



## **AUTOMATIC RADIO FREQUENCY IDENTIFICATION GATE SYSTEM**

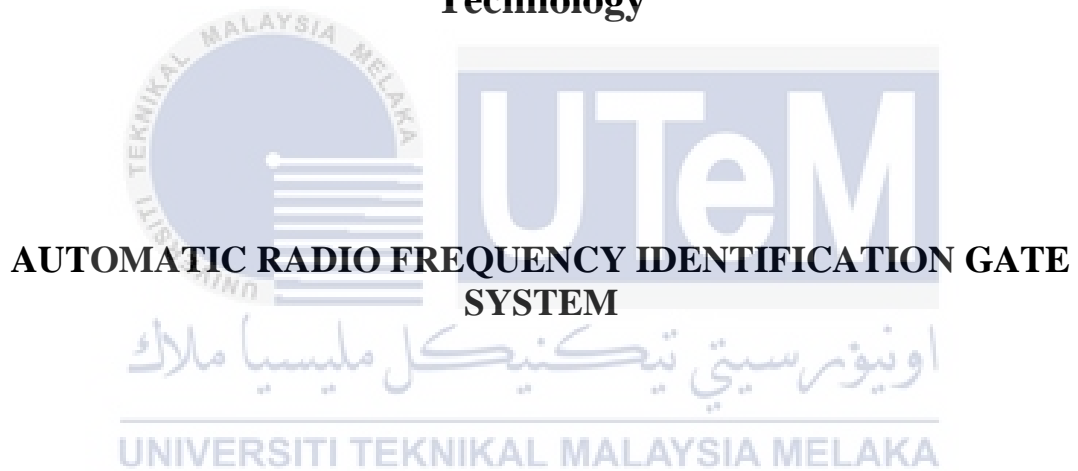


**BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY  
(BMMV) WITH HONOURS**

**2023**



**Faculty of Mechanical and Manufacturing Engineering  
Technology**



**AUTOMATIC RADIO FREQUENCY IDENTIFICATION GATE  
SYSTEM**

**Muhammad Afif Bin Borhan**

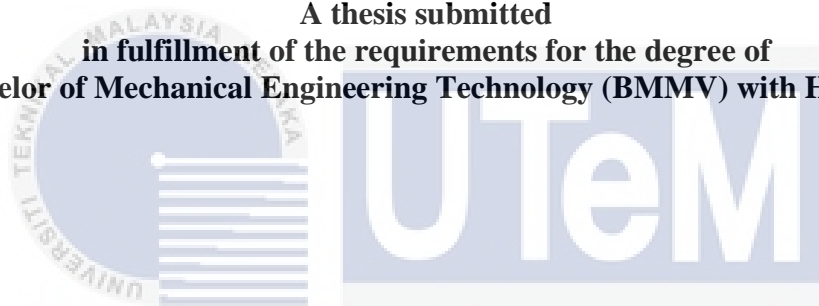
**Bachelor of Mechanical Engineering Technology (BMMV) with Honours**

**2023**

**AUTOMATIC RADIO FREQUENCY IDENTIFICATION GATE SYSTEM**

**MUHAMMAD AFIF BIN BORHAN**

A thesis submitted  
in fulfillment of the requirements for the degree of  
**Bachelor of Mechanical Engineering Technology (BMMV) with Honours**



اونيورسيتي تيكنيكل مليسيا ملاك  
**Faculty of Mechanical and Manufacturing Engineering Technology**  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2023**

## DECLARATION

I declare that this project entitled “Automatic radio frequency identification gate system” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature

:



Name

:

MUHAMMAD AFIF BIN BORHAN

Date

:

27 January 2023



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## APPROVAL

I hereby declare that I have checked this thesis, and, in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Mechanical Engineering Technology (BMMV) with Honours.

Signature



Supervisor Name : Ts. Dr. Nur Rashid Bin Mat Nuri @ MD Din

Date

27/1/23

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## DEDICATION

Dedicated, in grateful and thankful appreciation for support, encouragement, and understanding to my beloved mother, father, brothers, sisters, and all my friends.



## ABSTRACT

Congestion during peak hours in fenced areas gives many negative impacts such as waiting for security guards to open fences as well and queuing up to take attendance. Therefore, the RFID system and a combination of attendance apps were built to speed up the opening of the barrier and take staff attendance. In this project, the RFID system will be utilized in combination with the google form application to filter outgoing and incoming information of RFID owners before and after visitors enter the premises. It aims to reduce time taken for gate opening and by using this system, there was congestion during the queue to tick attendance. An additional feature of this automated radio frequency identification project is the inclusion of a smart parking concept, which allows the holder of a RFID card to see the available parking space on an LCD display before entering the facility. A sensor on the automobile parking section detects an incoming vehicle, and when the WeMo's D-1 receives a signal from the sensor, it sends the lcd display the number of vacant parking spaces in the area to show. It is expected that this system will apply in specific areas such as companies, universities, schools, and government premises. As the result, when the RFID receiver detects the car that comes automatically the admin will get a notification from the telegram stating the name and time the user enters the premises as the attendance staff. A prototype test was performed to test the infrared sensor according to the detection of a predetermined area. There are 3 detection areas that have been tested which are detect zone, 1 sensor only detect and not detect. In addition, the integration system between the prototype and the coding was completely successfully. An analysis has also been made to take the time data taken by the user to complete a car cycle into a premise. As a result of this, the time taken by the RFID system is shorter than the manual system. Hence, the RFID gate system is effective in saving time and reducing congestion that occurs outside the gate barrier to get into a premise.

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## **ABSTRAK**

*Pelbagai jenis kesesakan yang berlaku pada waktu puncak antaranya di kawasan berpagar terdapat impak negatif seperti menunggu pengawal keselamatan membuka pagar dan beratur mengambil kehadiran. Oleh itu, sistem RFID dan gabungan aplikasi kedatangan staff diwujudkan untuk mempercepatkan pembukaan pagar serta mengambil kedatangan staff. Dalam projek ini, sistem RFID akan digunakan bersama dengan aplikasi google form untuk menapis maklumat keluar dan masuk pemilik rfid sebelum dan selepas pengunjung memasuki premis. Ia bertujuan untuk mengurangkan masa yang diambil untuk membuka pintu pagar dan dengan menggunakan sistem ini, tiada kesesakan semasa beratur mengambil kedatangan. Selain itu, projek automatik radio frequency identification ini dilengkapkan dengan smart parking concept, sistem ini berfungsi apabila sebelum masuk ke dalam premis pemilik rfid kad akan nampak di paparan lcd jumlah parkir kereta yang kosong atau penuh di dalam premis. Ini kerana apabila sensor infrared yang dipasang pada bahagian parkir kereta mengesan kenderaan masuk ke dalam premis secara automatik sensor memberi tindak balas pada wemos D-1 untuk menghantar jumlah parkir yang kosong ke paparan lcd. Dijangka sistem ini akan terpakai di kawasan tertentu seperti syarikat, universiti, sekolah dan premis kerajaan. Sebagai hasil daripada projek ini, apabila penerima RFID mengesan kereta yang masuk secara automatik admin akan mendapat pemberitahuan daripada telegram yang menyatakan nama dan masa pengguna masuk ke sesuatu premis sebagai kakitangan kehadiran tersebut. Ujian prototip telah dilakukan untuk menguji sensor inframerah mengikut kawasan pengesanan yang telah ditetapkan. Terdapat 3 kawasan pegesanan yang telah diuji iaitu semua sensor dapat dikesan, satu sensor sahaja yang dapat dikesan dan tidak dapat dikesan oleh sensor. Selain itu, penyepaduan sistem antara prototaip dan pengekodan telah berjaya sepenuhnya. Analisis juga telah dibuat bagi mengambil data masa yang diambil oleh pengguna untuk melengkapkan satu kitaran kereta masuk ke dalam sesuatu premis. Hasil daripada kajian dibuat masa yang diambil oleh RFID sistem lebih singkat berbanding sistem manual. Oleh itu, projek RFID gate sistem ini berkesan untuk menjimatkan masa dan mengurangkan kesesakan yang berlaku di luar gate barrier untuk masuk ke sesuatu premis.*



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In the Name of Allah, the Most Gracious, the Most Merciful

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Firstly, i would like to express my deepest thanks to Ts. Dr. Nur Rashid Bin Mat Nur @ Md Din, as my project's supervisor who had guided me along the project journey. I feel motivated and encouraged every time i attend her meeting.

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I would like to thank to all technical staffs at the Faculty Engineering Technology Mechanical and Manufacturing, especially Mr. Idain lab technicians at Final Year Project Lab for their warmest helping hands. Their opinions and suggestion had helped me in realizing this project. Deepest thanks and appreciation to my family and others for their cooperation, encouragement, constructive suggestion and full of support for the report completion, from the beginning till the end.

## TABLE OF CONTENTS

	PAGE
DECLARATION	
APPROVAL	
DEDICATION	
ABSTRACT	i
ABSTRAK	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF SYMBOLS AND ABBREVIATIONS	ix
LIST OF APPENDICES	x
<b>CHAPTER 1 INTRODUCTION</b>	<b>11</b>
1.1 Background	11
1.2 Problem Statement	12
1.3 Objective	12
1.4 Scope of project	12
1.5 Report Organization	13
<b>CHAPTER 2 LITERATURE REVIEW</b>	<b>14</b>
2.1 Introduction	14
2.2 Implementation of Open and Close a Housing Gate Portal using RFID Card	14
2.3 Implementation of RFID system in Libraries: A case study in UPES library	15
2.4 Attendance System Design and Implementation Based on Radio Frequency Identification (RFID) And Arduino	17
2.5 A Comparative Survey on Silicon Based and Surface Acoustic Wave (SAW)-Based RFID Tags: Potentials, Challenges, and Future Directions	19
2.6 Theoretical Calculations of Feeders	19
2.7 Automated Tracking System Using RFID for Sustainable Management of Material Handling in an Automobile Parts Manufacturer	20
2.8 Radio Frequency Identification (RFID) Based Attendance System with Automatic Door Unit	22
2.9 Conclusion	25

<b>CHAPTER 3</b>	<b>METHODOLOGY</b>	<b>26</b>
3.1	Introduction	26
3.2	Flowchart	27
3.3	Automatic RFID gate system development	28
3.4	Hardware Development	28
3.5	Automatic RFID gate block diagram	28
3.6	Automatic RFID gate system flow chart	29
3.7	Wemos-D1	30
3.8	Arduino Uno	31
3.9	Infrared sensor	32
3.10	RFID receiver and transmitter	33
3.11	Servo Motor	34
3.12	LED Display	35
3.13	Software Implementation	36
3.14	List of Component	37
3.15	Drawing Assembly	38
3.16	Drawing system	39
3.17	Hardware implementation	39
	3.17.1 Circuit Flow	39
	3.17.2 Breadboard Test	40
3.18	Software implementation	41
	3.18.1 Making Telegram Bot	41
	3.18.2 Telegram connection by microcontroller	42
3.19	Finalizing Project	43
<b>CHAPTER 4</b>	<b>RESULTS AND DISCUSSION</b>	<b>45</b>
4.1	Introduction	45
4.2	Pretesting device	45
	4.2.1 Sensor Function ability check	45
	4.2.2 Prototype Testing	47
4.3	Data Analysis	48
4.4	Result and Discussion	52
<b>CHAPTER 5</b>	<b>CONCLUSION AND RECOMMENDATIONS</b>	<b>53</b>
5.1	Conclusion	53
5.2	Recommendation	53
	<b>REFERENCES</b>	<b>54</b>
	<b>APPENDICES</b>	<b>56</b>

## LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Battery-Free Temperature Sensor with Liquid Crystal Elastomer Switching Between RFID Chips (Shafiq et al., 2020)	20
Table 3.1:	Specification Wemos D-1	31
Table 3.2:	Servo Motor Specification	34
Table 3.3:	List of component	37
Table 4.1:	Data collected at Mydin MITC	48
Table 4.2:	Data Collected at Garden Plaza	50



## LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1:	Automatic Gate Portal design (Sari et al., 2021)	15
Figure 2.2:	Working in RFID System in Library(Chhetri & Thakur, 2019)	16
Figure 2.3:	The data communication of SPI pins (Rikabi et al., 2018)	19
Figure 2.5:	On-site system setup configurations using (a) single antenna, (b) doubled antenna (Jamaludin et al., 2018)	21
Figure 2.6:	RFID Technology Students attendance system.(Nosiri, 2013)	23
Figure 3.1:	Flow Chart in developing project	27
Figure 3.2:	The automatic RFID gate system block diagram	28
Figure 3.3:	Automatic RFID gate detection system flow chart	29
Figure 3.4:	Automatic RFID parking system	30
Figure 3.5:	Wemos-D1	30
Figure 3.6:	Ultrasonic sensor	31
Figure 3.7:	Infrared sensor	32
Figure 3.8:	RFID receiver and transmitter	33
Figure 3.9:	Servo Motor	34
Figure 3.10:	LED Display	35
Figure 3.11:	Software Implementation	36
Figure 3.12:	Drawing assembly	38
Figure 3.13:	Drawing system	39
Figure 3.14:	Arduino IDE Program	43
Figure 4.1:	Testing sensor prototype	45

Figure 4.2: Prototype testing	47
Figure 4.3: Total Time Taken against Number of car at Mydin Mall	49
Figure 4.4: Total Time Taken against Number of car at Garden Plaza	51



## LIST OF SYMBOLS AND ABBREVIATIONS

RFID	-	Radio Frequency Identification
UPC	-	Universal Product Code
v	-	Voltage
w	-	Walt
LED	-	light-emitting diode
LCD	-	Liquid-crystal display
IoT	-	Internet of thinking



## LIST OF APPENDICES

APPENDIX	TITLE	PAGE
APPENDIX A	RFID receiver and transmitter data	56
APPENDIX B	Infrared sensor specification	57
APPENDIX C	Gantt chart psm 1	58
APPENDIX D	Gantt chart psm 2	59
APPENDIX E	Coding RFID System	60-61
APPENDIX F	Turnitin report	62-65





## CHAPTER 1

### INTRODUCTION

#### 1.1 Background

Radio-Frequency Identification (RFID) is a technology that enables data to be transmitted securely at very fast speeds. It also doesn't require a line of sight like barcodes do, which means that it is more user-friendly and able to be used in a wide variety of settings. Data relating to an object is stored on an RFID tag which can be added to an item. The tag carries this data in a small but powerful chip and operates in a variety of radio frequencies. An RFID reader is used in conjunction with the chip in order to transmit the data securely and in that way, you can rely on the safe communication of information RFID compliance is required, applications that currently use barcode technology are good candidates for upgrading to a system that uses RFID or some combination of the two. In addition, RFID tags are not susceptible to the damages that may be incurred by barcode labels, like ripping and smearing. A singular challenge in modern security is controlling access to a facility (whether industrial or residential), while upholding the level of protection required. The traditional solution is a gated entry or security gate built in the center of a security fence or other structure. While it is always possible to have human-powered security gates with guards who check and clear those seeking entry and allow or deny access, it is not cost efficient or easily managed. It is an outdated system in the face of an RFID tag and vehicle access control system. This RFID automated gate system is ideal for use in government buildings, educational institutions, and commercial establishments. This is due to the fact that the system can lessen the amount of traffic outside the building during peak hours. The person

in charge of the building's security system will be able to access data on employee arrivals and departures thanks to this initiative.

## **1.2 Problem Statement**

People need to wait outside until the security guard or person-incharge opens the door. Furthermore, during time peak hour, the gates will always be open, at the same time outsiders will take the opportunity to enter the area without permission. So this RFID gate will only allow registered vehicle to enter the car park. Finally, by using RFID gate manpower can be reduced.

## **1.3 Objective**

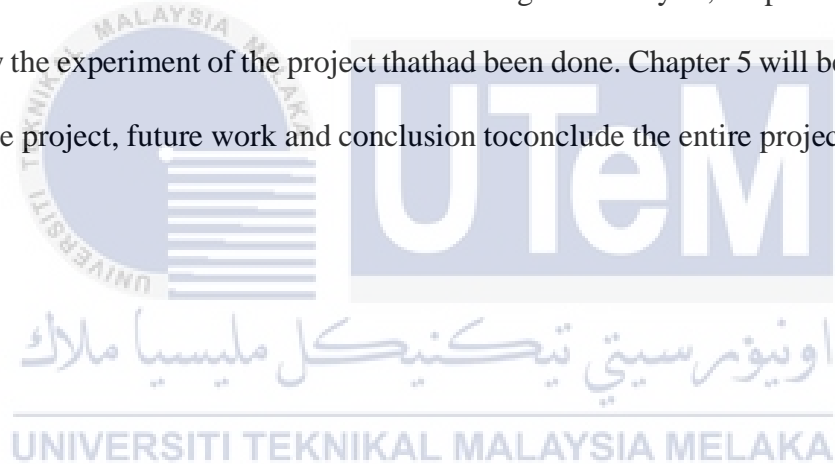
1. To develop RFID autogate system prototype using Arduino platform
2. To develop vehicle parking and customer personnel monitoring system
3. To access the time management front of autogate system

## **1.4 Scope of project**

1. To realize this type of radio frequency identification gate system by considering time constrain and low-cost device.
2. Physical prototype will be produced namely automatic RFID gate system.
3. An Arduino Uno and HCSR-04 ultrasonic sensor will be use.

## 1.5 Report Organization

This report is presented in five chapters. Chapter 1 fixated on brief prelude of the project carried. The paramount overview or description including problem statement, project objective and project scopes are well accentuated in this chapter. Chapter 2 will be predicated on literature review of the project. It is mainly fixated on the precedent research and the conceptual information applied on this system. Chapter 3 will expound on the concept, theories and principles used to consummate the project. This component consists of the methodology and the information on research and experiment during the project development. Chapter 4 will be explaining more detail about the outcome of the result. This is including data analysis, output of the project and how the experiment of the project that had been done. Chapter 5 will be discussion about the project, future work and conclusion to conclude the entire project done



## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

This chapter will give a detailed description about what have been published on some topics by scholars and researchers. The main purpose of writing this literature review is to gets knowledge and ideas that have been established about automatic radio identification gate system that focusing reduce traffic congestion and maintains the lock system security.

Moreover, there are resources on the topic of automatic radio frequency identification that have been widely published. The information has been collected from different resources such as published documentation, white paper, and journals in the web site

#### 2.2 Implementation of Open and Close a Housing Gate Portal using RFID Card

Needs assessment the housing gate portal was left open by security so that anybody could readily access the housing area, allowing criminal actions like as stealing to often occur, and this was examined by whydunit in Widia Graha I, which is situated at Jalan Srikandi, Kel. Delima Kec. Tampan, Pekanbaru - Riau. An automated gate portal that can open and shut to prevent people without an RFID card from entering the residential area and having to report to security was built based on the issues found in Widya Graha I am housing and the research done by kumar [17]. Fonda [18] investigated how the system can read sensors on the RFID card and then automatically activate the gate entrance at this moment.

Tool Design after the design phase of the design is done in roughly two months, this tool will be built and developed. The Making a PCB prototype containing gate portal for testing

prior to installation was a step in the development of this product by Joshi. Implementation is the stage when the design that was created in the previous stage is put into practise. This system was developed by rouan utilising Arduino Uno and the C++ programming language.

Testing In this step, the sensor is coupled to an RFID card, and the portal reads the sensor and subsequently opens. Upon exiting the gateway, it will immediately shut off. Zhang examined how user-conducted testing works. Currently, mohandes is doing maintenance on the housing gate portal sensor to ensure that it continues to function properly. Implementation, the fourth step in the process. Hardware Design A hardware design is a tool, or a set of tools used to put into practice housing gate opening and closing using an RFID card.

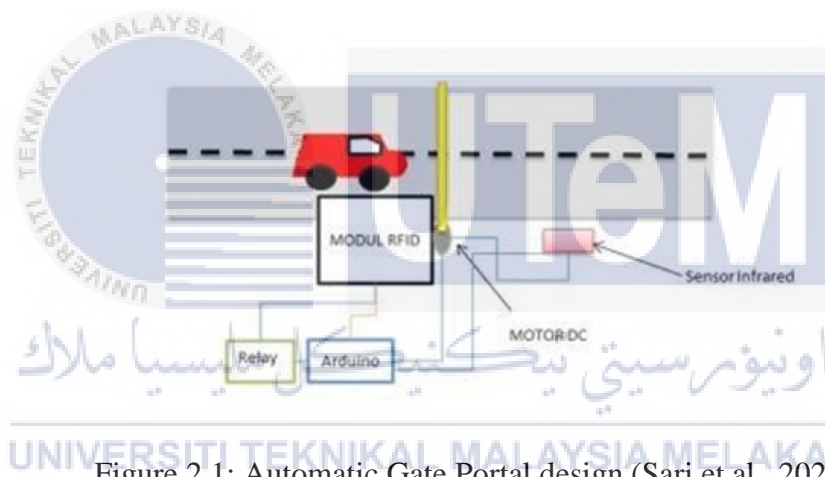


Figure 2.1: Automatic Gate Portal design (Sari et al., 2021)

### 2.3 Implementation of RFID system in Libraries: A case study in UPES library

The 21st century's most critical and cutting-edge technology is Radio Frequency Identification (RFID). Currently, it's one of the most contentious ICT innovations around. Library RFID systems were first used in the late 1990s to replace their barcode-based systems. RFID aids in the protection of library resources, as well as the circulation process, user service, and the reduction of library theft. An academic library or large public library's RFID implementation budget is a hot topic right now. However, the cost of RFID components is decreasing daily. With this research, we can gain an idea of the estimated

costs of deploying an RFID system in a library. Dehradun, Uttarakhand, is where UPES was founded in 2003. A central library, a school of law library, and a business library now exist at UPES. Books, dissertations, bound volumes of periodicals, and more make up around 2 million papers in the three libraries together. Securitization is needed for all of this. Using RFID in these three libraries is a major factor in their success.

More than 1.5 million volumes and 300 CDs in the domains of engineering, design, management, and law are housed in three UPES libraries: the Central Library, the School of Business Library, and the School of Law Library. The UPES library used LIBSYS software in the past. It was moved to open source ILMs KOHA in the year 2013. A scanner is used to check out library materials, which have been barcoded with the accession number as an identification. To ensure the accuracy of library materials, barcode scanners and laptop computers are used for stock checking. RFID and Koha were used at UPES library in order to improve stock taking, circulation, and document security. In order to enhance library services, RFID systems were installed in 2017 at three locations across two UPES campuses.

Requirement analysis, technical assessment, process evaluation and budget evaluation are all part of the RFID implementation process. First, a team of topic specialists, communication engineers, application developers, and professional staff was created, and the team worked together throughout the process.

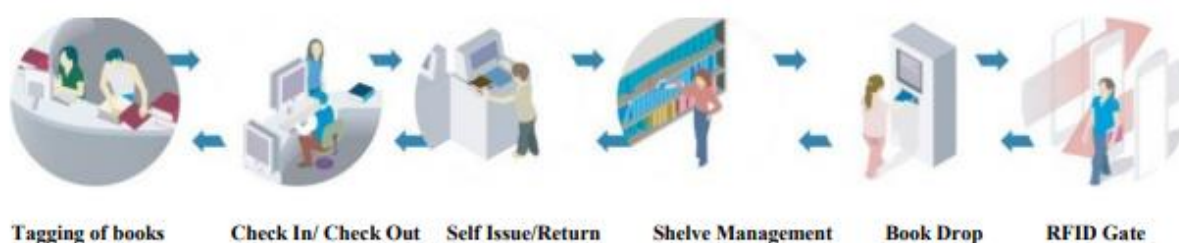


Figure 2.2: Working in RFID System in Library(Chhetri & Thakur, 2019)

## 2.4 Attendance System Design and Implementation Based on Radio Frequency Identification (RFID) And Arduino

When it comes to identification, RFID is the better option since it is both easier and more accurate. RFID is not the only way of identifying; barcodes, optical character recognition, and intelligent cards are all options. There are alternative methods, but RFID is the most often used since it is simpler and less expensive. There are a variety of uses for RFID technology, including transportation and logistics, postal tracking, time-and-attendance monitoring, security, and even animal identification and tracking. RFID tags may be used to uniquely identify each item. RFID tags and readers are the two major components of the RFID system. Small transmitters that reply wirelessly to queries or inquiries and broadcast a code number matching to the identifier make up an RFID tag. Electromagnetic waves emitted by a Reader are absorbed by the tags antenna and generate a current. In addition to student identification, this strategy may be used to get access to a facility or sell a business. The hardware and software components of the system described in this study divided into two major categories. The hardware is built utilising (RFID, Arduino, and microcontroller panel) that can expose a unique ID that is not found on the student card. The programme is set up to keep track of the number of hours a student has spent with an attendant and show that information on a screen. When it comes to the old method of registering students' guests, time and accuracy are two of the most typical issues. In a classroom with many pupils, some children are unable to hear their teacher's voice call out their names. The RFID system was created to address the issues raised above. Each student is given a unique ID card under this method. Attendees will be able to sign up right away, saving time and reducing the possibility of human mistake. At the same time, the university's website may be updated with a list of student attendees.

Using Bluetooth, Vishal Bhalla, Ankit Gahlot, and Vijay Gupta were able to implement an attendance tracking system in 2013. Using this strategy, an application was installed on the instructor's mobile phone that allowed it to query the student's phone over Bluetooth. The existence of the student may be established when the student's mobile phone data, Media Access Control (MAC) addresses, are sent to the instructor's mobile phone. This technique has certain drawbacks, such as the fact that a student's phone is essential for participation. A student's absence from class will not be recorded in the attendance system if he does not have his cell phone with him. An advanced method that is more advanced than RFID identification and punching the presence of authorised visitors was suggested by Gaganpreet Kaur Marwah, Yashi Mishra and Shekhar Verma back in 2015. "Voice greetings" will be a new feature to be introduced. The unique feature of this concept was the usage of an SD card module to store several audio files with unique names. Then quote them with each tag's unique identifier.

As a result, the selected audio file will be played anytime a card is identified. Students' attendance records may be stored on a memory card using an excel sheet if their card identifiers match those in the database. In this work, we come up with a novel concept.