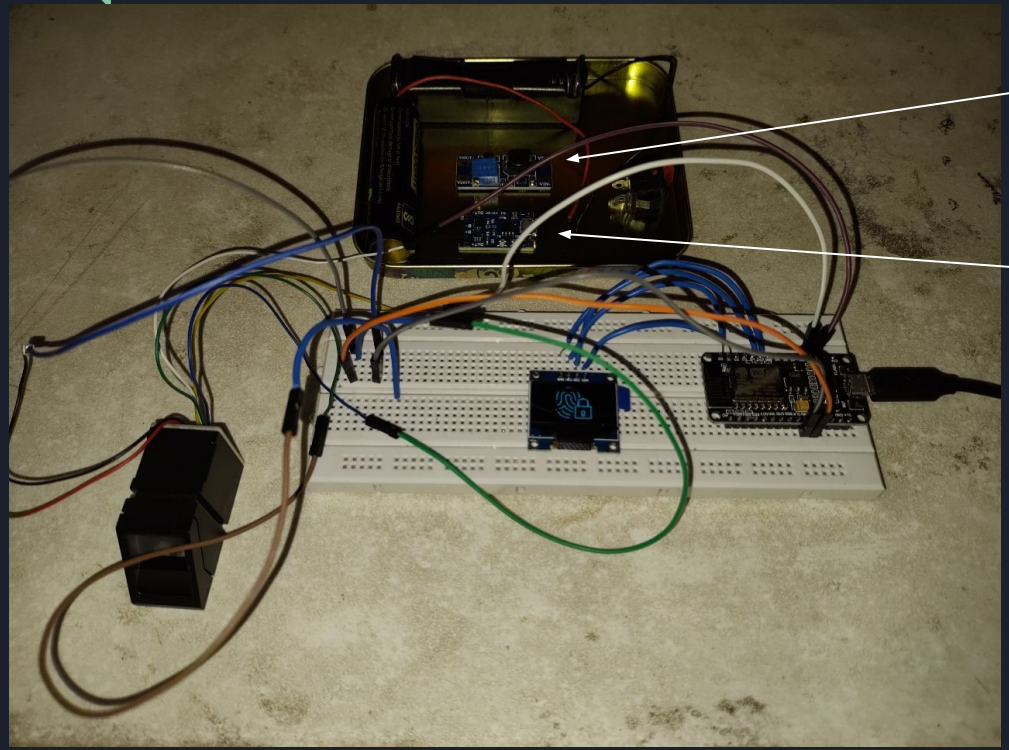
WIFi Connected
Successfully

HARDWARE IMPLEMENTATION



Fingerprint is Locked for Authentication

REALTIME HARDWARE IMPLEMENTATION

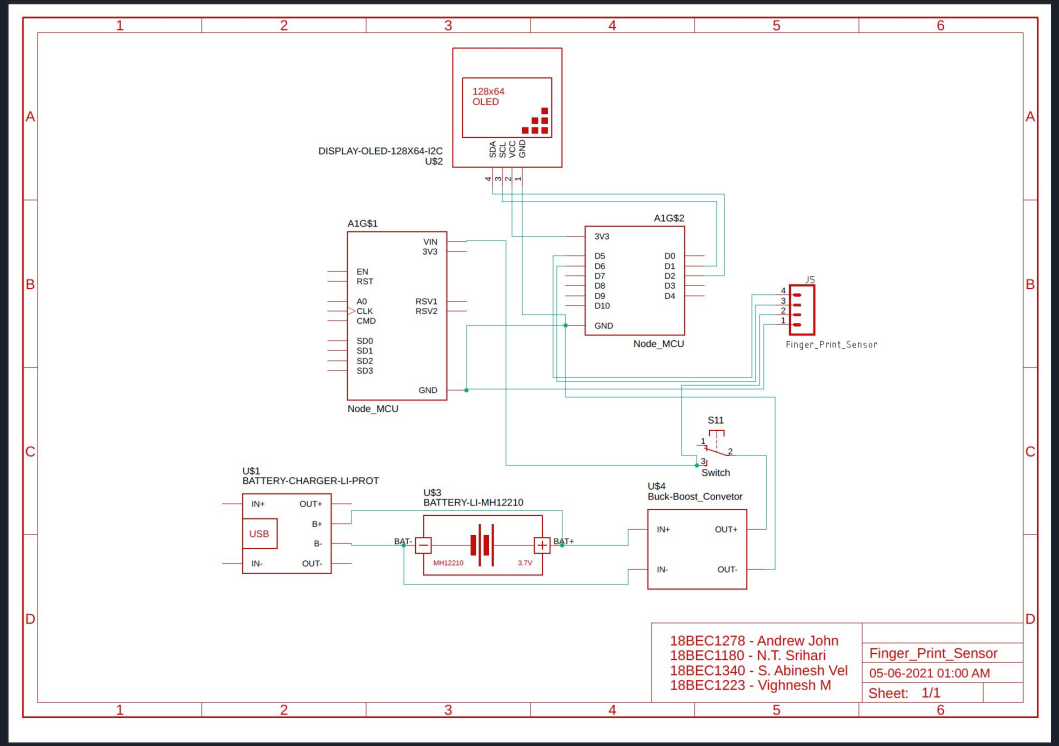


MT3608 Boost Converter

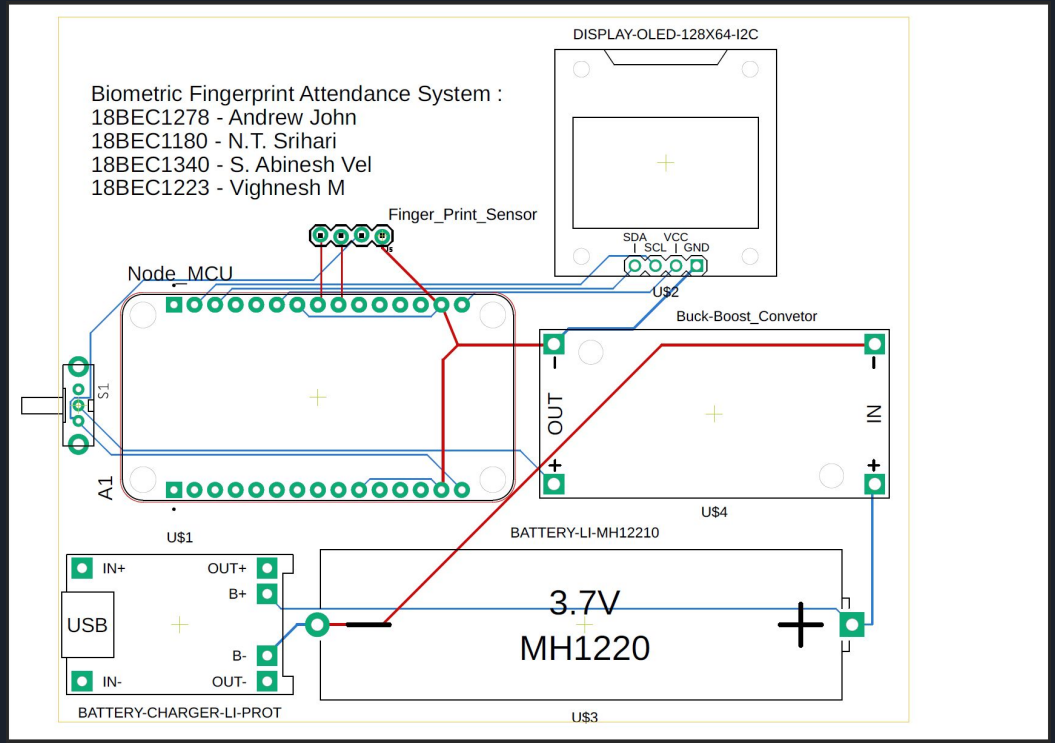
TP4056 Li-Ion Battery Charger

Boost Converter and Li-Ion Battery Charger for Real Time Implementation

SCHEMATIC DESIGN



PCB DESIGN


Biometric Fingerprint Attendance System :
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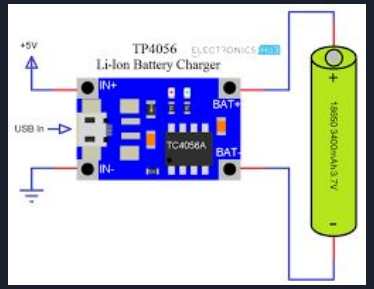
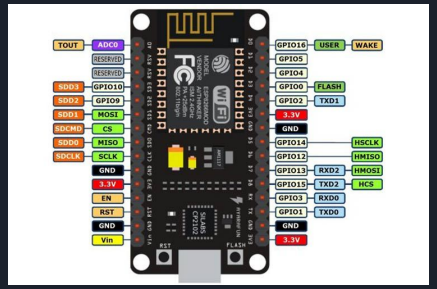
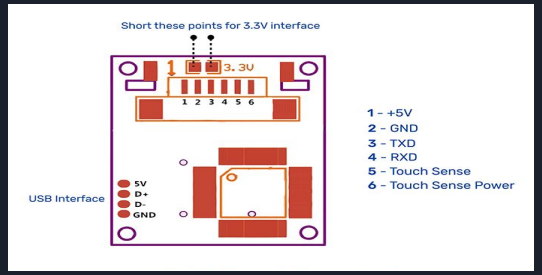
18BEC1180 - N.T. Srihari
18BEC1340 - S. Abinesh Vel
18BEC1223 - Vighnesh M
DISPLAY-OLED-128X64-I2C
SDA
SCL
VCC
GND
U$2
Finger_Print_Sensor
Node_MCU
S1
A1
Buck-Boost_Convetor
OUT
IN
U$4
U$1
BATTERY-LI-MH12210
IN+
OUT+
B+
USB
B-
IN-
OUT-
BATTERY-CHARGER-LI-PROT
3.7V
MH1220
U$3

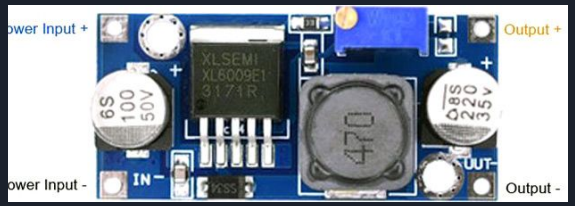
COST ANALYSIS

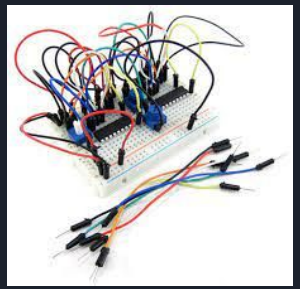
NodeMCU-	₹ 350
R307 Fingerprint sensor-	₹ 1500
0.96" OLED Display-	₹ 250
Li-Ion Battery (18650)-	₹ 150
TP4056 Li-Ion Battery Charger-	₹ 75
MT3608 Boost Converter-	₹ 75
On/Off switch-	₹ 15
Breadboard-	₹ 100
Connecting Wires-	₹ 150
Labour -	₹500
TOTAL =	**₹3165 + GST%**











APPLICATIONS

There are numerous applications for the use of Biometric Technology, but the most common ones are given below:

- **Logical Access Control:** This market application refers to gaining access to a computer network either at the place of the business or corporation or via a secured remote connection from a distant location.
- **Physical Access Control:** Physical Access Entry refers to giving an employee of a business or a corporation access to a secure building, or even a secure office from within it.
- **Time and Attendance:** The use of Biometric Technology can play an integral role in Time and Attendance based applications, by combatting the weaknesses such as one employee fraudulently reports the time worked for another employee when they did not show up for their required work shift, and he or she still gets paid for it.
- **Law Enforcement:** Law enforcement agencies across all levels of the Federal Government are also starting to use Biometric Technology to confirm the identity of any suspects or wanted felons. It has been traditionally Fingerprint Recognition which is the most widely used modality.
- **Surveillance:** Surveillance is simply keeping tabs of a large group of people, and from there, determining any abnormal behavior from an established baseline. In this instance, it is Facial Recognition which is used the most than Biometric Fingerprint.

THANK YOU!