An IOT Project Report On:

Smart Card For Health Records

Submitted in partial fulfilment of the requirement for Degree in Bachelor of Engineering (Information Technology)

By

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CERTIFICATE

This is to certify that the project entitled

Smart Card For Health Records

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In partial fulfillment of degree of T.E in Information Technology for term work of the project is approved.

External Examiner: **Internal Examiner:**

Internal Guide:

Date: -

Head of Department:

ABSTRACT

In global healthcare, there is a need for increased visibility, efficiency, and gathering of data around relevant interactions. RFID tracking solutions are able to help healthcare facilities manage mobile medical equipment, improve patient workflow, monitor environmental conditions, and protect patients, staff and visitors from infection or other hazards. Smart health cards can improve communication between practitioners and enhance quality of care.

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CHAPTER 1

INTRODUCTION

1.1 PROBLEM STATEMENT

Hospitals are currently facing challenges of improving patient safety and reducing operational costs, which are often compromised by human and systemic errors.

Five problems are identified as the common phenomena that lead to healthcare operation failures including: **medical mistakes, increased costs, theft loss, drug counterfeiting, and inefficient workflow.**

Smart healthcare systems are required that can help patients in a number of ways, all stemming from the system's ability to authenticate a patient's identity when the patient seeks medical care. Identifying the patient is the cornerstone of quality medical care and good health system management.

Accurate identification of each person who receives healthcare has multiple benefits:
- Decreases medical errors
- Expedites the admissions process
- Reduces healthcare costs
- Expedites claims reimbursement

1.2 PURPOSE

Purpose of smart cards allows patients to bypass the clipboards, paperwork and other tedious formalities. Instead, the patient can scan the card into the kiosk, allowing the healthcare provider to receive all the health records instantaneously.

Significant cost savings occur at the start of the admission process and continue throughout the claims management process. Complete and accurate information is provided, removing issues caused by human error.

Since **medical fraud** and **identity theft** is a growing concern for both consumers and providers, smart cards support the use of additional security mechanisms like picture, security PIN, to prevent the use of a lost or stolen healthcare card by someone else.

1.3 SCOPE

Smart healthcare cards manage patient identity and give practitioners and pharmacists secure access to their medical records.

All around the world, costs of healthcare are exploding. Advanced medicines and technology are boosting life expectancy. As people get older, however, they need more frequent and more expensive care, causing the price of insurance to skyrocket. At the same time, patients today see a wider range of doctors and specialists. Their – often redundant – medical records are scattered across different practices.

A number of countries have implemented measures to cut healthcare costs. One of the most basic and vastly successful measures is the introduction of card-based e-health networks. Smart health cards improve communication between practitioners and enhance quality of care. They also streamline administration and reduce fraud.

1.4 PROPOSED SYSTEM

The **RFID reader** is connected to arduino via appropriate connections.
As the card is **scanned** by the RFID reader, **unique ID** of the chip is displayed by the Arduino IDE.

The **unique ID** is fetched from the **Arduino IDE** to the **Website** which stores each patient's medical data.

The website displays detailed information regarding the **patient's health record**, which includes **prescriptions**, **previous visits**, etc. The patient's age is set to increase automatically to ensure that the patient does not miss out on important vaccines.

The **healthcare providers** are permitted to make appropriate changes in the patient's health records.

The main advantage of using the smart card is that in case of **emergency**, the patients need not carry the **required files** and **reports**. The smart card makes the process more efficient and saves time.

1.5 PROJECT ADVANTAGES AND LIMITATIONS

RFID tracking solutions are able to help healthcare facilities manage mobile medical equipment, improve patient workflow, monitor environmental conditions, and protect patients, staff and visitors from infection or other hazards. Smart card technology can provide high levels of security and privacy protection, making smart cards ideal for handling sensitive information such as identity and personal health information.

However, there are still some problems in the development process. The solution to these problems depends not only on technological progress, but also on the joint efforts of patients, doctors, health institutions, and technology companies.

CHAPTER 2
LITERATURE SURVEY

2.1 EXISTING SYSTEM

A Smart Card Network in health Care Services

V. Gogou , S. Pavlopoulos' , D. Kua yiannis, D. Koutsoun's

Biomedical Engineering Laboratory, Department of Electrical and Computer Engineering, National Technical University of Athens, Athens, Greece.

Athens Medical Centre, Athens, Greece.

A **central database** stores full clinical records of each insurance company customer (including family and personal medical history, diagnostic examination results, medical prescriptions and treatments, list of administered drugs, etc.), as well as the required **administrative daia** concerning the customer contract (contract validity, expiry dates, coverage, etc.). Administrative profiles of the contracted healthcare service providers are also organized in this database.

Apart from the insurance company, that has **direct access** to the database, the contracted health care service provider (doctors, hospitals, etc.), connects to the database, each time a customer appears with his/her personal smart card - using dialup or leased lines- to his/her medical record and initiates a transaction. As soon as the identity of the customer is confirmed using the smart card and his/her **unique PIN number**, the transaction is **initiated**. Thus, the customer himself gives the provider the possibility to **access and update** his/her medical and administrative data in the database and on the card as well. All transactions in- between the contracted providers, or the providers and the insurance company are also conducted on-line, using the network.

The use of the smart card in the specific smart card health network can be summarized to the following:

- Identification and access key for customers and transactions
- Authentication medium
- Basic patient medical record organized in such a way so that it can be used in emergency cases, and also used in offline simulations.

The architecture that has been used for the smart card ensures that the card can securely serve its roles. The data on the card is **divided** by **access levels.**

The first level contains the so-called emergency data set and is accessible to practically everyone. As it has been pointed out before, this data is of vital need in emergency cases when the smart card holder cannot even provide his/her PIN number. Therefore, this group of data includes **required demographic and administrative data**, but mainly specific medical information, such as allergies to drugs, chronic diseases, etc. ENV 1308 was used as a backbone for the structure of the emergency data set, although the specific emergency data set was enriched with the help of the collaborating physicians of the project.

The rest of the levels are accessible-updateable only with the use of the holder's personal PIN numbers. They provide a generic medical folder, access to which depends on the privacy of information.

More specifically, **PIN1 area** on the card includes the holder's basic medical record (family history, operations, etc.). **PIN2** area is restricted for private medical information that is not considered needed for trivial healthcare services (eg. Sexually transmitted diseases). lt is the holder's right to disclose or not this information to the contracted provider.

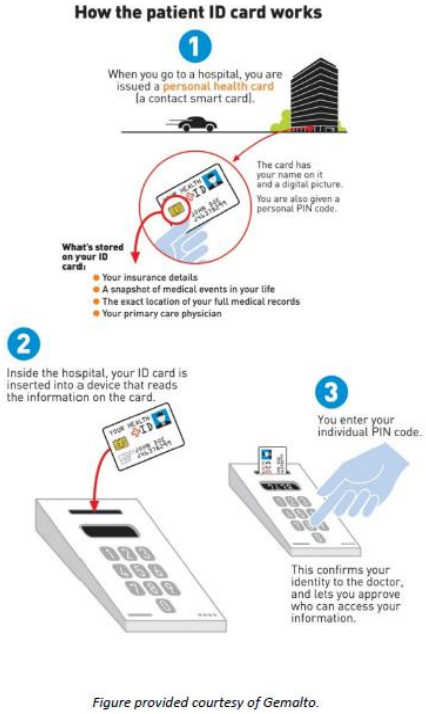


Figure provided courtesy of Gemalto.

Smart Healthcare Cards implemented by *Smart Card Alliance, USA* for patient identification.

2.2 RELATED WORK

RFID technology has many important applications in **medicine** and the **pharmaceutical industry**. **Tracking patient information**, as well as medicines, is one important way it improves modern medicine.
Positive Patient Identification(PPI) applications, which include smart patient wristbands, have been implemented by numerous medical universities to reduce patient misidentification.

Placement of **RFID chips** inside patients' bodies has been proven practical by the Austrian DVI in Thailand since 2005. This aims at preserving patient identification and verification.
Modern **Specimen Labelling systems** that use RFID technology has proven to be useful in reducing specimen labelling errors in pathology laboratories.

Use of **Surgical instruments with embedded RFID tags** have been put to use to ensure that surgical objects like sponges are not left inside the patient's body post surgery.
A modern dosage system introduced by various medical organizations **Portable Data Assistant(PDA)** to scan barcodes on drug packaging as well as the **RFID wristbands** carried by the patients, to alert drug mismatch, over-dosage and drug errors.
Automated healthcare services, including **self pill-dispensers** to help patients to take their doses effectively, have been integrated using RFID technology to aid patients at home as well as visually impaired and physically disabled patients.

CHAPTER 3
SYSTEM DESIGN

3.1 ARCHITECTURAL DESIGN

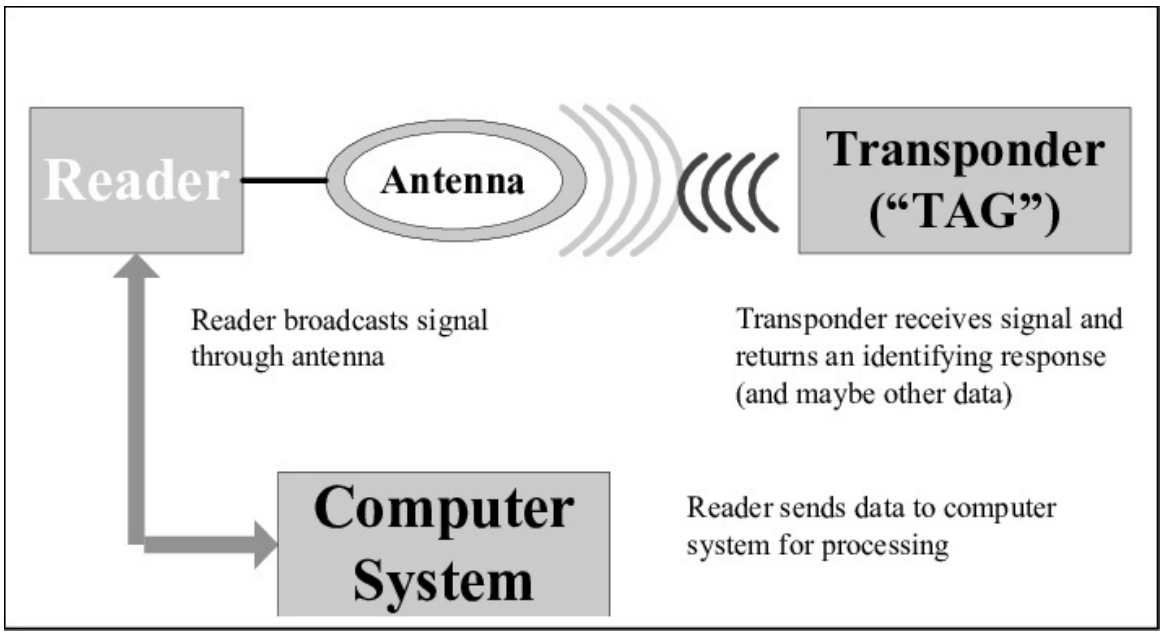


Fig 3.1.1 Working of RFID

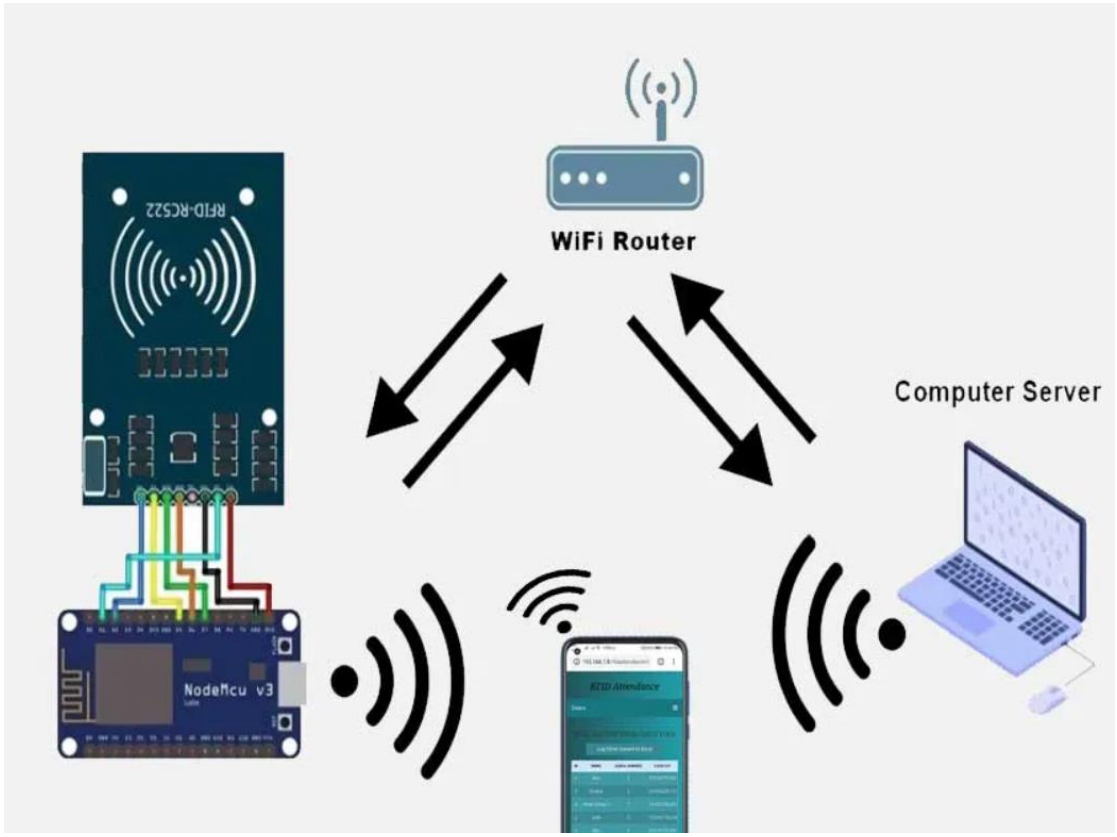


Fig 3.1.2 Project Implementation

CHAPTER 4
SYSTEM REQUIREMENTS

4.1 HARDWARE REQUIREMENTS

Node MCU: is an open source firmware for which open source prototyping board designs are available. It uses many open source projects, such as lua-cjson and SPIFFS.

RFID Reader: RFID Reader is the brain of the RFID system and is necessary for any system to function. Readers, also called interrogators, are devices that transmit and receive radio waves in order to communicate with RFID tags.

RFID Cards: RFID tags consists of a tiny radio transponder; a radio receiver and transmitter. Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number can be used to inventory goods.

Bread Board: It is a construction base for prototyping of electronics. It is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype an electronic circuit.

Jumper Wires: It is an electrical **wire**, or group of them in a **cable**, with a connector or pin at each end which is normally used to interconnect the components.

Micro USB Wire: A miniature version of USB interface used to connect compact devices.

4.2 SOFTWARE REQUIREMENTS

Arduino IDE

Sublime Text

MAMP Server

MySQL Server

CHAPTER 5
IMPLEMENTATION DETAILS

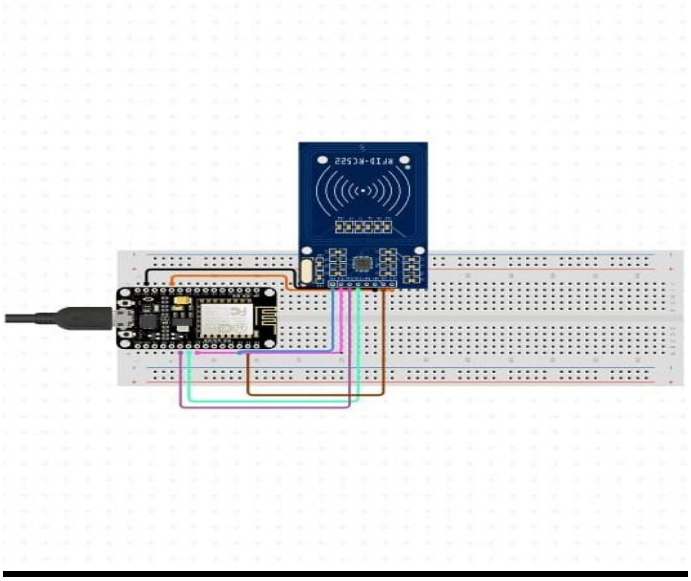


Fig 5.1 Interfacing RFID and Node MCU

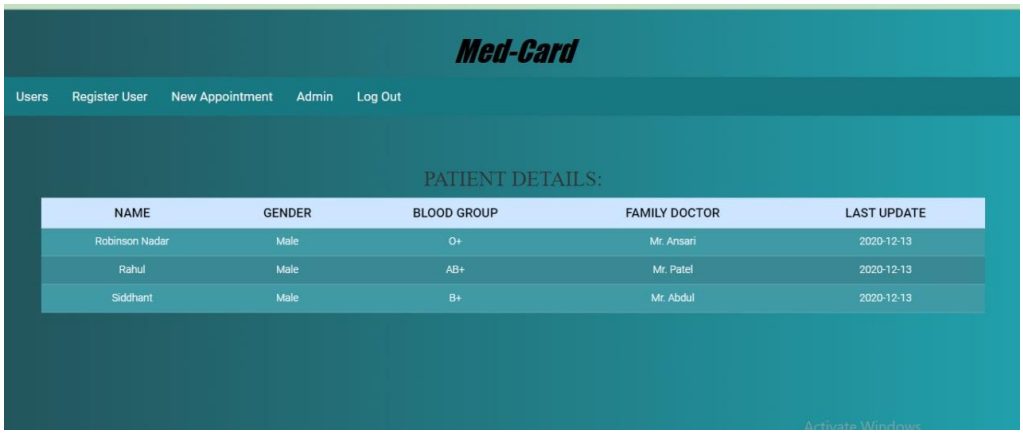


Fig 5.2 Patient Details

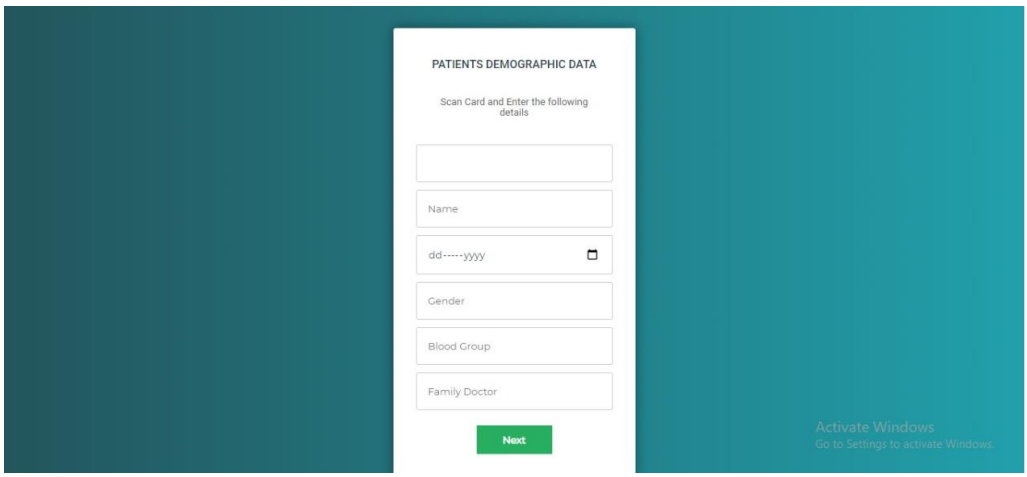


Fig 5.3 Patient Demographic Information

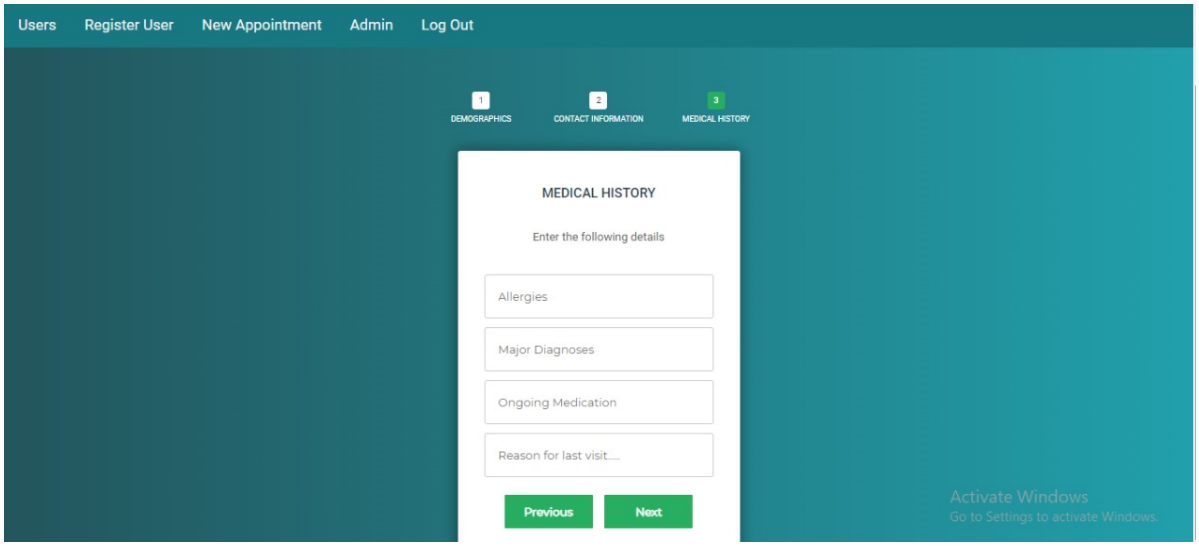


Fig 5.4 Patient Medical History

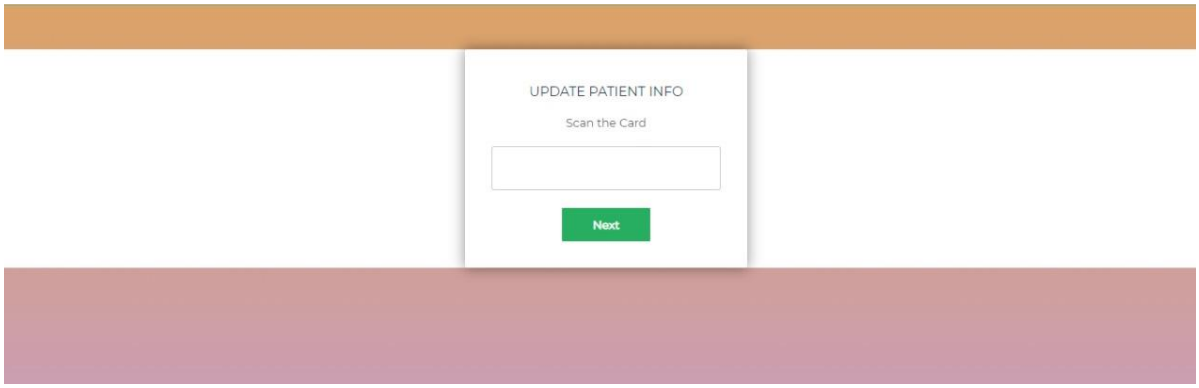


Fig 5.5 New Appointment

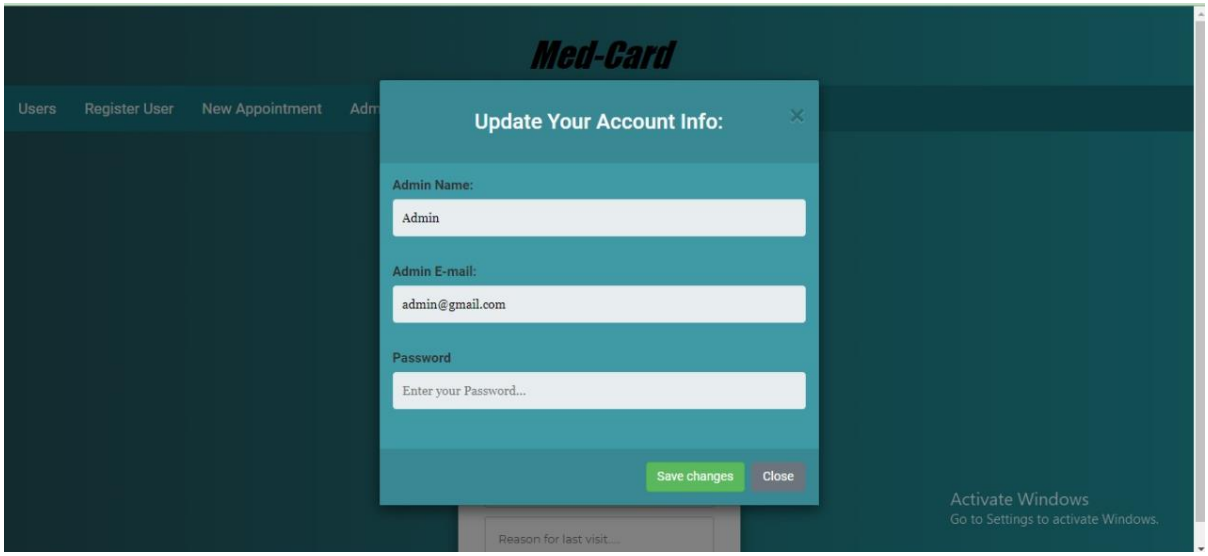


Fig 5.6 Updating Admin Status

CHAPTER 6
IMPLEMENTATION RESULTS

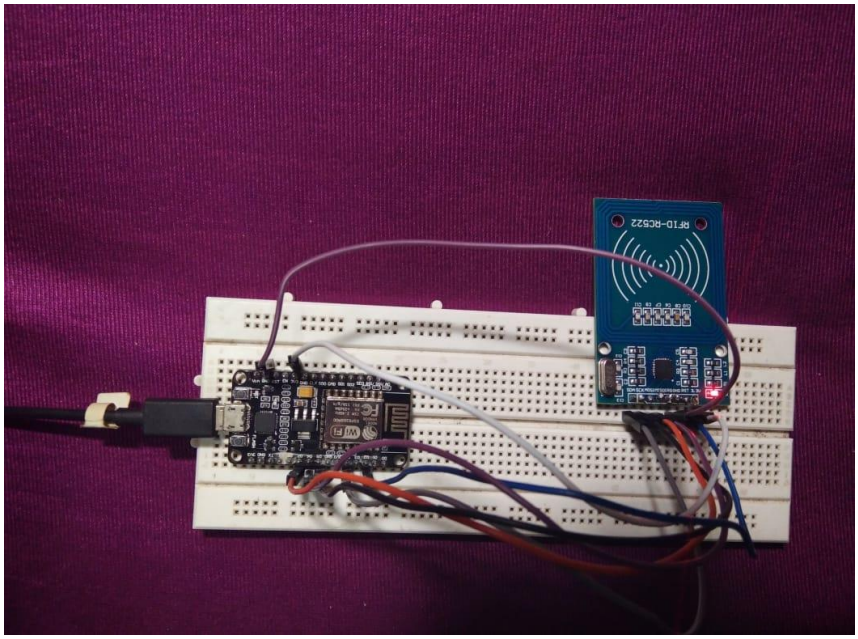


Fig 6.1 RFID Node MCU Connection

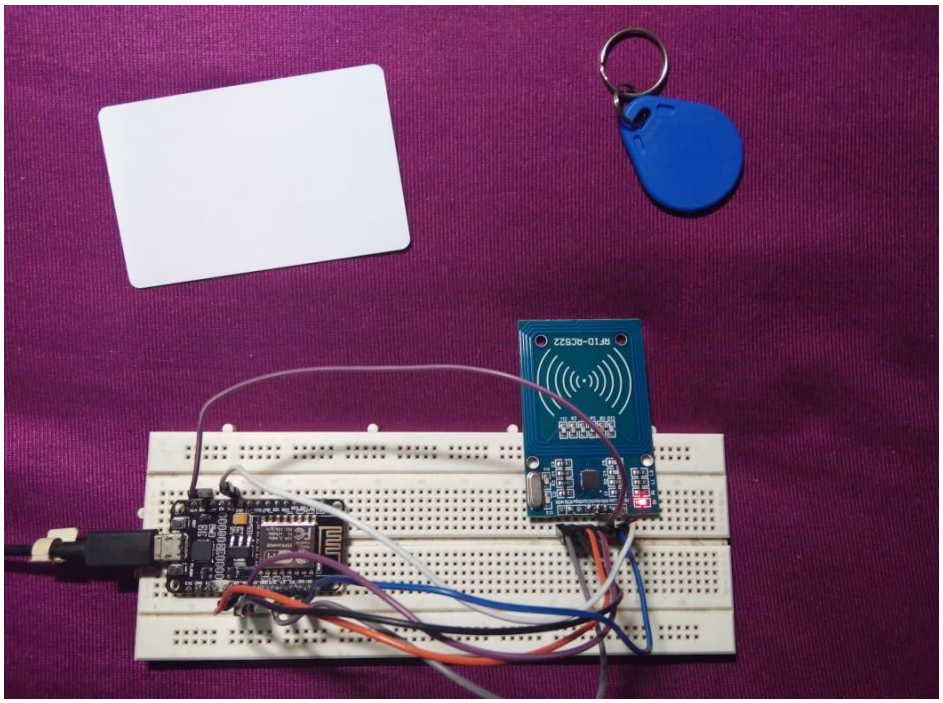


Fig 6.2 Scanning of Med Card

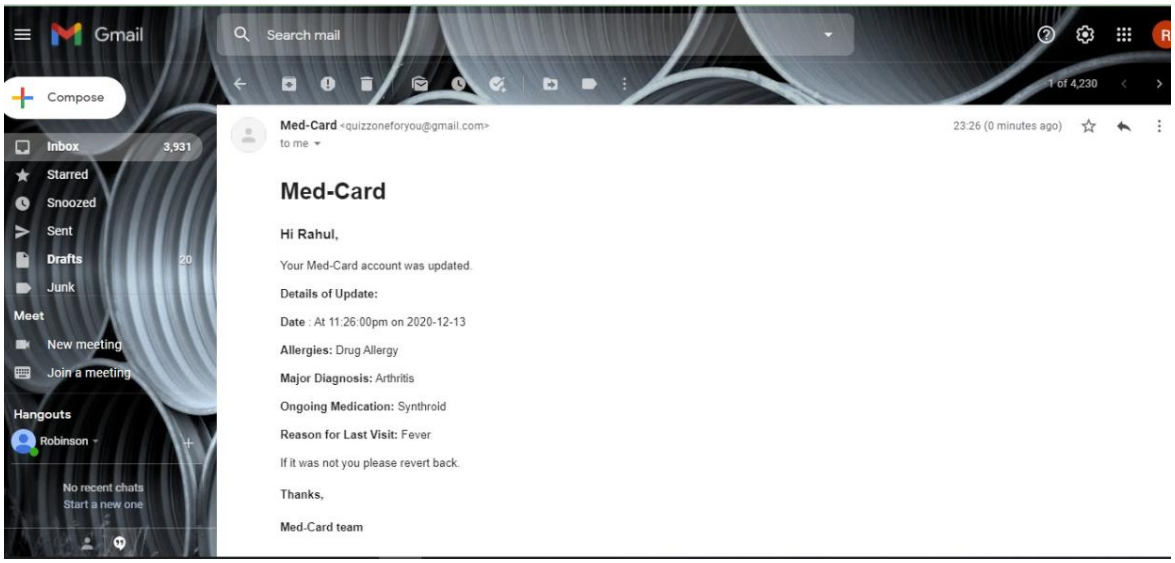


Fig 6.3 Appointment Verification

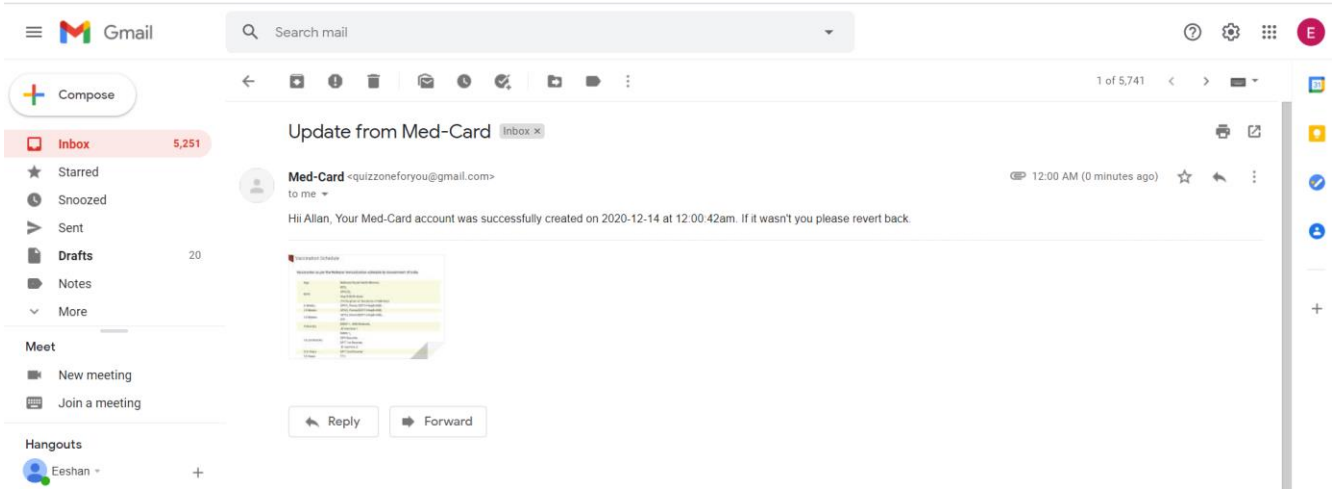


Fig 6.4 Account Verification

CHAPTER 7
CONCLUSION AND FUTURE SCOPE

CONCLUSION

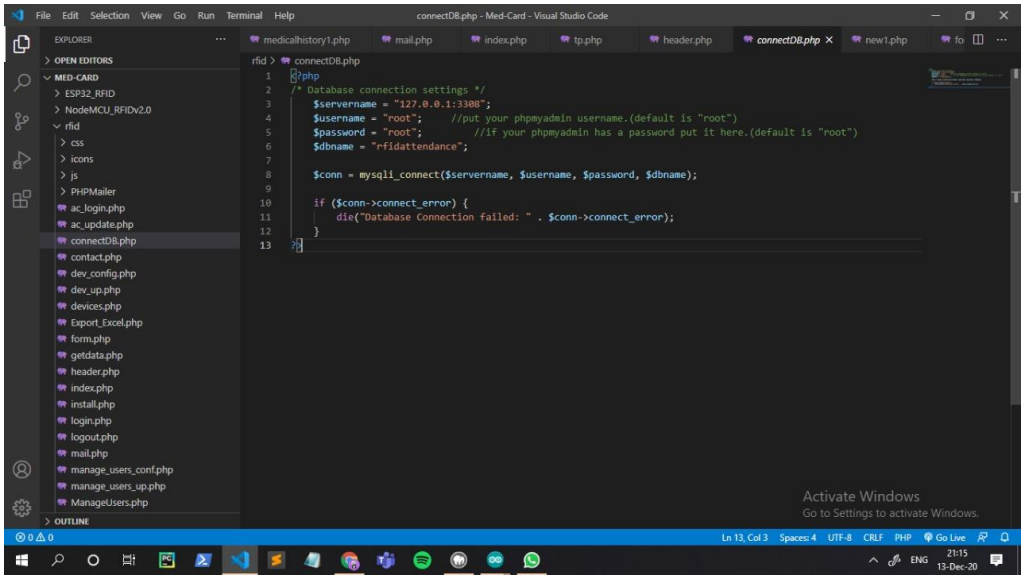
In sum, the prospects for smart health card are vast. For individual users, smart card can facilitate better health self-management. Timely and appropriate medical services can be accessed when needed, and the content of medical services will be more personalized.

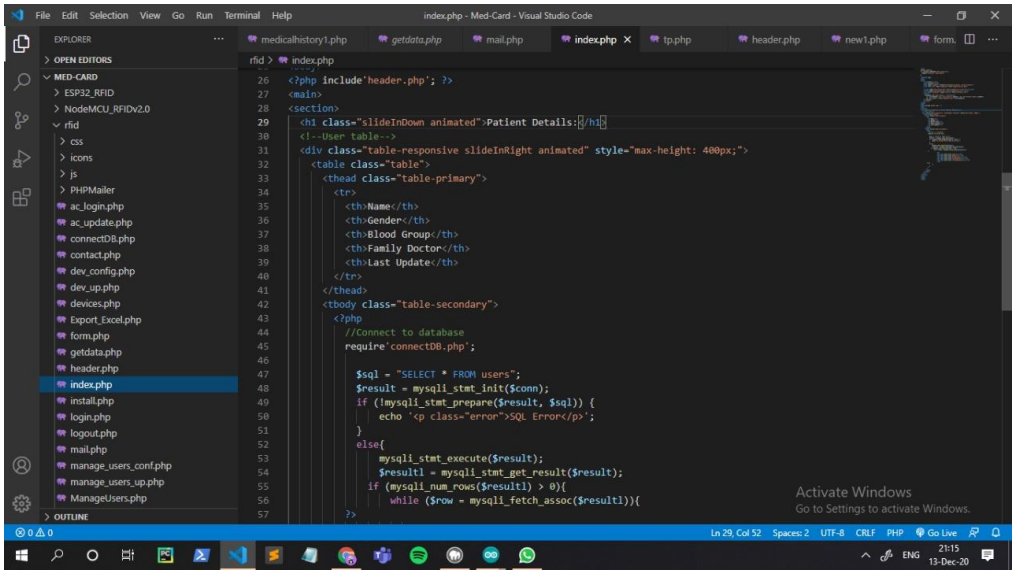
FUTURE SCOPE

For medical institutions, smart health card can reduce costs, relieve personnel pressure, achieve unified management of materials and information, and improve the patient's medical experience.

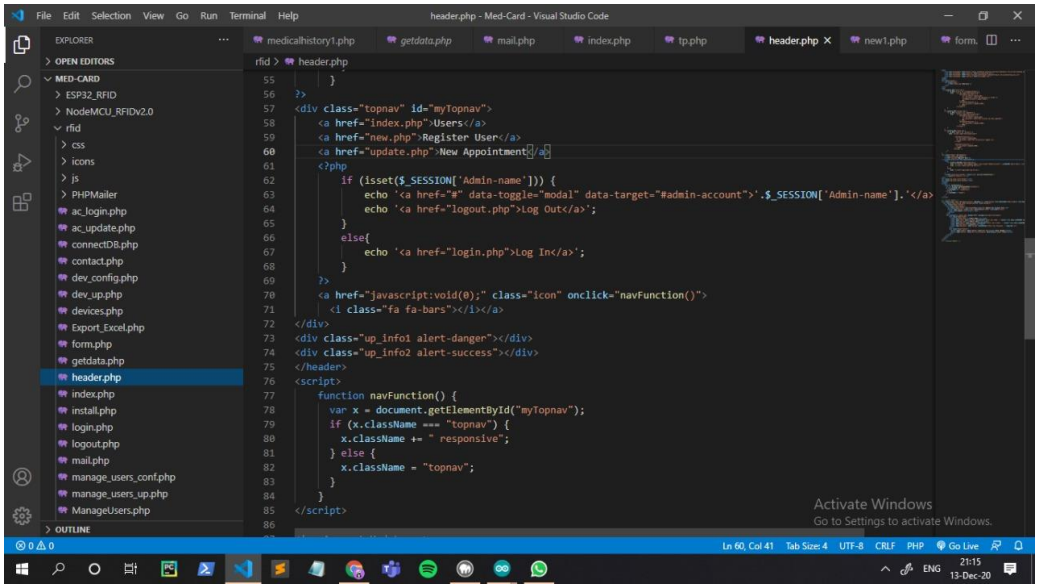
For research institutions, smart health card can reduce the cost of research, reduce research time, and improve the overall efficiency of research. With regard to macro decision-making, smart health card can improve the status quo of medical resource inequality, push the process of medical reform, promote the implementation of prevention strategies, and reduce social medical costs.

CHAPTER 8
APPENDIX: CODE SAMPLE


connectDB.php - Med-Card - Visual Studio Code
<?php
/* Database connection settings */
$servername = "127.0.0.1:3308";
$username = "root";
//put your phpmyadmin username.(default is "root")
$password = "root";
//if your phpmyadmin has a password put it here.(default is "root")
$dbname = "rfidattendance";
$conn = mysqli_connect($servername, $username, $password, $dbname);
if ($conn->connect_error) {
die("Database Connection failed: " . $conn->connect_error);
}
?>
Activate Windows
Go to Settings to activate Windows.

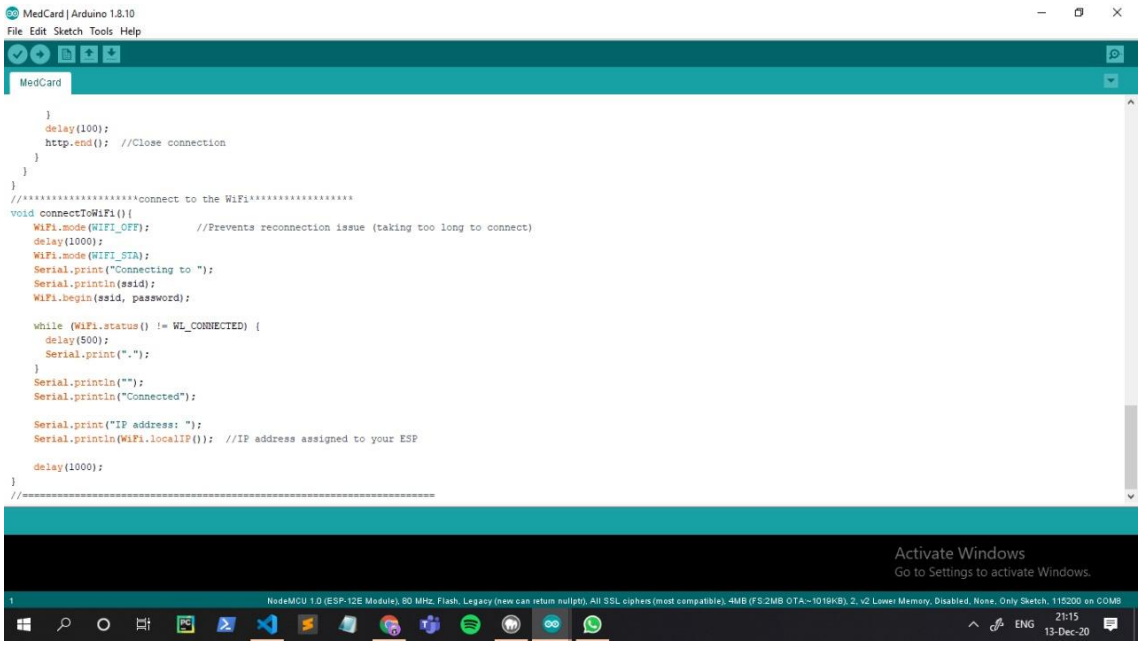

index.php - Med-Card - Visual Studio Code
<?php include'header.php'; ?>
<main>
<section>
<h1 class="slideInDown animated">Patient Details:</h1>
<!--User table-->

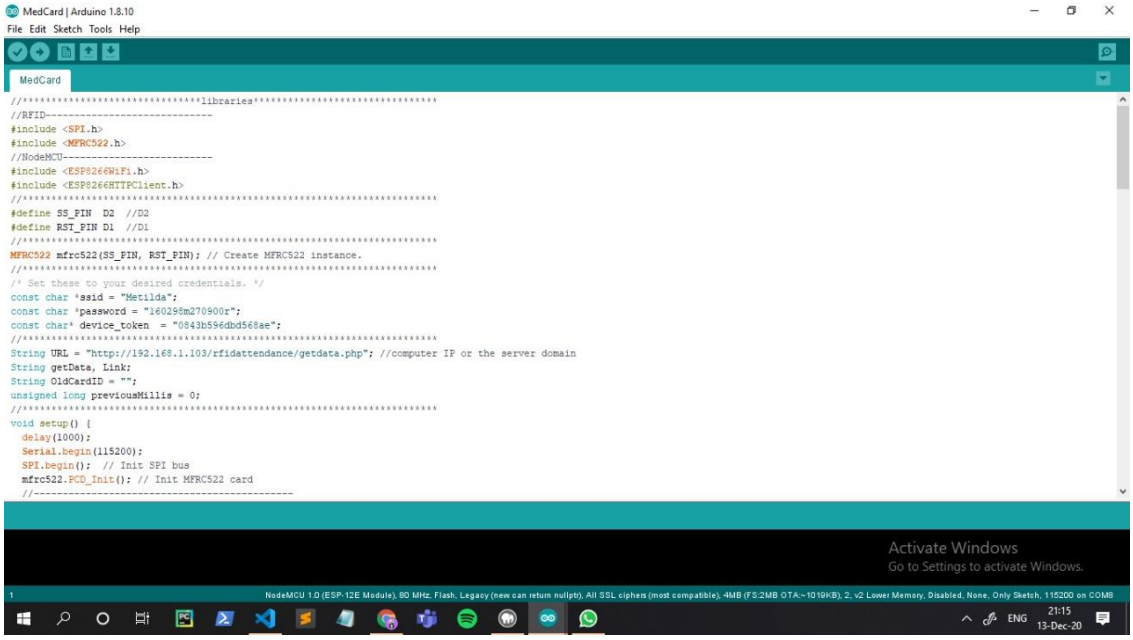
<table class="table">
<thead class="table-primary">
<tr>
<th>Name</th>
<th>Gender</th>
<th>Blood Group</th>
<th>Family Doctor</th>
<th>Last Update</th>
</tr>
</thead>
<tbody class="table-secondary">
<?php
//Connect to database
require'connectDB.php';
$sql = "SELECT * FROM users";
$result = mysqli_stmt_init($conn);
if (!mysqli_stmt_prepare($result, $sql)) {
echo ' SQL Error ';
}
else{
mysqli_stmt_execute($result);
$result1 = mysqli_stmt_get_result($result);
if (mysqli_num_rows($result1) > 0){
while ($row = mysqli_fetch_assoc($result1)){
?>
Activate Windows
Go to Settings to activate Windows.


header.php - Med-Card - Visual Studio Code
}
?>

Users
Register User
New Appointment
<?php
if (isset($_SESSION['Admin-name'])) {
echo ''.$_SESSION['Admin-name'].'
echo 'Log Out';
}
else{
echo 'Log In';
}
?>

</header>
<script>
function navFunction() {
var x = document.getElementById("myTopnav");
if (x.className === "topnav") {
x.className += " responsive";
} else {
x.className = "topnav";
}
}
</script>
Activate Windows
Go to Settings to activate Windows.


MedCard | Arduino 1.8.10
File Edit Sketch Tools Help
MedCard
}
delay(100);
http.end(); //Close connection
}
}
}
//********************connect to the WiFi******************
void connectToWiFi(){
WiFi.mode(WIFI_OFF); //Prevents reconnection issue (taking too long to connect)
delay(1000);
WiFi.mode(WIFI_STA);
Serial.print("Connecting to ");
Serial.println(ssid);
WiFi.begin(ssid, password);
while (WiFi.status() != WL_CONNECTED) {
delay(500);
Serial.print(".");
}
Serial.println("");
Serial.println("Connected");
Serial.print("IP address: ");
Serial.println(WiFi.localIP()); //IP address assigned to your ESP
delay(1000);
}
//===
Activate Windows
Go to Settings to activate Windows.
NodeMCU 1.0 (ESP-12E Module), 80 MHz, Flash, Legacy (new can return nullptr), All SSL ciphers (most compatible), 4MB (FS:2MB OTA:~1019KB), 2, v2 Lower Memory, Disabled, None, Only Sketch, 115200 on COM8
ENG
21:15
13-Dec-20


MedCard | Arduino 1.8.10
File Edit Sketch Tools Help
MedCard
//*********************************libraries*********************************
//RFID-------------------------------
#include <SPI.h>
#include <MFRC522.h>
//NodeMCU----------------------------
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>
//***
#define SS_PIN D2 //D2
#define RST_PIN D1 //D1
//***
MFRC522 mfrc522(SS_PIN, RST_PIN); // Create MFRC522 instance.
//***
/* Set these to your desired credentials. */
const char *ssid = "Metilda";
const char *password = "160298m270900r";
const char* device_token = "0843b596dbd568ae";
//***
String URL = "http://192.168.1.103/rfidattendance/getdata.php"; //computer IP or the server domain
String getData, Link;
String OldCardID = "";
unsigned long previousMillis = 0;
//***
void setup() {
delay(1000);
Serial.begin(115200);
SPI.begin(); // Init SPI bus
mfrc522.PCD_Init(); // Init MFRC522 card
//--
Activate Windows
Go to Settings to activate Windows.
NodeMCU 1.0 (ESP-12E Module), 80 MHz, Flash, Legacy (new can return nullptr), All SSL ciphers (most compatible), 4MB (FS:2MB OTA:~1019KB), 2, v2 Lower Memory, Disabled, None, Only Sketch, 115200 on COM8
ENG
21:15
13-Dec-20

CHAPTER 9
ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

We are very thankful to F.C.R.I.T, Vashi and Mumbai University for adding this course into our syllabus .It helps us gain knowledge in hardware field and explore new possibilities. We are thankful to Prof.Suraj Khandare for guiding us and providing with necessary resources for successfully completing our project.

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Siddhant Nalawade
Eeshan Nanekar

CHAPTER 10
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REFERENCES

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