



## **UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

### **DEVELOPMENT OF SMART LOCK FOR CLASSROOM USING NODEMCU ESP8266**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Electronics Engineering Technology (Industrial Electronics) (Hons.)

by

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TAJUK: **DEVELOPMENT OF SMART LOCK FOR CLASSROOM USING NODEMCU ESP8266**

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## **APPROVAL**

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Industrial Electronics) (Hons.). The member of the supervisory is as follow:

.....  
(RAEIHAN BINTI MOHD ZAIN)

## **ABSTRAK**

Kini, internet telah menjadi sebuah rangkaian yang penting serta merupakan penghubung antara alat elektronik yang digunakan untuk memudahkan kehidupan seharian. Tujuan projek ini adalah untuk membina pintu bilik kuliah kos rendah yang mampu dikawal melalui system dalam talian. Seterusnya, vandalism telah menjadi masalah utama yang berterusan sehingga ke hari ini. Masalah ini menyebabkan masyarakat berasa tidak selesa kerana mereka tidak dapat menggunakan kelengkapan terutama di univeristi yang telah disediakan oleh kerajaan. Dengan adanya sistem ini di universiti, tahap keselamatan di dalam bilik kuliah dapat ditingkatkan dengan mengurangkan risikko vandalism terutama pada waktu malam. “The Development of Smart Lock for Classroom Using NodeMCU ESP8266” adalah sistem pintu bilik kuliah boleh dikawal oleh aplikasi telepon pintar dengan menggunakan kata laluan yang sah melalui modul WI-FI. Terdapat dua cara untuk membuka pintu. Pertama, modul WI-FI, aplikasi Android dan kunci pintu solenoid digabungkan bertujuan membolehkan proses pembukaan pintu melibatkan orang yang dibenarkan melalui sistem dalam talian dari luar kelas. Kedua, sensor PIR serta sensor pintu magnetik digunakan untuk mengesan pergerakan di dalam kelas dan seterusnya membuka kunci pintu solenoid dengan menghantar isyarat kepada NodeMCU ESP8266. Di bahagian ini, penggera akan berfungsi apabila pintu dibuka dalam masa yang ditetapkan di dalam sistem. Sistem ini merupakan aplikasi yang luas kerana ianya boleh diakses secara dalam talian.

## **ABSTRACT**

Nowadays, the internet has become a vital part of our daily lives and common interface in many electronic devices which have been used to simplify people's daily lives. The purpose of this project is to develop a low cost classroom's door that can be controlled through online system. Furthermore, vandalism in our community has become major problem that continues on arise every day. This problem has made the community become uncomfortable because they are unable to use the facility provided, especially in university culture that being provided by the government. By implementing this system at university, the safety level of the classroom can be improved by reducing the risk of vandalism especially during night activities. The Development of Smart Lock for Classroom Using NodeMCU ESP8266 is a system where classroom's door can be controlled by smartphone application using valid identification and password via WI-FI module. There are two ways of opening the door. Firstly, WI-FI module, Android's application and solenoid door lock combined to operate door accessibility for the authorized person through online system from outside the classroom. Secondly, PIR sensor as well as magnetic door sensor used to detect movement in the classroom thus opening the door lock by sending a signal to the controller. In this part, the buzzer will functionally ON when the door is open within short amount of time set in the system. This system finds a wide application in areas where physical presence is not always possible.

## **DEDICATION**

To my lovely parents.

## **ACKNOWLEDGEMENT**

All praise to Allah because the report was finished with successfully. This report would not have been possible without considerable guidance and support from those who involved from the beginning until end. I would like to acknowledge those who have enabled to complete this project. In particular, I wish to express my sincere appreciation to my supervisor also as a coordinator for this final project, Madam Raeihah Bt Mohd Zain for encouragement, guidance, critics and friendship in order to finish up the entire requirement needed in completing the report. Secondly, I would like to express my appreciation toward both of my father and mother who has contributed regardless in energy, time and money in order to help me complete this task. Thirdly, special thanks go to my friends especially my housemates who help me to solve many problems as well as gave suggestion and idea about the project. My sincere appreciation also extends to all my colleagues and others who have provided assistance at various occasions. Finally, I would like to thanks to my big family for their understanding, encouragement and support towards the completion of my report.



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# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

This chapter will describe guidance for preparing the entire content of the report, including project background, problem statement, goals, scope, and expected project outcomes. In this section, each section will be further described.

### 1.1 Project Background

Nowadays, the Internet has become a vital part of our daily lives. It became an important connection between electronic devices and people's daily lives. The internet is a powerful tool that has enabled the user to search, store and manage their own information. Since its introduction, the amount of people visiting the web has risen drastically and became one of the primary basis of communication in daily lives. Electricity is a powerful part of functioning as a society in today's culture. Online management system was invented to make good use of internet. Development of Smart Lock for Classroom using NodeMCU ESP8266 that allow user to control any connected classroom door through smartphone application. By implementing this system in university, it can also improve the security level of the classroom by reducing the risk of vandalism especially during night activities. Thus, the university may no longer need to hire technicians to manage all the lecture halls because the electromagnetic door lock would be controlled by an authorized person via online system. Thus, the university may

no longer need to hire technicians to manage all classroom because an authorized person would control the electromagnetic door lock via an online system.

## **1.2 Problem Statement**

Vandalism is a growing international problem that continues on arise every day. According to statistics, the police department reported nearly 492 cases last year. This problem has made the community become uncomfortable because they are unable to use the facility provided, especially in university culture that being provided by the government effectively. This project is developed in order to encounter these troublesome issues.

In addition, it is also wastes of manpower because the technician has to check each classroom and lock the door one by one every day after class session. So, it is actually a waste of time and unsystematic. Thus, this project aims to establish a minimal-cost system which offer real-time management of the classroom's door through online. Besides that, it also consists of an application in smartphone to ease lecturers and authorized person rather than open the door manually

## **1.3 Objectives**

- 1.3.1 To develop an efficient system to control classroom's door through online and Bluetooth system that can eliminate manpower usage and improve time management.
- 1.3.2 To develop a low cost an Internet of Thing (IoT) door lock system for classroom.
- 1.3.3 To prevent classroom environment from vandalism activity.

## **1.4 Scope of the project**

This primary system focuses on using the internet (WI-FI module) to control and monitor doors in the classroom. This project will focus on application through the smartphone only. Besides, only the authorized person can log in the application using the same identification and password developed by the admin. This system will notify the user the current status in the classroom. In addition, the user hence authorized person can unlock one door only at a time. Bluetooth which used serial communication will be used as second choice if there is problem regarding internet connection. In this project, NodeMCU ESP8266 will receive an input data from WI-FI module through application in the smartphone and transmit it to solenoid lock part.

## **1.5 Expected Result.**

The expected result of this system is that door lock condition can be monitored and controlled by an authorized person in accordance with the schedule provided in the classroom through application in smartphone. There are two ways to open the door by using PIR sensor and application in smartphone. Firstly, the user must enter the identification and password provided by developer through the apps. Once the process is complete, they can choose either to unlock by using timer, button in the smartphone or by using Bluetooth connection. With the authorized person's approval, the door will instantly unlock hence students do not have to wait for technician to unlock the door. Secondly, when a movement detected by the PIR sensor detect a movement, the door will automatically unlock. The buzzer will functionally ON when the door is open within short amount of time set in the system. Indeed, this project will encounter the problem regarding vandalism and time wasting in the university.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter basically contains several articles, journals and conferences devoted to a brief summary and those related to the project to be undertaken. This study focuses on the power efficiency in the classroom.

#### **2.1 Past Related Project Research**

##### **2.1.1 Face Recognition Based on Auto-Switching Magnetic Door Lock System Using Microcontroller**

Because of its capacity to assess and consequently defines human identity, the face recognition system is commonly used for human detection particularly for safety reasons. This document introduces the creation Graphical User Interface (GUI) based on face recognition system and Peripheral Interface Controller (PIC) as an input/output carrier for turning ON/OFF door lock for safety matters.

The design is achieved by connecting GUI integrated in MATLAB2009a with microcontroller to auto-switch magnetic door lock for safety system. Using USB serial communication, the GUI and PIC microcontroller enables data input transmission from GUI to microcontroller. The advanced scheme demonstrates that the transmission of auto-switching mode is applied through PIC

microcontroller and USB serial communication cable. It was also discovered that GUI can effectively turn ON/OFF the magnetic lock when an approved picture from the GUI database is recognized. The efficiency and features of the built scheme indicates that information transfer from GUI to microcontroller is achieved effectively after the picture is acknowledged.

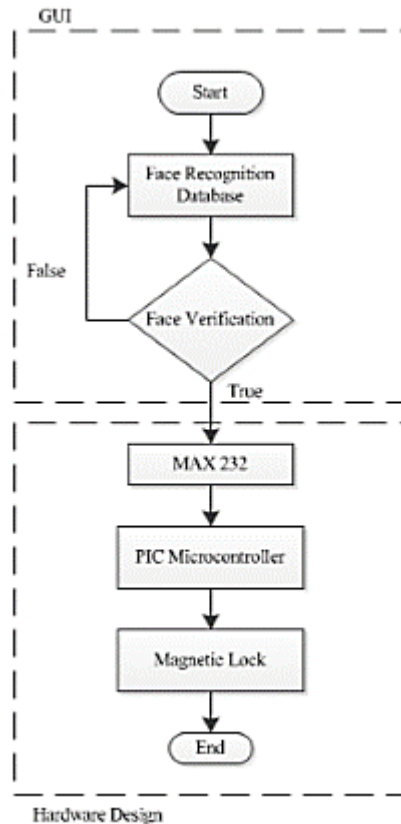


Figure 2.1: Flow chart of process in magnetic lock

Figure 2.1 shows that the develop system is separated into two parts GUI based picture identification scheme and hardware implementation for the microcontroller. The GUI-based image identification scheme acts as the PIC16F877A microcontroller's master control slave device. In this scheme, a known picture is converted as an ASCII code into an 8-bit signal through serial communication channel to microcontroller circuit. Then MAX232 converts the

linear stream to CMOS rank signals. The obtained signal is evaluated to secure or activate the magnetic door by the microcontroller.

### 2.1.2 Android-based Home Door Lock Application via Bluetooth for Disabled People

This document describes an ongoing project that provides the requirements of people with physical disabilities at home. It utilizes Bluetooth technology to communicate between the user's computer and the controller panel. The prototype promotes manual control and control of the microcontroller to lock and unlock home door. A Bluetooth can be used to offer distant access from a laptop or smartphone by linking the device to a relay panel and Arduino controller panel.

This article discusses the Android-based application's growth and features (Android Application) to assist individuals with disabilities achieve ownership of their living room. The aim of this research is to suggest a scheme that can assist disabled individuals open a magnetic door wirelessly using Android smartphone. The range and safety elements were regarded with the use of Bluetooth technology integrated in the portable phone. The scheme was prepared to activate a key to open or close the door from a brief range by clicking a button on a smartphone.

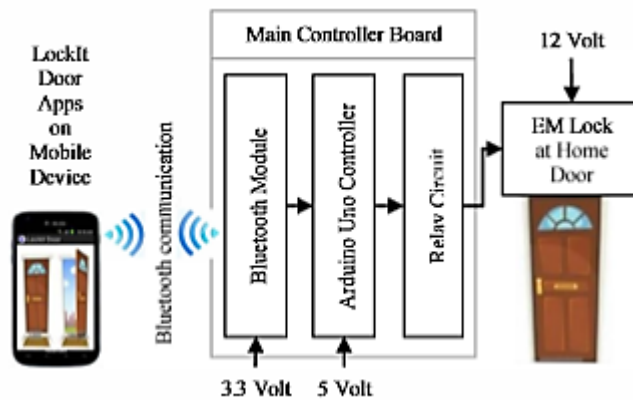


Figure 2.2: Block diagram of scheme construction

After wireless connection is developed through a coupling method between smartphone and Bluetooth module is done, the key choices by the user are sent to the primary controller panel assembled as a radio frequency (RF) signal at home. The Arduino Uno controlled used to analyze key select by the user and determines the conditions of the electromagnetic (EM) lock door. The Arduino has C language programming where it is user friendly. It sense the RF signal at the input channel of the controller. When 12v activated the relay circuit, the relay circuit linked to Arduino will unlock the EM lock to open door.

### **2.1.3 Digital Security System with Door Lock System Using RFID Technology**

Radio Frequency Identification (RFID) is a cost effective technique that can be introduced for various application including safety, human monitoring, stock detection and access control application. This paper's primary goal is to develop and execute a digital safety scheme that can be implemented in a secure area where only a genuine individual can be accessed.

This initiative also introduced a safety scheme with door locking scheme using passive RFID from capable of activating, authenticating, validating the user, and unlocking the door in actual moment for safe entry. The door locking scheme operates in actual moments as the door rapidly opens when the user puts their tag in reader contact. The scheme also creates log containing each user's check-in and check-out along with basic data of user.

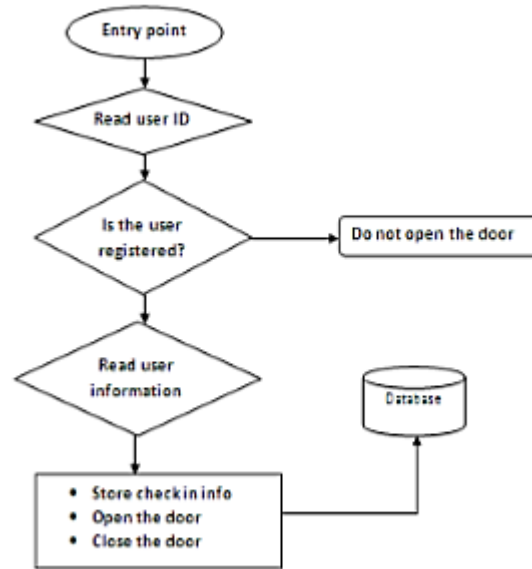


Figure 2.3: Check-in procedure required

The system records a new user and burns the corresponding personal data of the user in RFID tag. This RFID tag will be accessible through the system. When a registered user arrives at the entry point and places the tag in a reader. When registering the user, the folder data matches the user data contained in the scheme. The door is accessible to user admission after effective authentication and automatically close after a specified time period. The data regarding check-in also placed in the database with date and time. The scheme also creates a log based on data check-in. the scheme generates a log based on check-in data.

#### 2.1.4 Smart Digital Door Lock for the Home Automation

With the electronic door lock, this system is the base station network of sensor nodes and actuators. A suggested door locking scheme comprises of a user authentication RFID reader touch LCD, door opening and closing module, indoor condition detection sensor modules, communication module and control module