POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

HOSPITAL SMART CARD

NAME	REGISTRATION NO
1. **SITI NUR ANTASHA ALAINA BINTI JEFRI**	**08DEU20F2002**

JABATAN KEJURUTERAAN ELEKTRIK

SESI 2 2022/2023

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This report submitted to the Electrical Engineering Department in fulfillment of the requirement for a Diploma in Electrical Engineering

JABATAN KEJURUTERAAN ELEKTRIK

SESI 2 2021/2022

CONFIRMATION OF THE PROJECT

The project report titled "Hospital Smart Card " has been submitted, reviewed and verified as a fulfills the conditions and requirements of the Project Writing as stipulated

Checked by:

Supervisor’s name :

Supervisor’s signature:

Date :

Verified by:

Project Coordinator name :

Signature of Coordinator :

Date :

"I acknowledge this work is my own work except the excerpts I have already explained to our source."

1. Signature :

Name : **SITI NUR ANTASHA ALAINA BINTI JEFRI**

Registration Number : **08DEU20F2002**

Date : 25 MAY 2023

DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE : HOSPITAL SMART CARD

SESSION: SESI 2: 2022/2023

1. I, **1. SITI NUR ANTASHA ALAINA BINTI JEFRI, 08DEU20F2002**

   is a final year student of **Diploma in Electrical Engineering, Department of Electrical, Politeknik Sultan Salahuddin Abdul Aziz Shah**, which is located at **Persiaran Usahawan,40140 Shah Alam Selangor Darul Ehsan**. (Hereinafter referred to as 'the Polytechnic').

2. I acknowledge that 'The Project above' and the intellectual property therein is the result of our original creation /creations without taking or impersonating any intellectual property from the other parties.

3. I agree to release the 'Project' intellectual property to 'The Polytechnics' to meet the requirements for awarding the **Diploma in Electrical Engineering** to me.

Made and in truth that is recognized by;

a) **SITI NUR ANTASHA ALAINA**) .
(Identification card No: - 020702050300) ....…….
)**SITI NUR ANTASHA ALAINA BINTI JEFRI**

In front of me, Click here to enter text. (Click here to enter text.)) .....……
As a project supervisor, on the date:) **NAAGAJOOTHI A/P ADIN NARAINA**

ACKNOWLEDGEMENTS

I have made efforts in this Project. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them. I am highly indebted to Naagajoothi A/P Udin Naraina for their guidance and constant supervision as well as for providing necessary information regarding the Project & also for their support in completing the Project.

I would like to express my gratitude towards my parents & member of (Electrical Department) for their kind co-operation and encouragement which help me in completion of this Project. I would like to express my special gratitude and thanks to the industry people for giving me such attention and time.

My thanks and appreciations also go to my colleague in developing the Project and the people who have willingly helped me out with their abilities.

ABSTRACT

Smart cards have grown in popularity in recent years due to their capacity to securely store and process massive amounts of data. Smart cards have the potential to revolutionize patient care in the healthcare industry by providing a safe and effective means of managing patient information. This study focuses on the creation of an RFID-enabled smart card system for hospitals. A smart card holder identifier, an access controller for hospital doors, and a smart card reader/writer are all part of the system. Electronic circuit design, operation principles, serial communication with a computer, and software are all thoroughly studied. The smart card system offers various advantages to hospitals, including enhanced security and access management. Only authorized staff can use the smart card to get entry to restricted locations such as patient rooms, laboratories, and pharmaceutical storage spaces. Furthermore, the smart card can contain critical patient information such as medical history, medications, and allergies, which can be accessed at any time by authorized healthcare practitioners. A comprehensive access control network for hospital doors is being discussed to deploy the smart card system. This entails installing smart card readers at all entrance points and creating software to manage access control rights. Overall, smart card use in hospitals has the potential to significantly improve patient care and safety. Hospitals may ensure that patient data stays confidential and that only authorized staff have access to sensitive areas by securely storing and accessing patient information and providing access control to restricted areas.

ABSTRAK

Kad pintar semakin popular sejak beberapa tahun kebelakangan ini kerana kapasitinya untuk menyimpan dan memproses sejumlah besar data dengan selamat. Kad pintar berpotensi untuk merevolusikan penjagaan pesakit dalam industri penjagaan kesihatan dengan menyediakan cara yang selamat dan berkesan untuk mengurus maklumat pesakit. Kajian ini memfokuskan kepada penciptaan sistem kad pintar berdaya RFID untuk hospital. Pengecam pemegang kad pintar, pengawal akses untuk pintu hospital dan pembaca/penulis kad pintar adalah sebahagian daripada sistem. Reka bentuk litar elektronik, prinsip operasi, komunikasi bersiri dengan komputer, dan perisian semuanya dikaji dengan teliti. Sistem kad pintar menawarkan pelbagai kelebihan kepada hospital, termasuk keselamatan yang dipertingkatkan dan pengurusan akses. Hanya kakitangan yang diberi kuasa boleh menggunakan kad pintar untuk mendapatkan kemasukan ke lokasi terhad seperti bilik pesakit, makmal dan ruang simpanan farmaseutikal. Tambahan pula, kad pintar itu boleh mengandungi maklumat pesakit kritikal seperti sejarah perubatan, ubat-ubatan dan alahan, yang boleh diakses pada bila-bila masa oleh pengamal penjagaan kesihatan yang dibenarkan. Rangkaian kawalan akses yang komprehensif untuk pintu hospital sedang dibincangkan untuk menggunakan sistem kad pintar. Ini memerlukan pemasangan pembaca kad pintar di semua pintu masuk dan mencipta perisian untuk mengurus hak kawalan akses. Secara keseluruhan, penggunaan kad pintar di hospital berpotensi meningkatkan penjagaan dan keselamatan pesakit dengan ketara. Hospital boleh memastikan bahawa data pesakit kekal sulit dan hanya kakitangan yang diberi kuasa mempunyai akses ke kawasan sensitif dengan menyimpan dan mengakses maklumat pesakit dengan selamat dan menyediakan kawalan akses ke kawasan larangan.

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CHAPTER 1

1 INTRODUCTION

1.1 Introduction

Recently, our nation has been stunned by the news that our hospital system is very low other than system in hospital in other country. This may be an exceptionally genuine issue since the community feels lower. In Malaysia, it still not concerned about the establishment of this hospital record system. This venture’s primary thought is to plan a kind of framework that can change the hospital record system to become more technologies and upgrade system. In this extend, it is counting 3 sections of the full model. In general, the end outcome of this project will be a function that connects customers' or patients' personal information with the server or medical center that complies with the system (Figure 1.1). Aside from critical security, the system should ensure the integrity of all records. The database development, smart card application, and interface programmed are the three key components of this project. The focus of the study is on information technology (IT) knowledge. Aside from comprehending human computer interaction (HCI), the author must also become acquainted with the graphical user interface (GUI) design process. These two subjects will primarily serve as a bridge between humans and machines. The cornerstone of this endeavor, however, would be Arduino programming.

In addition to distributing knowledge of the specific smart card architecture, the author must become acquainted with advanced programming language skills. Technically, the author will face a wide range of new areas of study related to IT knowledge.

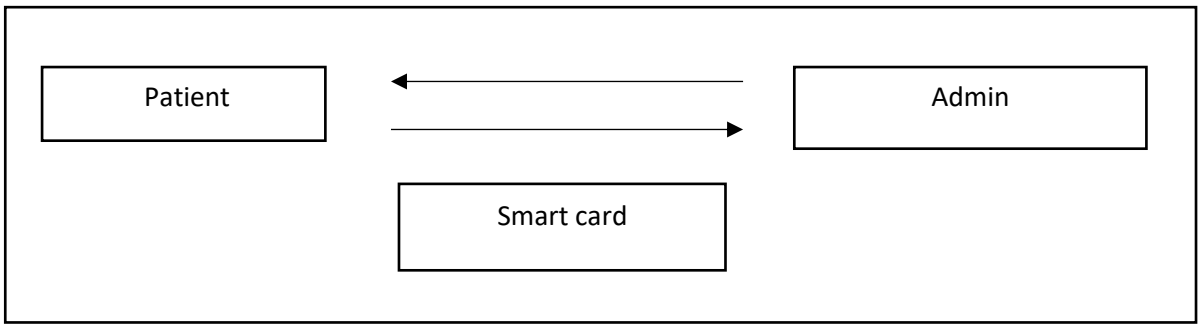


figure 1.1 Basic layout of hospital smart card

1.2 Problem Statement

In the old days we recorded health using paper. We can see how thick and how much paper is used for all patients who come to the hospital. For information, there are several problems encountered when using the current patient record system. The first problem is that it can be a waste of time. This happens because nurses will take time to find our health records that use paper. The second problem is that when we use a lot of paper, we can indirectly destroy the habitat of trees. This is because paper is made from trees; when a lot of paper is processed, a lot of trees will also be cut down. This destruction can lead to environmental destruction. The third problem is that this old system uses a lot of human power. The use of human power occurs because the process of finding records and keeping patient health records is from human power.

1.2.1 Problem Identification\

Several issues have been observed at medical organizations that demand the completion of this project:

a) The traditional method of registering a new patient.

b) A filing system based on plain cards can be inconvenient for archival purposes.

c) Other general practitioners (GP) do not dynamically communicate patient information for optimal orientation.

d) Patients' medical histories are fast lost for future reference.

g) Clinics and hospitals do not share patient medical information.

As far as the author is concerned, the implementation of this project will result in new concerns such as: a) the possibility of unlawful access.

b) Attempting to compromise a terminal database or smart card architecture.

b) The client's misfortune of losing the smart card.

d) The client's burden of carrying many smart cards at the same time.

1.3 Research Objectives

This project requires less theory on pass course to be practiced, allowing the author to go deeper into IT knowledge. However, the author must become acquainted with the specific smart card architecture, such as the electrical characteristics of the card. There will be two approaches involved in finishing this project, which will be separated into two semesters:

a) Semester 1 - Create a rough interface layout and exact information for the system, as well as tools for Arduino programming.

b) Semester 2 - Create and test the prototype, database, and client terminal system in preparation for successful implementation.

The main objective of this Project is to reduce time wastage. This project uses a technology system that uses the concept of golden time. This project can save nurses time in keeping patient health records by only using smart cards. The second objective is to save the forest from destruction as well as the habitat that lives in the

forest. So, when we want to save the forest indirectly, we will reduce the use of paper. The third objective is to reduce the use of human power. Human power can be reduced. Nurses can also save energy in the best way to treat patients in the hospital perfectly.

1.4 Scope of Research

The focus of this project is to give ease to the patient of hospital with build hospital smart card. This card will save all the profile, history of patient, the type of patient's illness. This RFID card system also can access certain departments of patients with touch card at the door scanner. The patient will touch the door sensor at a certain department of the patient and the door will be unlocked. It can prevent the other patient entering the wrong department in hospital. This project includes software and hardware. This project will be realized using a prototype that imitates the real function of RFID and Arduino system. This project only focuses on saving the tree at the forest and facilitating the patient with using smart card.

1.5 Project Significance

A Patient Smart Card is the product. The objectives of the second semester are critical after finishing the entire prototype. The Gantt chart [Appendix Al] summarizes the scheduled tasks and milestones for this semester of the final year project. It covers the complete timetable, from basic design and data structure construction to coding, testing, and report authoring. The project scope appears to be doable for the author to finish on time with the potential outcomes, and the time allowed will be employed efficiently for generating the entire product.

1.6 Chapter Summary

This project intends to improve Malaysia's hospital record system by using a technological foundation. The project's three main components are database development, smart card application, and interface programming. The emphasis is on knowledge of information technology (IT), particularly human-computer interaction (HCI) and graphical user interface (GUI) design. Arduino programming is the project's foundation.

The current paper-based patient record system has various flaws, including time wasted searching for records, environmental degradation due to paper usage, and a large reliance on human labor. Traditional patient registration techniques, difficult file systems, a lack of dynamic transmission of patient information among practitioners, loss of medical histories, and a lack of patient medical information sharing are among the issues reported in medical organizations.
The research objectives involve gaining knowledge of smart card architecture and its electrical characteristics. The project will be divided into two semesters, focusing on interface layout, exact system information, Arduino programming tools, and creating a prototype, database, and client terminal system. The project's main goals are to save time, preserve the environment by reducing paper usage, and reduce dependency on human power. The scope of the research includes the creation of a hospital smart card system that uses RFID technology to maintain patient profiles and medical histories and to grant access to certain departments. The project focuses on software and hardware implementation using a prototype that simulates the RFID and Arduino systems.

The project's relevance rests in developing a Patient Smart Card that addresses the highlighted difficulties. The Gantt chart depicts the tasks and milestones for design, coding, testing, and report writing. The project appears to be viable to execute within the timeframe specified, with efficient use of time to deliver the end output.

CHAPTER 2

2 LITERATURE REVIEW

2.1 Introduction

Deciding what is excellent or bad is highly subjective. It is dependent on the user's opinion on how to apply the subject. Some people may find the Hospital Smart Card insulting, and vice versa. Technologically, this application can be viewed as an advancement in the health-care system. It would be hard to satisfy everyone, as some could see it as a burden.

2.2 A Specific Application in the Hospital

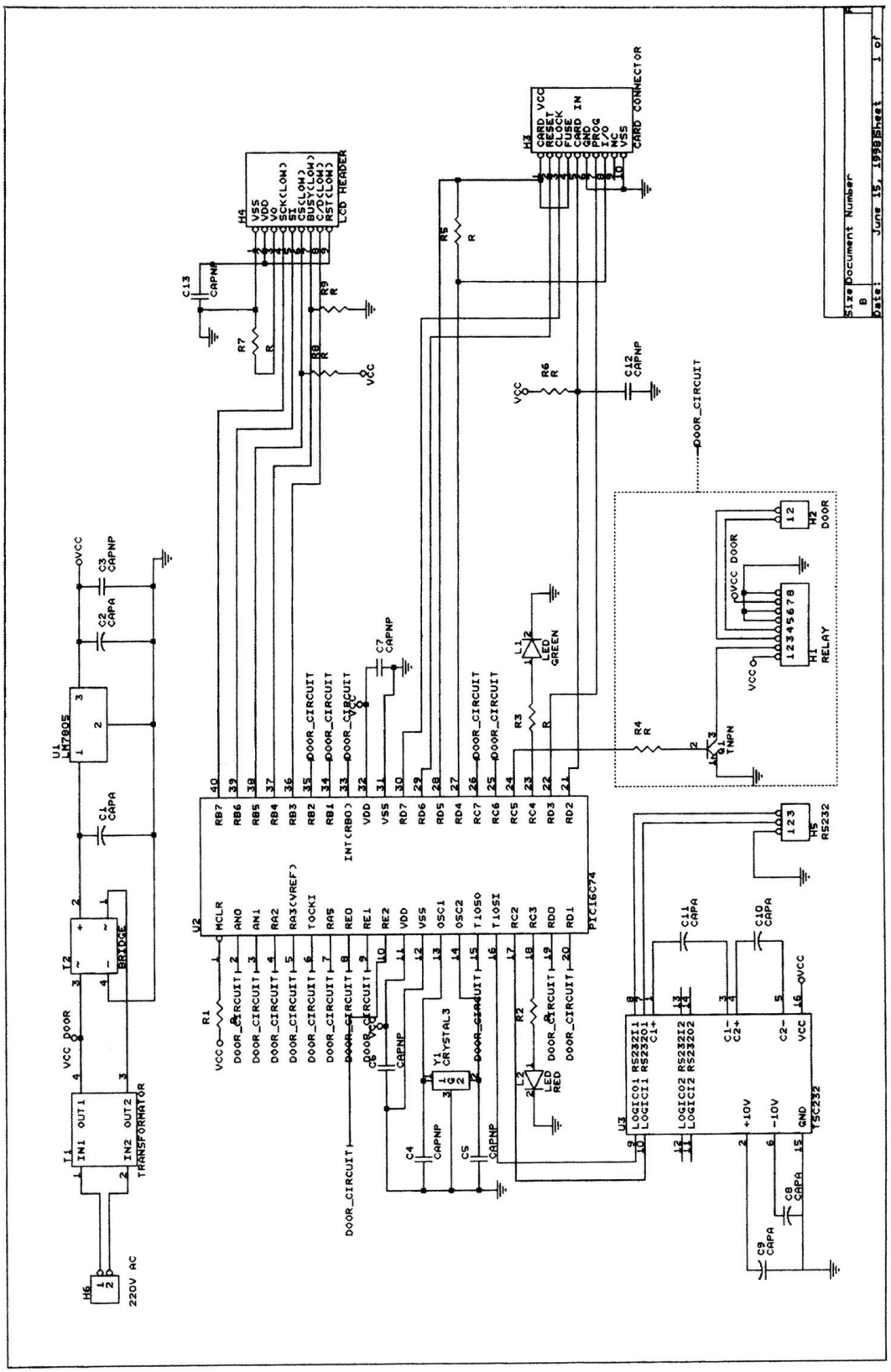
A smart card is a plastic card the size of a credit card that contains an integrated circuit (IC). The IC incorporates a microprocessor and memory, allowing smart cards to process and store more data than was previously possible. Smart cards are secure because they limit who has access to the data stored on the card. It can be used for both payment and non-payment transactions, such as information storage and exchange in hospitals. A nonpayment card's improved capacity and processing capabilities allow it to store all relevant patient data and emergency information.

Many advantages are possible with a smart card that were not possible with a magnetic strip, such as the ability to manage information for multiple applications on the same card, the ability to perform 1 million write/erase cycles, and the active computing power of the microprocessor to check the authenticity of the system and safeguard against unauthorized use. The ability to encrypt data and store it in unreadable places aids in preventing unauthorized reading and cloning, which plagues some magnetic strip systems. Microchips with varying memory capacities and functional properties can provide customers with solutions for a variety of applications. Furthermore, chip cards are less expensive when the magnetic strip card infrastructure is easily updated with the equipment required to interface with smart cards for healthcare applications. (1)

Smart Card Applications

The passage discusses the use of smart cards and their applications in various sectors. It highlights the importance of subscriber identification modules (SIM) in GSM phones for secure mobile communication. Smart cards are widely used for electronic payments, functioning as stored value cards that can be used for retail transactions. They also find applications in identification and access control systems, membership cards, payphones, transportation systems, and healthcare services. The project mentioned in the passage focuses on designing an electronic circuit using a microcontroller, LCD display, analog circuits, serial communication, access control circuits, position indicators, and a card connector to read and write Gemplus GPM896 memory type smart cards. The circuit serves as a general reader/writer through the serial port, allowing modification of smart card content. Additionally, it acts as a card holder identifier and access controller for a hospital, providing controlled access to its facilities based on smart card authentication. The electronic circuit design includes a microcontroller (PIC16C74), a liquid crystal display (VK4101), analog circuits for power regulation, serial communication using a dual driver/receiver, access control circuits with a relay, position indicators using LEDs, and a card connector for smart card insertion. The operation of the electronic circuit is divided into two modes: general reader/writer mode and card holder identifier/access controller mode. In the reader/writer mode, the circuit can read and modify smart card content via the serial port. In the identifier/access controller mode, the circuit authenticates the smart card, activates the access control circuit to open the door, displays the card holder's name on the LCD, and indicates access confirmation using a green LED. If the card's secret codes are incorrect, access is denied, the door remains closed, and a red LED indicates access rejection. The passage also briefly mentions the possibility of expanding the electronic circuit to control multiple access points using additional I/O pins of the microcontroller, allowing it to manage access control for multiple doors.

Additionally, the passage mentions RS232 conventions, which are standards for data transmission over long lines, and explains the UART (Universal Asynchronous Receiver-Transmitter) registers and their addresses used for serial communication through the RS232 port.


TRANSFORMATOR
220V AC
LM7805
BRIDGE
CRYSTAL3
PIC16C74
TSC232
RS232
RELAY
TNPN
LED GREEN
LED RED
CARD CONNECTOR
LCD HEADER
DOOR_CIRCUIT
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2.3 Control System

The electronic circuit consists of the following main parts: Microcontroller, Liquid Crystal Display, Analog Circuits, Serial Communication, Access Control Circuits, Position Indicators, and Card Connector

2.3.1 Microcontroller

PIC16C74, 40 pin EPROM based 8-bit CMOS microcontroller of Microchip.

family is used for this application. The general features are 35 single word instructions, 4096 x 14 on-chip EPROM program memory, 192 x 8 general purpose registers, interrupt capability, eight levels deep hardware stack, power saving SLEEP mode, and wide operating-voltage range (2.5 to 6.0V)

Liquid Crystal Display

VK4101 of Vikay family, an 8-character, 14-segment intelligent alphanumeric

display module, is used to display the messages. This module is designed to communicate with microcontroller through an 8-bit serial interface. The general features are low power consumption CMOS technology, built-in 14-segment ASCII alphanumeric decoder, two 32 x 4 static RAM for display data and blinking data storage, +5V single power supply, and serial data input.

2.4 Chapter Summary

The chapter goes over the elements of an electronic circuit that are employed in a specific application of a smart card system in a hospital. A microprocessor, a liquid crystal display (LCD), analogue circuits, serial communication, access control circuits, position indicators, and a card connector are the major components of the circuit. The microcontroller used is a PIC16C74, a 40-pin EPROM based 8-bit CMOS microcontroller from Microchip. It has features such as 35 single-word instructions, on-chip EPROM program memory of 4096 x 14, general-purpose registers of 192 x 8, interrupt capability, hardware stack with eight levels, power-saving sleep mode, and a wide operating voltage range of 2.5 to 6.0V.

The liquid crystal display (LCD) module used is the VK4101 from the Vikay family. It is an 8-character, 14-segment intelligent alphanumeric display module. It communicates with the microcontroller through an 8-bit serial interface. The module

features low power consumption CMOS technology, a built-in 14-segment ASCII alphanumeric decoder, two 32 x 4 static RAM for display data and blinking data storage, operates on a +5V single power supply, and accepts serial data input.

Overall, the mentioned components form the core of the electronic circuit used in the hospital smart card system, enabling functions such as data display, communication with the smart card, access control, and position indication.

CHAPTER 3

3 RESEARCH METHODOLOGY

3.1 Introduction

This project's completion involves multiple components and distinct stages. The three components of the system, namely the interface, client terminal, and database server, are mostly completed individually.

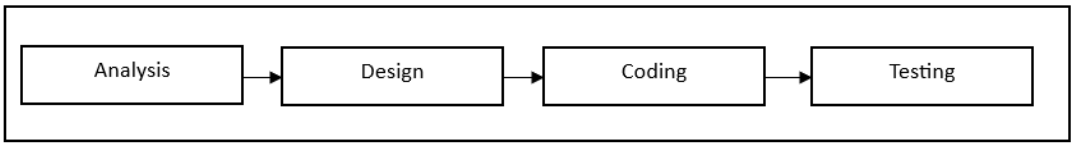


Figure 3.1. process of methodology

Project Design and Overview.

As mentioned in the previous chapter, the designed controller uses a closed-loop system with Arduino as the main controller. The design of the controller circuit using Arduino is realized using Proteus Software and then convert to PCB circuit. This Arduino will give control to save data and read the card. For the second output, Arduino will control the door to open card scanning at the reader.

3.1.1 Block Diagram of the Project

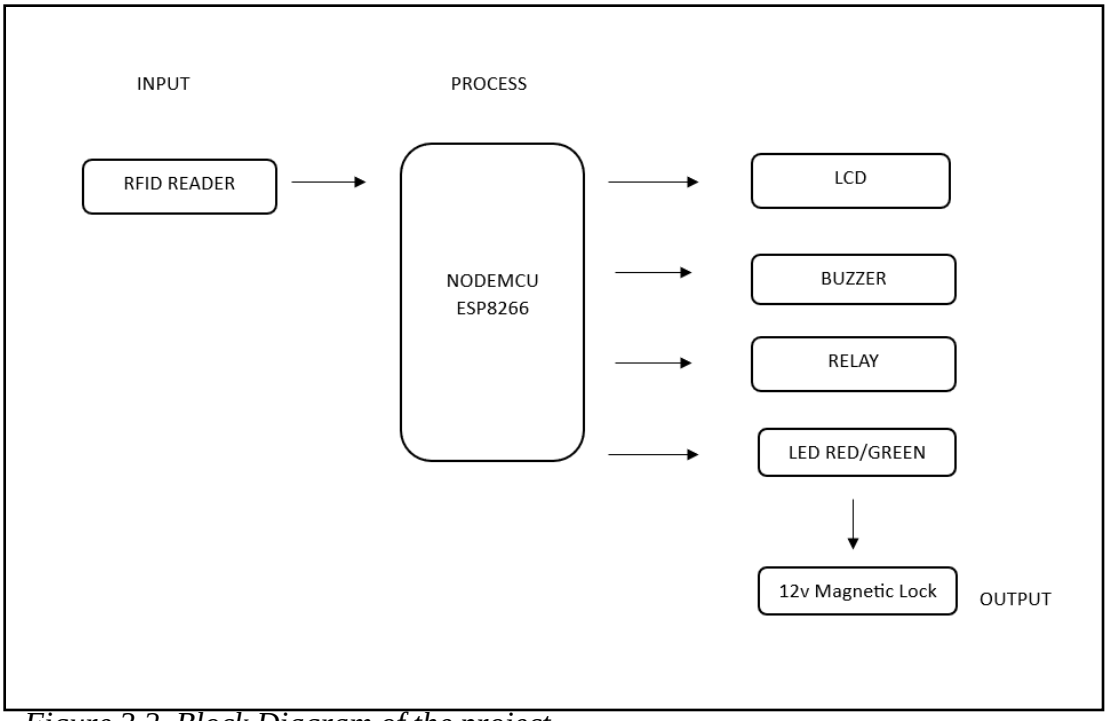


Figure 3.2. Block Diagram of the project

3.1.2 Flowchart of the Project 2

This flowchart shows the circuit diagram of the whole system. It shows that we have two flowcharts. The first flowchart is for saving the data from the card and reading the card. If we follow, we see in this first flowchart, we must scan first the card we have, and the scanner will read the data in the card. Then, they will connect to the application about personal information patient and history illness of patient. If the illness has addition, we will insert the information into the card by the laptop or computer. Lastly, we save it on the computer and automatically it will save it too in the smart card. As for the second flowchart, we are making for scanner door lock. First when we scanned our card at the scanner. Then, they process the card by reading the data in the card. When the reader has scanned the data, the door will open when you are in the right department but if you are at the wrong of your department, the LED red will be blinking, and door will not open.

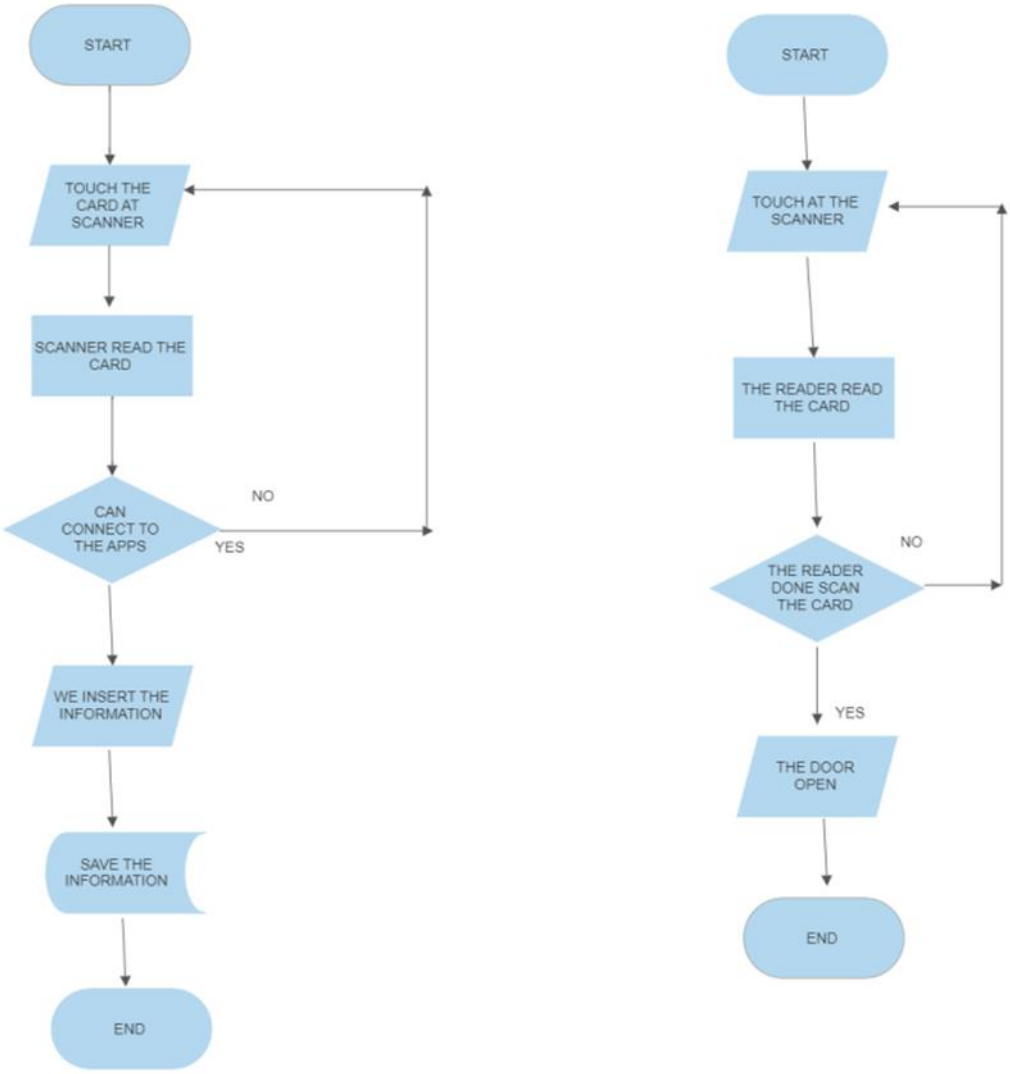


Figure 3.3: Flow chart of operation of the system

*Images may be subject to copyright

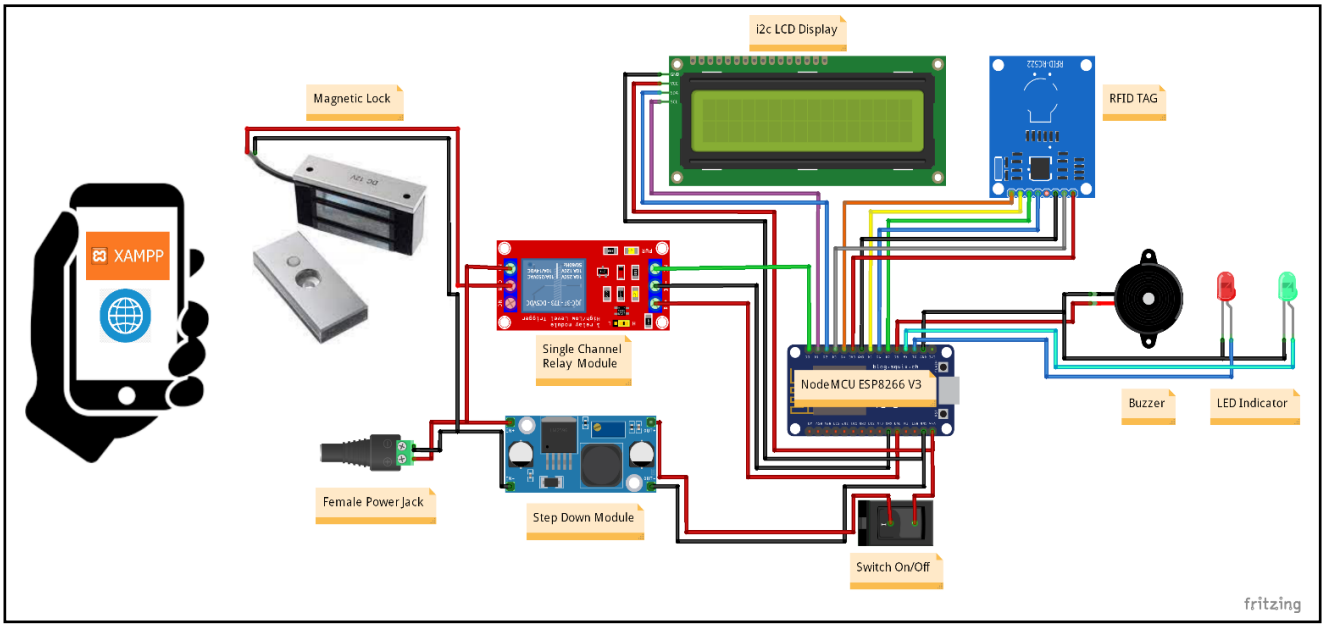
3.2 Project Hardware

As mentioned in the previous chapter, the designed controller is using Arduino Uno. This microcontroller will control and give instructions to all the components in the circuit. Then, we use Arduino RFID RC522 Card Reader. These components content RFID cards and also card readers. We also use LED to give the information

for user when the door lock will open or not. If the LED red blinking, the door will not open and if LED green blinking, the door will open. The buzzer we use to give the sound if the card is not related to the wrong department in the hospital.

3.2.1 Schematic Circuit

Error! Reference source not found. shows the overall circuit diagram of this Project for scanning the card and insert the information into the card.



3.2.2 Description of Main Component

1. **NodeMCU ESP8266**

The NodeMCU (Node MicroController Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds.

2. Arduino RFID RC522 Card Reader

The RC522 RFID module based on the MFRC522 IC from NXP is one of the cheapest RFID options you can get online for less than four dollars. It usually comes with an RFID card tag and a key fob tag with 1KB of memory. And the best part is that it can write a tag that means you can store any message in it.

3.2.2.1 Component 1

1. Buzzer

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

3.2.2.2 Component 2

1. LED

The Bi-color LED is a handy little component that allows two colors (red and green) in a single LED while only having two pins (cathode and anode). The color of the LED depends on the polarity of the connection, only allowing one color at a time. This LED can easily be applied to a circuit to visually indicate polarity direction. Or in my case it can save me an extra i/o pin on a forthcoming Arduino project.

3.2.2.3 Component 3

1. Relay 5V

Relay is one kind of electro-mechanical component that functions as a switch. The relay coil is energized by DC so that contact switches can be opened or closed. A single channel 5V relay module generally includes a coil, and two contacts like normally open (NO) and normally closed (NC).

3.2.2.4 Component 4

1. Adapter 12V (2 AMP)

This 12V 2A Power Adapter is a high-quality power supply manufactured specifically for electronics. These are switch mode power supplies which means the output is regulated to 12V and the capable output current is much higher (2000mA).

Specification:

Voltage Input: AC 100-240V

Frequency Response: 50/60Hz

3.2.2.5 Component 5

1. Step Down Module

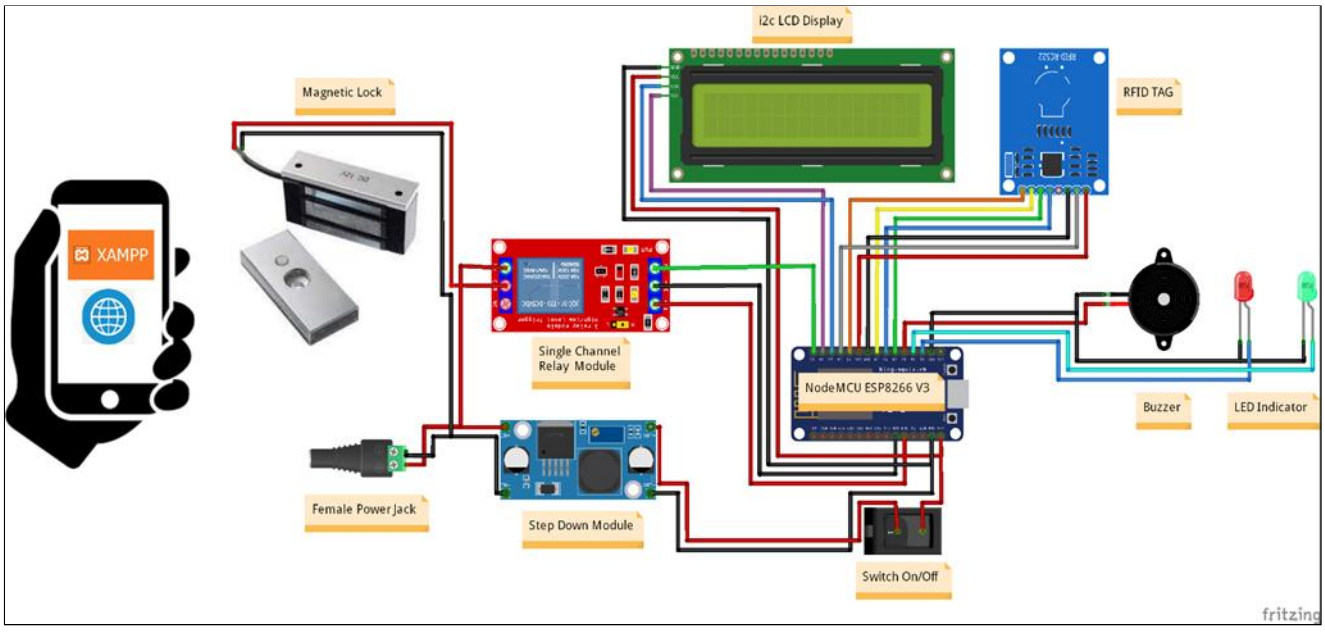
The LM2596 regulator is monolithic integrated circuit ideally suited for easy and convenient design of a step−down switching regulator (buck converter). It can drive a 3.0 A load with excellent line and load regulation. It is internally compensated to minimize the number of external components to simplify the power supply design. Since LM2596 converter is a switch−mode power supply, its efficiency is significantly higher in comparison with popular three−terminal linear regulators, especially with higher input voltages. The LM2596 operates at a switching frequency of 150 kHz thus allowing smaller sized filter components than what would be needed with lower frequency switching regulators. Available in a standard 5−lead TO−220 package with several different lead bend options, and D2PAK surface mount package. The other features include a guaranteed 4% tolerance on output voltage within specified input voltages and output load conditions, and 15% on the oscillator frequency. External shutdown is included, featuring 80 A (typical) standby current. Self-protection features include switch cycle−by−cycle current limit for the output switch, as well as thermal shutdown for complete protection under fault conditions.

3.2.2.6 Component 6

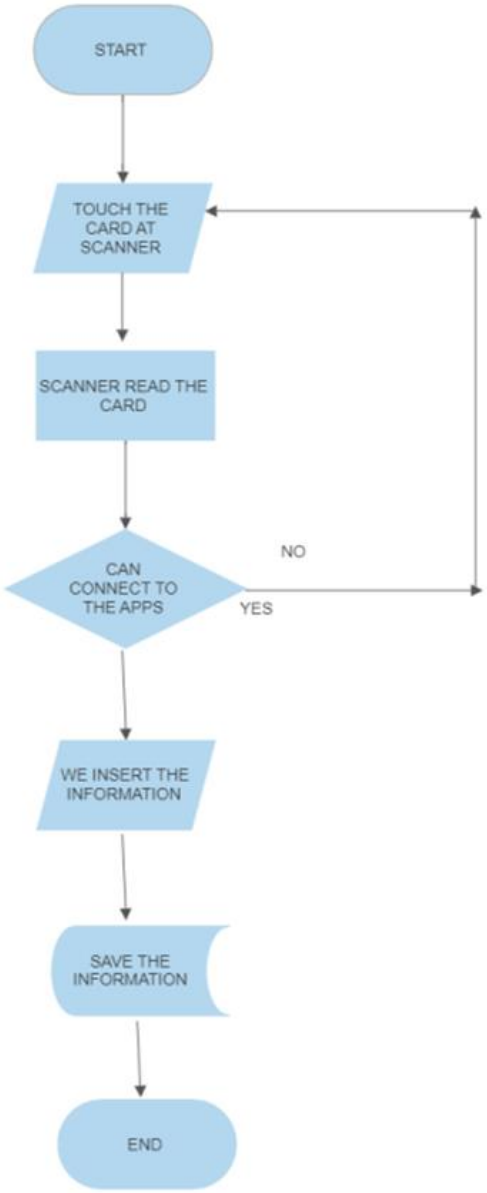
1. LCD Display

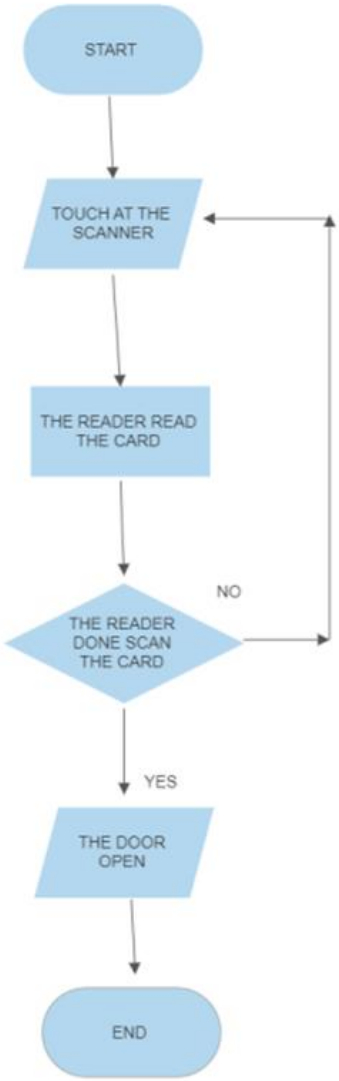
LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

3.2.3 Circuit Operation



3.2.4 Flowchart of the System





3.2.5 Description of Flowchart

It shows that we have two flowcharts. The first flowchart is for saving the data from the card and reading the card. If we follow, we see in this first flowchart, we must scan first the card we have, and the scanner will read the data in the card. Then, they will connect to the application about personal information patient and history illness of patient. If the illness has an addition, we will insert the information into the card by the laptop or computer. Lastly, we save it on the computer and automatically it will save it too in the smart card. As for the second flowchart, we are making for scanner door lock. First when we scanned our card at the scanner. Then, they process the card by reading the data in the card. When the reader has scanned the data, the door will open when you are in the right department but if you are at the wrong of your department, the LED red will be blinking, and door will not open.

3.2.6 Mechanical Design/Product Layout

Figure 3.4. Design of the project

3.3 Sustainability Element in The Design Concept

This prototype's focus is to save the destruction of trees. That's means that the trees and forests in our world are in very bad condition is why these prototypes exist because it reduces the use of trees to make paper. That shows most of tree destruct that because of the use of a lot of paper without limits. Next, this prototype also provides to open the department door. This is very useful for all hospital departments such as Radiology, Neurology and all the departments in the hospital, because they can prevent people and other patients from entering the hospital department at will. Lastly, this project can reduce the use of manpower. One of the prototype's functions is to make it easier for people in the hospital.

3.4 Chapter Summary

The interface, client terminal, and database server must all be completed as part of the project. These elements are being developed separately. In a closed-loop system, Arduino serves as the primary controller. Proteus Software is used to build the controller circuit, which is then turned into a PCB circuit. Arduino oversees data storage, card reading, and door opening during card scanning. Overall, the project includes several components, circuitry, and flowcharts that will be used to construct a smart card system for hospital access control and data storage while including sustainable and efficient design elements.

CHAPTER 4

4 RESULTS AND DISCUSSION

4.1 Introduction

Financial resources for this project, most of the basic components and material used in this project are using our own money because we don't have a sponsor. The cost projection is estimated at RM500. This cost is under the budget, and this is quite cheaper than the others project. The development cost is still feasible for six months. It is viable and achievable based on the investigation conducted.

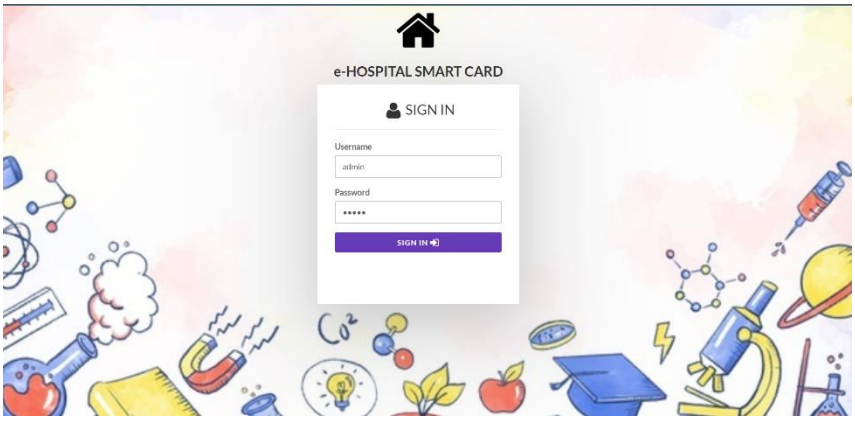
4.2 Results and Analysis

4.2.1.1 Interface and Data Structure

Web apps were used to design and construct the interface. The interface design has two basic components, which the author refers to as the system menu and data modules.

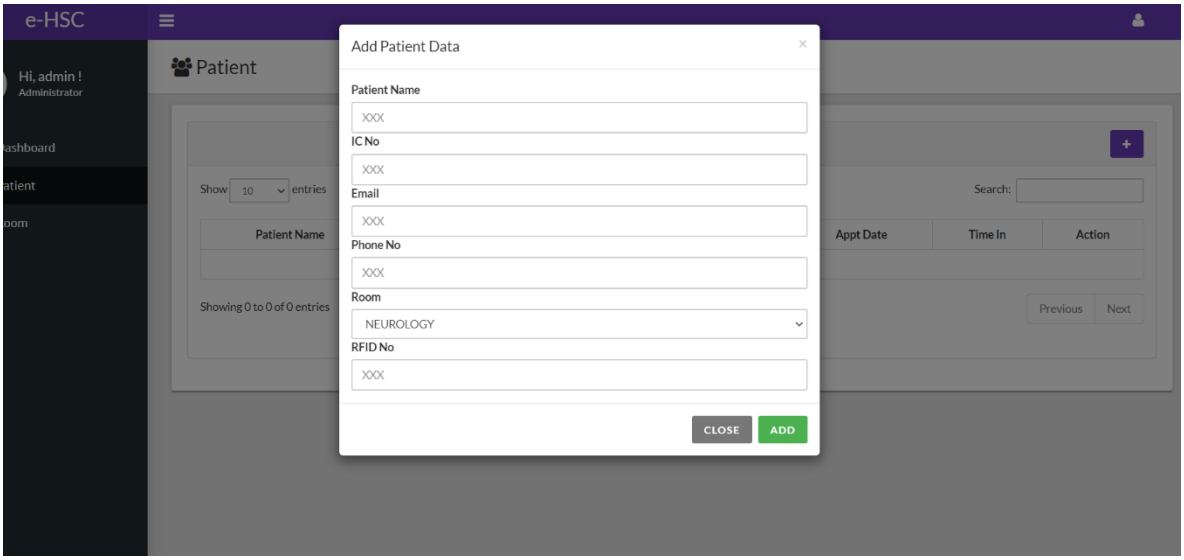
a) **System Menu**

The system starts with the main menu which will lead to the front page of website. The administrator must fill in the username and password.



The menu also indicates the card status and connectivity to the smart card.

Date and time are also included. The source code is critical for associating the reader, interface, and card [Appendix A3-l]. The link can be found in the Administrator menu. Administration workers can use this button to access the smart card's internal data contents and alter the core password. There is also an option to return to the main menu.



In this menu, the admin must add patient data. By scanning the card at scanner, the number of the card will be automatically filled in at RFID No. After that, we fill in the patient's name, ic, IC number, email patient, Phone no, and room or department of patients. Then, we add.

4.3 Chapter Summary

Overall, the financial resources for the project were self-funded, and the cost projection was within the budget. The interface and data structure of the system were successfully designed and implemented, providing functionality for user authentication, data entry, and management of the smart card system.

CHAPTER 5

5 CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

As a result, this project is a success because it meets the four objectives indicated previously. Gradually, the author can now make the project as big as it can be, and the relevance of the topic to engineering prospects is becoming clear.

5.1.1.1 Relevance to the Goals

The first objective is to reduce time wastage. This is completed because when using this Hospital smart card, the admin or the nurse can save time by not doing save the patients history with manual user by using paper.

The second objective is saving the forest from destruction as well as the habitat that lives in the forest. This is completed because, when using this card, paper consumption is reduced. Then the forest is saved and can save the habitats in the forest.

The last objective is to reduce the use of human power. This is completed because Human power can be reduced. Nurses can also save energy in the best way to treat patients in the hospital perfectly.

5.2 Conclusion

In conclusion, this project was successful in accomplishing the four objectives described above. The introduction of the Hospital smart card system has achieved the primary goal of decreasing time waste. By reducing the need for manual record-keeping on paper, the administrator or nurse can save time. The smart card system makes the process more efficient and time effective.

The second goal of preventing forest destruction and maintaining habitat has also been met. The initiative contributes to the protection of trees and the habitats they support by lowering paper usage through the installation of the smart card system. The use of electronic records rather than paper-based documentation minimizes the demand for paper, reducing the requirement for deforestation. Furthermore, the project achieved its goal of lowering the use of human labor. Smart card technology reduces the effort for nurses and administrators. Patient history management and data entry are automated, allowing healthcare workers to better use their time and energy in providing best patient care.

Overall, the project's performance in accomplishing these goals demonstrates its importance to engineering prospects. It highlights how technology and new solutions may be used to address difficulties in healthcare settings while also improving efficiency, environmental sustainability, and better resource management.

5.3 Chapter Summary

This chapter concludes that the project was effective in accomplishing the four objectives that were established earlier. Because administrators and nurses no longer must manually save patients' histories on paper, the installation of the Hospital smart card system has resulted in less time wasted. Furthermore, by lowering paper use using smart cards, the scheme has helped to save trees and their habitats. Finally, the goal of lowering human power utilization has been met, allowing nurses to better allocate their energy in providing best patient care. The project highlights the potential of technology and new solutions in tackling difficulties in healthcare facilities while encouraging efficiency, environmental sustainability, and improved resource management.

CHAPTER 6

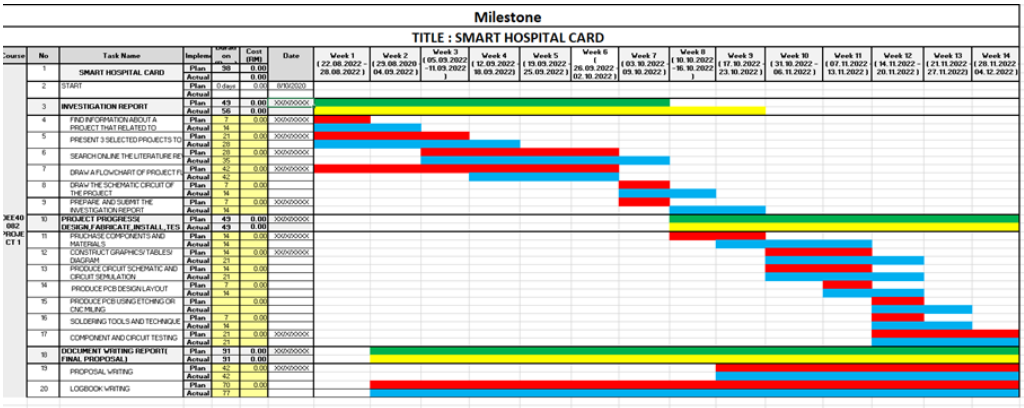
6 PROJECT MANAGEMENT AND COSTING

6.1 Introduction

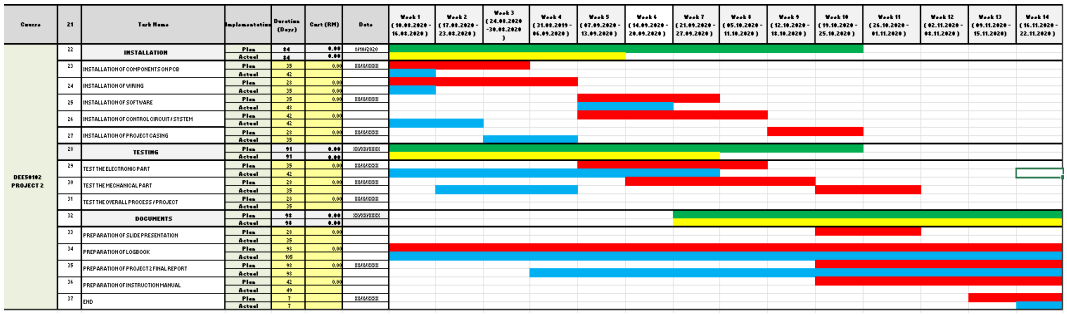
Financial resources for this project, most of the basic components and material used in this project are using our own money because we don't have a sponsor. The cost projection is estimated at RM500. This cost is under the budget, and this is quite cheaper than the others project. The development cost is still feasible for six months. It is viable and achievable based on the investigation conducted.

6.2 Gant Chart and Activities of the Projek

6.3 Semester 4



Semester 5



6.4 Cost and Budgeting

This project involves the cost of purchasing components and materials throughout its implementation components involving cost are hardware. Most of the hardware components are got from online purchase. Before buy the component, a survey was made into several online shops to compare prices, such as Shopee, Lazada and RS Component. This method makes it easier as well because it will save time and costs.

The overall gross budget estimate in the implementation of this project is less than RM 500 and other expenses is at as shown in Table 1 According to this budget cost, this project can be considered as a less costly project compared to other projects that can cost over a thousand ringgit. The cost of the project is also in line with one of the key features of a good project developer that is low cost but has a high-quality project.

NO	COMPONENT AND MATERIALS	THE UNIT PRICE	QUANTITY	TOTAL
1	NODEMCU ESP8266	RM 14.90	1	RM14.90
2	Adapter 12V (2AMP)	RM9.90	1	RM9.90
3	Jumper Wire Female to Female	RM2.50	1 BUNDLE	RM2.50
4	Jumper Wire Male to Female	RM2.50	1 BUNDLE	RM2.50
5	Jumper Wire Male to Male	RM2.50	1 BUNDLE	RM2.50
6	Female Power Jack	RM2.00	1	RM2.00
7	Step Down Module	RM3.00	1	RM3.00
8	Electric Box	RM4.50	1	RM4.50
9	Buzzer	RM1.00	1	RM1.00
10	Switch On/Off	RM1.60	1	RM1.60
11	LCD Display	RM11.00	1	RM11.00
12	RFID MODULE	RM9.00	1	RM9.00
13	LED GREEN\RED	RM0.10	2	RM0.20
14	Single Channel Relay Module	RM5.00	1	RM5.00
15	12v Magnetic Lock	RM50.00	1	RM50.00
	TOTAL			**RM119.60**
	LIST OF OTHER COSTING			
1	Transportation			RM30
2	Internet			RM 40
3	Craft Work			RM5.00
	TOTAL			**RM75.00**
	FULLY TOTAL			**RM194.60**

Table 1: List of Components and Materials

6.5 Chapter Summary

The summary of this chapter is that the project is being funded using the team's own money as they do not have a sponsor. The estimated cost of the project is RM500, which is considered low compared to other projects. The team conducted a survey of online shops to compare prices before purchasing the necessary hardware components, which helped save time and costs. The overall budget estimate for the project is less than RM500, making it a low-cost project with a focus on high-quality development.

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7 APPENDICES

APPENDIX A- PROGRAMMING

APPENDIX A

```
#include <SPI.h>
#include <MFRC522.h>

constexpr uint8_t RST_PIN = D3;     // Configurable, see typical pin layout above
constexpr uint8_t SS_PIN = D4;      // Configurable, see typical pin layout above

MFRC522 rfid(SS_PIN, RST_PIN);      // Instance of the class
MFRC522::MIFARE_Key key;

String rfid_card;     // Store rfid card id
String verification;  // Store notify id
int rfid_status;      //
String responReadStatus;
//========================================================================
===============
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 16, 2);

void init_LCD() {
  lcd.begin();                  // initial LCD setup
  lcd.backlight();              // Turn on the blacklight and print a message.
  lcd.setCursor (0, 0);         // splash screen and warmup
  lcd.print(" SMART HOSPITAL ");
  lcd.setCursor (0, 1);
  lcd.print("     SYSTEM     ");
```

```
  delay(2000);                  // set for at least 2 Seconds
  lcd.clear();
}

void init_Display() {
  lcd.clear();
  lcd.setCursor (0, 0);         // splash screen and warmup
  lcd.print("  PLEASE TOUCH  ");
  lcd.setCursor (0, 1);
  lcd.print("  YOUR ID CARD  ");
}

void closingMagneticDoor() {
  lcd.clear();
  lcd.setCursor (0, 0);         // splash screen and warmup
  lcd.print(" Door are Close ");
  lcd.setCursor (0, 1);
  lcd.print("     in 5s     ");
  delay(1000);
  lcd.setCursor (0, 1);
  lcd.print("     in 4s     ");
  delay(1000);
  lcd.setCursor (0, 1);
  lcd.print("     in 3s     ");
  delay(1000);
  lcd.setCursor (0, 1);
  lcd.print("     in 2s     ");
  delay(1000);
  lcd.setCursor (0, 1);
  lcd.print("     in 1s     ");
  delay(1000);
```

```
}

//=========================================================================
===============

#include <ESP8266HTTPClient.h>

#include <ESP8266WiFi.h>


// Setting connection

const char* ssid = "realme 7 pro";

const char* pswd = "zyan2002";

const char* host = "192.168.70.60"; //"rfid.mbrainsolutions.com"; // look at
computer/laptop IPv4 wifi server https://rfid.mbrainsolutions.com/login.php


void init_WiFi() {

 // Setting Wifi connection


 lcd.setCursor(0, 0);

 lcd.print("Status WIFI : ");

 lcd.setCursor(0, 1);

 lcd.print("   Connecting   ");

 delay(2000);


 WiFi.hostname("NodeMCU_ESP8266");

 WiFi.begin(ssid, pswd);


 //Check WiFi connection

 while (WiFi.status() != WL_CONNECTED)

 {

  //Nodemcu trying to connect

  Serial.print(".");

  delay(500);

 }
```

```
  //status for success connect
  Serial.println("WiFi CONNECTED");
  lcd.setCursor(0, 1);
  lcd.print("   Connected!   ");
  delay(3000);
  init_Display();
}
//=============================================================================
===============
// define global pin config
#define LED_Green    3
#define LED_Red      1
#define Buzzer       D8
#define Solenoid     D0

void init_PinMode() {
  pinMode(LED_Green, OUTPUT);
  pinMode(LED_Red, OUTPUT);
  pinMode(Buzzer, OUTPUT);
  pinMode(Solenoid, OUTPUT);

  digitalWrite(LED_Green, LOW);
  digitalWrite(LED_Red, HIGH);
  digitalWrite(Buzzer, LOW);
  digitalWrite(Solenoid, HIGH);
}
//=============================================================================
===============
void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);
  init_LCD();
```

```
  init_WiFi();
  init_PinMode();
  SPI.begin();     // Init SPI bus
  rfid.PCD_Init(); // Init MFRC522
  Serial.println("Start System");
}
//=========================================================================
===============
void loop() {
  // Read rfid card
  if ( ! rfid.PICC_IsNewCardPresent())
    return;
  if (rfid.PICC_ReadCardSerial()) {
    for (byte i = 0; i < 4; i++) {
      rfid_card += rfid.uid.uidByte[i];
    }
    //=========================================================
    // print out from item(String from serial monitor) and rfid_card(string from rfid tag)
    Serial.println("Tag ID's : " + String(rfid_card));
    //=========================================================
  }
  if (rfid_card) {

    buzzerCard_isScan();
    sentID_to_db();
    lcd.setCursor (0, 0);
    lcd.print(" Please Wait For");
    lcd.setCursor (0, 1);
    lcd.print("  Verification  ");
    delay(5000);
    readRfid_status();
```

```
    init_Display();


    if (rfid_status == 1) {
      buzzerCard_verified();
      digitalWrite(Solenoid, LOW); // unlock
      lcd.setCursor (0, 0);
      lcd.print("  Please Enter  ");
      lcd.setCursor (0, 1);
      lcd.print("    the Room    ");
      rfid_status = 0;
      closingMagneticDoor();
      sentRfid_status();
      digitalWrite(Solenoid, HIGH); // lock
    } else {
      // Do nothing here
    }
    digitalWrite(LED_Green, LOW);
    digitalWrite(LED_Red, HIGH);
    rfid_card = "";
    verification = "";
    rfid.PICC_HaltA();
    rfid.PCD_StopCrypto1();
    //Serial.println("");
  }
}
//================================================================================
===============
void buzzerCard_isScan() {
  digitalWrite(LED_Green, HIGH);
  digitalWrite(LED_Red, LOW);
  for (int x = 0; x <= 1; x++) {
```

```
   digitalWrite(Buzzer, HIGH);
   delay(150);
   digitalWrite(Buzzer, LOW);
   delay(150);
  }
}
//================================================================================
===============
void buzzerCard_verified() {
  digitalWrite(LED_Green, HIGH);
  digitalWrite(LED_Red, LOW);
  for (int x = 0; x <= 2; x++) {
   digitalWrite(Buzzer, HIGH);
   delay(200);
   digitalWrite(Buzzer, LOW);
   delay(200);
  }
}
//================================================================================
===============
void sentID_to_db() {
  // Process for sending data to server
  String Link;
  HTTPClient http;
  Link = "http://" + String(host) + "/project23-
magneticdoor/id_input_to_dataBase.php?pswd=" + String(rfid_card);
  //Serial.println(Link);
  http.begin(Link); // link execution
  http.GET();
  http.end();
}
```

```
//=========================================================================
===============

void sentRfid_status() {

  // Process for sending data to server

  String Link;

  HTTPClient http;

  Link = "http://" + String(host) + "/project23-
magneticdoor/id_name_to_dataBase.php?notify=" + String(rfid_status);

  //Serial.println(Link);

  http.begin(Link); // link execution

  http.GET();

  http.end();

  init_Display();

}

//=========================================================================
===============

void readRfid_status() {

  // Process to read status from database parking 1

  String LinkReadStatus;

  HTTPClient httpReadStatus;

  LinkReadStatus = "http://" + String(host) + "/project23-
magneticdoor/id_name_from_dataBase.php";

  httpReadStatus.begin(LinkReadStatus);

  // take value database through readparking_1

  httpReadStatus.GET();

  // read status response

  responReadStatus = httpReadStatus.getString();

  Serial.println(responReadStatus);

  httpReadStatus.end();

  //change status rfid_status on esp32

  rfid_status = responReadStatus.toInt();

}
```