

# BUS ALERT SYSTEM (BAS)

MOHAMMAD AZIMI BIN BASARY

This Report is Submitted in Partial Fulfillment of Requirements for The Bachelor  
Degree of Electronic Engineering (Telecommunication Electronic)

Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer  
Universiti Teknikal Malaysia Melaka

June 2015



UNIVERSITI TEKNIKAL MALAYSIA MELAKA  
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN  
PROJEK SARJANA MUDA II

Tajuk Projek : BUS ALERT SYSTEM (BAS)

Sesi Pengajian : 1 4 / 1 5

Saya MOHAMMAD AZIMI BIN BASARI  
(HURUF BESAR)

mengaku membenarkan Laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (  ) :

SULIT\*

\*(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

TERHAD\*\*

\*\* (Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD

Disahkan oleh:

(TANDATANGAN PENULIS)

(COP DAN TANDATANGAN PENYELIA)

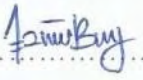
**Nazreen Binti Waeleh**  
Pensyarah  
Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer  
Universiti Teknikal Malaysia Melaka (UTeM)  
Hang Tuah Jaya  
76100 Durian Tunggal, Melaka

Tarikh: 11/06/2015

Tarikh: 11/6/2015

**PERAKUAN**

“Saya akui laporan ini adalah hasil kerja saya sendiri kecuali ringkasan dan petikan yang tiap-tiap satunya telah saya jelaskan sumbernya.”


Tandatangan : .....  .....

Nama Penulis : ..... MOHAMMAD AZIMI BIN BASARY .....

Tarikh : ..... 11/06/2015 .....

**PERAKUAN**

“Saya/kami akui bahawa saya telah membaca karya ini pada pandangan saya/kami karya ini adalah memadai dari skop dan kualiti untuk tujuan penganugerahan Ijazah Sarjana Muda Kejuruteraan Elektronik (Elektronik Telekomunikasi).”

Tandatangan :  .....

Nama Penyelia: Hazreen Binti Waeleh

Tarikh : 11 / 6 / 2015 .....

## DEDICATION

To my parents,

Basary Bin Omar & Sofiah Binti Abdullah

To my siblings

Faizal, Faezah, Hafizah, Shafura, Amirah, Hafiz, Aiman,

To my helpful friends

Faiz, Amar, Ruthra,

To all my lovely course mates

4-BENT 2011/2015

Thank you for always with my side along to complete this  
journey, I very appreciate with your support and help.

Thank you for all the memories.....

## ACKNOWLEDGEMENT

Alhamdulillah and thanks to Allah S.W.T because I can finish my work for final year project with successfully.

I am very thankful to everyone who all supported me for I have completed my project effectively and moreover on time.

I am equally grateful to my supervisor Pn Nazreen Bt Waeleh. She gave me moral support and guided me in different matters regarding the topic in how to do my research. She had been very kind and patient while suggesting me the outlines of this project and correcting my doubts. I thank her for her overall supports.

Besides that, I also thank to Mr Imran , Phd student at telecom lab because help me a lot while doing the program for the Arduino.

## ABSTRACT

The efficiency of bus alert system is vital to the productivity of the students in the university. Currently, the university only use timetable system which is not practical and efficient. Therefore, in this project bus alert system using transmitter, receiver and RF technique is proposed as an alternative solution for alerting the students about the arrival time of bus at the bus stop. The system consists of designing a transmitter-receiver circuit with the range is limited to 100 metres with the operating frequency of 300MHz. A one directional communication concept is applied in transmitting the signal from transmitter circuit to receiver circuit. A reliable and robust RF bus alert system that expected was developed.

## **ABSTRAK**

Sistem amaran bas yang cekap adalah penting dalam produktiviti pelajar di universiti. Pada masa ini, universiti hanya menggunakan sistem jadual waktu yang mana tidak praktikal dan cekap. Oleh itu, system amaran bas menggunakan teknik radio frekuensi, pemancar dan penerima telah dicadangkan sebagai langkah penyelesaian alternatif dalam usaha untuk memberi amaran tentang kehadiran bas di perhentian bas. Sistem ini termasuklah proses mereka bentuk litar pemancar dan penerima yang bertujuan untuk meliputi jarak jauh yang telah dihadkan kepada 100 meter dan berfrekuensi operasi 300MHz. Konsep komunikasi satu hala diaplikasikan dalam penghantaran isyarat dari litar pemancar ke litar penerima. Penghasilan sistem penggera bas yang berkesan dan kukuh telah berjaya dihasilkan.



## TABLE OF CONTENT

CHAPTER	TITLE	PAGES
	TITLE OF PROJECT	i
	DECLARATION	ii
	DEDICATION	iv
	ACKNOWLEDGEMENT	v
	ABSTRACT	vi
	ABSTRAK	vii
	TABLE OF CONTENT	viii
	LIST OF TABLES	xi
	LIST OF FIGURES	xii
	LIST OF KEYWORD	xiv
<b>I</b>	<b>INTRODUCTION</b>	<b>1</b>
	1.0 BACKGROUND OF STUDY	1
	1.1 BASIS OF PROJECT	3
	1.2 PROBLEM STATEMENT	3

1.3	OBJECTIVE	4
1.4	SCOPE OF STUDY	5
<b>II</b>	<b>LITERATURE REVIEW</b>	<b>7</b>
2.0	RESEARCH OF PREVIOUS WORK	7
2.1	RELATED WORKS	11
2.2	MICROCONTROLLER	13
2.2.1	ARDUINO UNO MICROCONTROLLER	14
2.2.2	ARDUINO UNO REV3	15
2.2.3	ATMEGA48PA/ 88PA/ 168PA/ 328P	17
2.3	RF MODULE (TRANSMITTER & RECEIVER)	19
2.4	SOFTWARE DEVELOPMENT	21
2.4.1	ARDUINO SOFTWARE IDE	21
2.4.2	MULTISIM SOFTWARE	23
2.4.3	PS SPICE SOFTWARE	24
2.4.4	PROTEUS SOFTWARE	25
2.4.5	ISIS SOFTWARE	26
2.5	RADIO FREQUENCY (RF) TRANSMISSION	27
<b>III</b>	<b>METHODOLOGY</b>	<b>28</b>
3.0	COMPONENTS AND TOOLS IDENTIFICATION	28
3.0.1	PROTOBOARD	29
3.0.2	TRANSMITTER AND RECEIVER	30
3.0.3	DECODER AND ENCODER	31
3.0.4	TESTING RESULTS FOR TX & RX	37
3.1	FLOW CHART	38
3.2	EXPECTED PROBLEM	40
3.3	EXPECTED OUTCOME	40

3.4	SOFTWARE DEVELOPMENT	41
3.4.1	ARDUINO SOFTWARE IDE	41
<b>IV</b>	<b>RESULTS AND DISCUSSION</b>	<b>42</b>
4.0	PROJECT HARDWARE	42
4.1	PROJECT TEST ON SOFTWARE	44
4.2	PROJECT TEST ON PROTOTYPE BOARD	49
<b>V</b>	<b>CONCLUSION AND RECOMMENDATION</b>	<b>51</b>
5.0	INTRODUCTION TO CONCLUSION	51
5.1	PROJECT LIMITATION RECOMMENDATION	52
	<b>REFERENCES</b>	<b>53</b>

**LISTS OF TABLE**

<b>NO</b>	<b>TITLE</b>	<b>PAGES</b>
2.1	Technical Specifications	15
2.2	Pin Description	20
3.1	Description Transmitter Pin	31
3.2	Description Receiver Pin	31
3.3	Value of Oscillator Resistor	32
3.4	Testing Result	37
3.5	Gantt chart for FYP -1	57
3.6	Gantt chart for FYP -2	57
3.7	Gantt chart for FYP 2014 – 2015	58

## LISTS OF FIGURE

NO	TITLE	PAGES
1.1	Basic Block Diagram of the Bus Alert System (BAS)	3
1.2	System Diagram	4
1.3	Distance between Tx-Transmitter and Rx-Receiver	6
2.1	Arduino Uno R3	15
2.2	Arduino Uno R3 Pin Definition	16
2.3	RF Module (Transmitter & Receiver)	19
2.4	Pin Diagram	20
2.5	Arduino Software IDE for Arduino Uno	22
2.6	Frequency Band	27
3.1	Breadboard	29
3.2	Breadboard with Completed Transmitter and Receiver Circuit	29
3.3	The Length of Antenna is 18cm	30
3.4	Transmitter Module 433 MHz	30
3.5	Receiver module 433MHz	31
3.6	Pin of the Decoder	32
3.7	Pin of Encoder	32
3.8	Block Diagram for Decoder PT2272	33
3.9	Flow Chart Diagram for PT2272	33
3.10	Block Diagram for Encoder PT2262	34
3.11	Flow Chart Diagram for PT2262	35
3.12	Schematic Diagram for Transmitter and Receiver	36
3.13	Methodology of Project	38
3.14	Coding using Arduino Software IDE	41

4.1	Completed Circuit Design	43
4.2	Completed RF-Tranmitter (Tx) Circuit Design	43
4.3	Completed RF-Receiver (Rx) Circuit Design	43
4.4	Arduino UNO Test for LCD Display using coding	44
4.5	Arduino UNO Test for LED and Buzer using coding	45
4.6	Arduino UNO Coding for Final Project	46
4.7	Arduino UNO Test for Wrong Coding and Connections	47
4.8	Arduino UNO Test for Correct Coding and Connections	47
4.9	Design and test the circuit used ISIS Software	48
4.10	Circuit for fabricate and itching process used ARES Software	48
4.11	Connection on Prototype Board when testing process	49
4.12	Connection on PCB Board after fabricate and itching process	49
4.13	LCD Display Sreen (LCD1602 Blue Screen with Backlight)	50
4.14	LED and Buzer	50

## LISTS OF KEYWORD

Tx	-	Transmitter
Rx	-	Receiver
RF	-	Radio Frequency
GPS	-	Global Positioning System
GSM	-	Global System for Mobile Communication
RFID	-	Radio Frequency Identification
IR	-	Infrared
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diode
Rev3	-	Revolution 3

**LISTS OF APPENDIX**

<b>NO</b>	<b>TITLE</b>	<b>PAGES</b>
A	FULL CODING PROGRAMMING OF ARDUINO UNO	55
B	GANTT CHART	57



## CHAPTER 1

### INTRODUCTION

This section gives an overview about the project such as idea of the project and the project's background. In this part, the objectives and the scope of the project are explained as well as background of study. This discussion is based on the problem statement of the project. The project title is "Bus Alert System (BAS)". This project is want to help alert the students about what time the bus is arrived by build the project that used Radio Frequency (RF) transmitter, receiver as the medium to pass and propagate the signal wave when trigger the button at transmitter circuit while Arduino Uno as a microcontroller.

#### 1.0 Background of Study

Radio Frequency (RF), Tx-Transmitter and Rx-Receiver are a wonderful technology with many applications in our society. It is common for remote nowadays

to use RF Transmitter and Receiver as medium for transfer and receive signal. Without RF Transmitter and Receiver, they have to use Infrared (IR) Transmitter and Receiver that only cover small area of coverage propagation. The function of RF Transmitter and Receiver is not only transmit the signal in one direction but it can transmit the signal in any direction and it can cover a large coverage area compared to IR Transmitter and Receiver where the IR Transmitter and Receiver can only transmit the signal in one direction. An RF module (Radio Frequency module) is a small electronic device used to transmit and receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through Radio Frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and receiver.

RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required achieving operation on a specific frequency. In addition, reliable RF communication circuit requires careful monitoring of the manufacturing process to ensure that the RF performance is not adversely affected. Finally, radio circuits are usually subject to limits on radiated emissions, and require conformance testing and certification by a standardization organization such as European Telecommunications Standards Institute (ETSI) or the Federal Communications Commission (FCC). RF modules are most often used in medium and low volume products for consumer applications such as garage door openers, wireless alarm systems, industrial remote controls, smart sensor applications, and wireless home automation systems. They are sometimes used to replace older infrared communication designs as they have the advantage of not requiring line-of-sight operation. Several carrier frequencies are commonly used in commercially available RF modules, including those in the industrial, scientific and medical (ISM) radio bands such as 433.92 MHz, 315 MHz, 868 MHz, 915 MHz, and 2400 MHz. These frequencies are used because of national and international regulations governing the use of radio for communication. RF modules may comply with a defined protocol for

RF communications such as Zigbee, Bluetooth low energy, or Wi-Fi, or they may implement a Proprietary protocol.

The project title is “Bus Alert System (BAS)” at UTeM. Bus alert system is a device used to alert students about what time bus is coming and arrived at bus stop. Currently bus alert system for university uses only timetable or schedule system. However the constraints of timetable system are the university’s student do not alerted and warned about the arrival of bus. Therefore, in this project a transmitter, a receiver, and an RF technique is proposed due fact that RF signal covers longer distance and reliable. The range of this project is limited to 10-100 meters with the operating frequency of 3-30MHz. The development of the proposed RF remote control consists of designing a transmitter-receiver circuit. A one directional communication concept is applied in transmitting the signal from transmitter circuit to receiver circuit. A reliable and robust RF bus alert system is expected to be developed.

### 1.1 Basis of Project

The idea of this project is to have a transmitter that will activate the Arduino Uno that already attached with the receiver module. The Arduino Uno Microcontroller will perform the process to take out the output. The buzzer is attached at the output of Arduino Uno. At last, the buzzer is ringing as the output of this project.



Figure 1.1 : Basic Block Diagram of the Bus Alert System (BAS)

## 1.2 Problem Statement

Bus system at UTeM nowadays, used only timetable or schedule system. This system is not so effective. The constraints of the timetable system are the university's student did not alert and warned about the arrival of the bus. This project is wanted to help alert the students about what time the bus is arrived. Students that live at hostel always miss to take the bus to go to class because one or two minutes late. It is because they do not notice about what time bus arrived at bus stop.

Students normally face problem while waiting for the bus especially during rainy day. This is due to the improper shelter in the bus stop as well as there is no fixed drop location. These factors make the student unable to get the bus on a proper time.

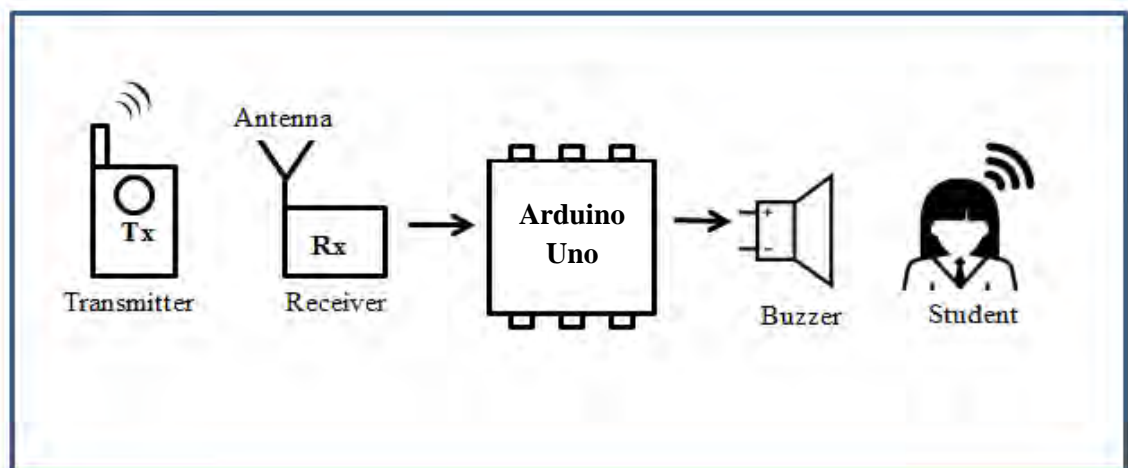


Figure 1.2: System Diagram

## 1.3 Objective

The aim of this project is to develop the bus alert system. This goals can be attained by :

1. Developing a bus alert system that will alert, notice and warn students about what time bus is arrived at bus stop.
- ☞ First objective is to built a project which implement a system that can help alerted, noticed and warned the students about the arrival of bus at the

parking lot. Nowadays, UTeM still use the conventional method which are the schedule and timetable system. The system is not practical to alert the students about what time bus is coming.

2. Designing a circuit for bus alert system.

☞ The second objective is to design a circuit using Multisim and Proteus Software then simulates the design circuit.

3. Developing a coding for Arduino Uno Microcontroller.

☞ The last objective of this project is to develop the code for Arduino Uno. The coding will be stored in Arduino Uno as to control all the process of the project.

#### 1.4 Scope of Study

This study will focus on developing two components of development. There are hardware development and software development. For hardware development, this project will use a RF technique, transmitter, receiver and bell or buzzer. The transmitter and receiver has their own advantage because this electronic device using a wave as a medium to propagate. The nature wave is spread the wave everywhere. Therefore, the transmitter and receiver not limit to one direction only.

For software development, the programming for Arduino Uno Microcontroller is using Arduino Software and for the circuit design, the most suitable is „ISIS“ software. The „ISIS“ software can be installed together with Proteus software and it can be used for stimulating the circuit created and changing the parameter required. This project has a distance range, it only covers around 100 metres of the bus parking lots.

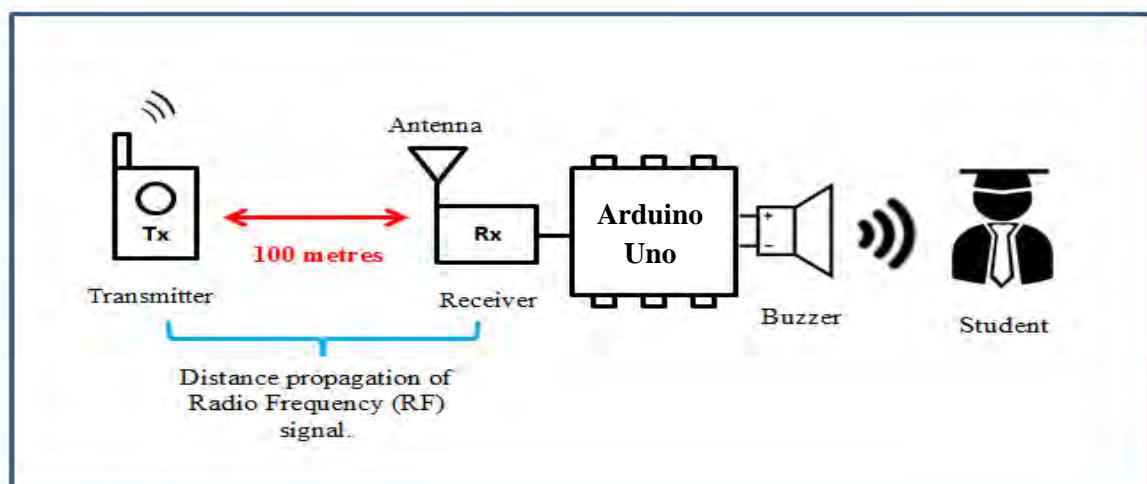


Figure 1.3: Distance between Tx-Transmitter and Rx-Receiver.

## **CHAPTER 2**

### **LITERATURE REVIEW**

Literature review consists of previous related to the project, information, articles and theories that make up the whole project. This chapter highlights the basic concepts and the fundamental theories of the part that will be used in the project. The main parts which will be discussed in the project are RF Tx-Transmitter, RF Rx-Receiver, Arduino Uno Microcontroller and buzzer or bell.

#### **2.0 Research of Previous Work**

Research of previous work is a part that contained about the compendium journals that have been chosen which related to the title of project. The students can take and get the ideas from the journals to improve or used back the ideas to overcome the problem during the process to build the project. In addition, students also can explore new things and what components that need to use for build the project. The students can do the improvement and the innovative from the project that has been built in the journals.

G.Lavanya ME., Preethy W., Shameem A., Sushmitha A.. “Passenger Bus Alert System for Easy Navigation of Blind”. International Conference on Circuits, Power and Computing Technologies 2013 [ICCPCT-2013]. 2013.

- ❖ **Journal 1** - This journal is about the project of a bus system using wireless sensor networks (WSNs). The project used ZigBee unit. This project is help the blinds people to recognized and identify the desired bus that the blinds want to take. Besides that, this project can help the blind people to navigate. In addition, this project is also aimed to help the elder people for independent navigation.
- ❖ **Improvement** – Based on the journal, the previous project was used Peripheral Interface Controller (PIC) as the microcontroller. For the improvement, I will used the Arduino Uno as the microcontroller for my project because the process for develop the coding is more simple compared to PIC.



**ZigBee Unit**



**GPS Module**



**Voice Synthesizer**