# SMART CLASSROOM BY USING WIFI AND ANDROID APPLICATION WITH ARDUINO MICRO CONTROLLER

MUHAMMAD ZIKRUL 'AZEEM BIN ZAKARIA



BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY

(Industrial Automation & Robotics) WITH HONOURS

2020


## Faculty of Electrical and Electronic Engineering Technology

# SMART CLASSROOM BY USING WIFI AND ANDROID APPLICATION WITH ARDUINO MICRO CONTROLLER

**Muhammad Zikrul 'Azeem Bin Zakaria**



**Bachelor Of Electrical Engineering Technology**
**(Industrial Automation & Robotics) With Honours**

**2020**

# SMART CLASSROOM BY USING WIFI AND ANDROID APPLICATION WITH ARDUINO MICRO CONTROLLER

**MUHAMMAD ZIKRUL 'AZEEM BIN ZAKARIA**

**A thesis submitted**
**in fulfillment of the requirements for the degree of**
**Bachelor of Electrical Engineering Technology**
**(Industrial Automation & Robotics) with Honours**



**Faculty of Electrical and Electronic Engineering Technology**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

2020

# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: SMART CLASSROOM BY USING WIFI AND ANDROID APPLICATION WITH ARDUINO MICRO CONTROLLER

Sesi Pengajian: 2021

Saya **Muhammad Zikrul 'Azeem Bin Zakaria** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (X)

☐ SULIT* Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.

☐ TERHAD* Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.

☒ TIDAK TERHAD

Yang benar,

.....

MUHAMMAD ZIKRUL 'AZEEM BIN ZAKARIA

Alamat Tetap:

NO 17, LORONG 3A, TAMAN BERLIAN,

08000 SUNGAI PETANI,

KEDAH.

Tarikh: 18/2/2021

Disahkan oleh penyelia:

.....

MUHAMMAD FAREQ BIN IBRAHIM

Cop Rasmi Penyelia

MUHAMMAD FAREQ BIN IBRAHIM
Jurutera Pengajar Kanan
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

Tarikh: 18/2/2021

*Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

**DECLARATION**

I hereby, declared this report entitled SMART CLASSROOM BY USING WIFI AND ANDROID APPLICATION WITH ARDUINO MICRO CONTROLLER is the results of my own research except as cited in references.

Signature: 

Author : MUHAMMAD ZIKRUL 'AZEEM BIN ZAKARIA

Date: 18/2/2021

**APPROVAL**

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation and Robotics) with Honours. The member of the supervisory is as follow:

Signature: .....

Supervisor : MUHAMMAD FAREQ BIN IBRAHIM

MUHAMMAD FAREQ BIN IBRAHIM
Jurutera Pengajar Kanan
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

Signature: .....

Co-supervisor: NURUL KAUSAR BINTI AB MAJID

## DEDICATION

I acknowledge my sincere dedication, honors and gratitude to both of my parents for their love, encouragement, supports, and sacrifices throughout whole of my life. Without their sacrifices and encouragement, I cannot possibly reach this stage. Special gratitude also dedicated to my brother and my sisters which always support and advise me in whatever I do in my life. Special thanks to all of lecturers especially my supervisor Encik Muhammad Fareq Bin Ibrahim, my co-supervisor Puan Nurul Kausar Binti Ab Majid and also my academic advisor Ts Puan Rosnaini binti Ramli who had taught and guided me throughout my studies and during this Bachelor Final Project 2. I would like to thank all my friends who always been with me throughout this challenging semester and help me during movement control order (MCO). An endless thank you for my friend Muhammad Mu'iz Bin Nor Azam that's help me in hardware configuration and wiring. I hope all of their supports and encourage will help me make this project a success.

# ABSTRAK

*Bilik darjah moden dengan menggunakan aplikasi Wi-Fi dan Android dengan Pengawal Mikro Arduino diciptakan untuk pengguna menghidupkan dan mematikan semua peralatan elektrik di bangunan besar atau kecil tanpa wayar. Sistem ini dirancang untuk memenuhi kesusahan yang dihadapi oleh pelanggan kerana di bangunan besar banyak alat elektrik mesti dihidupkan atau dimatikan. Memantau kesukaran atas peralatan elektrik yang tidak berfungsi, tenaga manusia yang terbuang dan masa untuk menghidupkan atau mematikan peralatan elektrik di bangunan besar adalah masalah utama yang dihadapi oleh pengguna yang bekerja atau tinggal di bangunan besar. Oleh hal yang demikian, sistem automasi kelas tanpa wayar untuk mengawal semua peralatan elektrik dengan sistem pemantauan dibina. Projek ini memfokuskan pada pengembangan sistem automasi bilik darjah tanpa wayar antara android, mod jambatan tanpa wayar dan modul Wi-Fi ESP8266 yang dikendalikan oleh pengawal antara muka yang dapat diprogramkan dengan ARDUINO UNO 2560. Secara keseluruhan, projek ini terbahagi kepada tiga bahagian. Bahagian pertama adalah mengenai komunikasi tanpa wayar menggunakan pemancar dan penerima penghala Wi-Fi ESP8266 dengan jambatan tanpa wayar dalam sambungan Ethernet. Bahagian kedua adalah merancang Antaramuka Pengguna Grafik (GUI) untuk aplikasi yang dikendalikan pengguna di mana telefon pintar android peribadi adalah komponen input. Ini juga digunakan sebagai sistem pemantauan untuk peralatan elektrik yang tidak berfungsi. Bahagian terakhir adalah mengenai pembangunan perkakasan di mana semua komponen elektronik disambungkan pada satu papan yang mengawal perkakas elektrik..*

## ABSTRACT

Smart Classroom by Using Wi-Fi and Android Application with Arduino Micro Controller were created for user to turn on or off and monitoring all electrical appliances in large or small building wirelessly. The program is designed to meet challenges encountered by the customer because in big buildings multiple electrical devices must be turned on or off. Monitoring in difficulties for not functioning electrical equipment, the wasted human resources and time to turn on or off electrical appliances in large building was the major problems that faced by consumer who worked or stay in a big building. For that reason, a wireless class automation system to control all electrical appliances with monitoring system is built. This project concentrating on developing a wireless classroom automation system between android, wireless bridge mode and ESP8266 Wi-Fi module which is controlled by programmable interface controller with is ARDUINO UNO 2560. Overall, this project is divided into three parts. The first part is concern on the wireless communication using transmitter and receiver ESP8266 Wi-Fi router with wireless bridge in Ethernet connection. Network bridging is the step that network infrastructure performs to establish a network of two or more networks or two or more parts of the network. Bridging is distinct from routing, which allows for the independent communication of multiple different networks while remaining separate. The second part is to design the Graphic User Interface (GUI) for user-controlled applications where personal android smartphone is the input component. It is also used as a monitoring system for not functional electrical appliances. The final part concerns the development of hardware, where all electronic components are connected on a single board that controls electrical appliances.

## ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude and appreciation to the lecturers who have helped me to succeed in Bachelor Degree Project 2. I really appreciate all the sacrifices and knowledge to my mentor that has given to me. I also thank you for giving me the opportunity to become a mentee under Encik Muhammad Fareq Bin Ibrahim for his encouragement, knowledgeable ideas and opinions, time consideration, spirit and being the guidance through the time of completing my Bachelor Degree Project (BDP). Here also I want to express my appreciation to my co-supervisor, Puan Nurul Kausar Binti Ab Majid for all their comments, ideas and helps in guiding me improving my BDP. My thanks and appreciation also dedicate to both of my panels, Encik Zaidi as Panel 1 and Encik Hanif as panel 2 that willing to observe my BDP, giving the positive comments which helps me to gain knowledge and improve the project in this period of time.

# TABLE OF CONTENT

# LIST OF TABLES

# LIST OF FIGURES

# LIST OF APPENDICES

# LIST OF SYMBOLS

| | | |
|---|---|---|
| mm | - | millimetre |
| cm | - | centimetre |
| m | - | metre |
| km | - | kilometre |
| inch | - | inches |
| kB | - | Kilobytes |
| MB | - | Megabytes |
| V | - | Volt |
| A | - | Ampere |
| B | - | Bytes |
| g | | Gram |
| Hz | | Hertz |

# LIST OF ABBREVIATIONS

| | |
|---|---|
| UTeM | Universiti Teknikal Malaysia Melaka |
| BEEA | Bachelor Degree of Electrical Engineering Technology (Industrial Automation and Robotics) |
| DC | Direct Current |
| AC | Alternate Current |
| RCB | Resdentual Circuit Breaker |
| MCB | Miniature Circuit Breaker |
| OEM | Original Equipment Manufacturer |
| SUV | Sport Utility Vehicle |
| MPV | Multi-Purpose Vehicle |
| RAM | Random Access Memory |
| ROM | Read Only Memory |
| iOT | Internet Of Things |
| EEPROM | Electrically Eraseable Programmable read-only memory |
| SRAM | Static Random Access Memory |

# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

This chapter introduced the general background of the smart classroom with application wireless bridge by using Android and Arduino microcontroller. Additionally, the inspiration of project to be developed is discussed along in the problem statement of this chapter. Others, such as two main objectives and scope or limitation also been reviewed. Besides, this chapter will be explained general background and view of the developed project based on Industrial Revolution 4.0 as known as IR 4.0.



## 1.2 Background

Nowadays most people used electrical appliances in this world. It was one of the important things needed for everyday human life. Nearly all the everyday human tasks are using technology to simplify the work. Using electrical supply to energize them through these technologies. Business typically uses more electrical appliances than normal homes, such as electronic scanning, lighting systems, air conditioners and others. The staff wanted electrical equipment to support them with their jobs or other things. Office appliances can be divided into three categories and are themselves the main appliances, minor appliances and consumer electronics. The most likely major appliances are office lighting system, fan and air conditioner.

There is a trend in home and office appliances networking together, combining the controls and key functions. Of starters, energy delivery should be handled more uniformly,