



## **ACKNOWLEDGEMENTS**

In the name of Allah S.W.T, the Most Beneficial and the Most Merciful, it is with deepest serve gratitude of the Al-Mighty that gives strength and ability to complete this final year project.

In order to complete this thesis, many obstacles have been endured. Therefore, I would like to take this opportunity to express my appreciation and gratitude to my supervisor, Pn. Hanunah Othman for her guidance in gathering information and spending her time giving me ideas and opinions in order for me to complete this thesis.

In accordance with that, I wish to express my special gratitude to my beloved family for their continuous support and unending prayers. Last but not least, all the member students of Electrical Engineering in Faculty of Electrical Engineering Universiti Teknologi Mara for always lending me a helping hand without fail.

## TABLE OF CONTENTS

<b>Title</b>	<b>i</b>
<b>Declaration</b>	<b>ii</b>
<b>Acknowledgement</b>	<b>iii</b>
<b>List of Figures</b>	<b>1</b>
<b>List of Tables</b>	<b>3</b>
<b>Abbreviation</b>	<b>4</b>
<b>Chapter 1</b>	
<b>Abstract</b>	<b>6</b>
<b>Chapter 2</b>	
<b>Introduction</b>	<b>7</b>
<b>Chapter 3</b>	
<b>Literature Review</b>	<b>11</b>
<b>Chapter 4</b>	
<b>Methodology</b>	<b>13</b>
<b>4.1 Introduction</b>	<b>13</b>
<b>4.2 LNA Design</b>	<b>15</b>

4.2.1	Introduction	15
4.2.2	LNA Design	16
4.2.3	Design Procedures and Calculations	17
4.2.4	Stability Consideration	18
4.2.5	Output Matching Network	20
4.2.6	Input Matching Network	26
4.2.7	Conversion from Lumped Element to Distributed Element	34
4.3	Tschebyshev BPF Design	39
4.3.1	Tschebyshev BPF Design Procedures	40
4.4	Microstrip Patch Antenna Design	45
4.4.1	Microstrip Patch Antenna Design Procedures	47
4.4.2	Microstrip Patch Antenna Fabrication	52
Chapter 5		
Results and Discussion		54
5.1	LNA Simulation Results	54
5.2	Tschebyshev BPF Simulation Results	64
5.3	Microstrip Patch Antenna Results	66
5.3.1	Microstrip Patch Antenna Simulation Results	66
5.3.2	Microstrip Patch Antenna Fabrication Results	73
Chapter 6		
Conclusion		82
References		85

# CHAPTER 1

## ABSTRACT

This thesis will focus on obtaining the best possible way to solve the bus transportation problem. The development of tracking the bus location using Radio Frequency Identification (RFID) system is also described in this thesis. The importance of RFID in today world is very high, due to its small package and its ability to store data. The existing problem in the bus transportation is that its location is not track and customers have to wait at the bus stop without knowing where the current location of the bus is.

In this project, RFID location detector is a new method to detect the bus location. It differs from the current Global Positioning System (GPS) to locate the bus location. The GPS system requires a much higher cost to maintain and to deploy in the first place. GPS system has a very serious disadvantage over RFID tagging system because it is weather dependent and its location is not precise since it is actually based on assumptions of location.

This project consists of three parts. The first part involved is the calculation and design procedures to come out with a Low Noise Amplifier (LNA) design for the RFID system. All the current specification and rules regarding the frequency range and transmitting power is done according to the International Telecommunication Union (ITU) standard. The second part involved in designing a Tschebyshev band pass filter (BPF) for the RFID system and the last part is about designing a microstrip patch antenna for the system. The microstrip patch antenna is then fabricated to compare the difference between simulation and real condition.

In this thesis it is hope to solve or to ease the problem related to the bus transportation problem. It is also to show that RFID technology can be used in vehicle tracking system.

Keywords: RFID, LNA, BPF, Transmitter.