Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMART BODY TEMPERATURE RECORDING SYSTEM USING RFID TAG

MUHAMMAD HAZIM BIN MAZLAN

Bachelor of Computer Engineering Technology (Computer Systems) with Honours

2022

DEVELOPMENT OF SMART BODY TEMPERATURE RECORDING SYSTEM USING RFID TAG

MUHAMMAD HAZIM BIN MAZLAN

A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Computer Engineering Technology (Computer Systems) with Honours

Faculty of Electrical and Electronic Engineering Technology

اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : DEVELOPMENT OF SMART BODY TEMPERATURE RECORDING SYSTEM USING RFID TAG

Sesi Pengajian : 2022/2023

Saya MUHAMMAD HAZIM BIN MAZLAN 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	

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Disahkan oleh:

(TANDATANGAN PENULIS)
Alamat Tetap:
NO.1, Jalan Meranti 2C/3,
Bandar Baru Batang Kali,
44300 Batang Kali,
Selangor.

Tarikh: 27/01/2023

(COP DAN TANDATANGAN PENYELIA)
MA TIEN CHOON
PENSYARAH
Fakulti Kejuruteraan Elektrik
Universiti Teknikal Malaysia Melaka

Tarikh: 27/01/2023

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

DECLARATION

I declare that this project report entitled “Development of Smart Body Temperature Recording System Using RFID Tag” 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	:	
Student Name	:	MUHAMMAD HAZIM BIN MAZLAN
Date	:	27/1/2023

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Computer Engineering Technology (Computer Systems) with Honours.

Signature : MA TIEN CHOON
PENSYARAH
Fakulti Kejuruteraan Elektrik
Universiti Teknikal Malaysia Melaka

Supervisor Name : MA TIEN CHOON

Date : 16/1/2023

UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEDICATION

I would like to dedicate this piece of work to my beloved parents and family, as they helped me in my time of woe and distress. They instilled in me the sense to learn and the willpower to push through and to never give up. Also, not to mention a thousand gratitude to my supervisor and friends for supporting me throughout the development of this project

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRACT

This project is aimed towards employees and workers to access their company vicinity using the RFID tags while also having their temperature measured by the infrared thermometer. Basically, if there is an anomaly or an elevated reading of temperature (Symptom of Covid-19) then access for that specific employee would be denied. Also, the data received would be admitted towards the website of the company that monitor the time schedule and employee's temperature. Since the outbreak of Covid-19, premises had implemented the use of temperature checker to detect their employees' temperature for safety measure. However, this method provides temporary adjustment as it could only perform crudely given its basic function. In addition, this method lacks the ability to record and alert the premises of the employees' health. Hence, an improvement is long overdue given the circumstances. Therefore, a more thorough system is needed to further enhance the system for a better work safe environment.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRAK

Projek ini bertujuan untuk pekerja dan pekerja mengakses kawasan sekitar syarikat mereka menggunakan tag RFID sambil juga mengukur suhu mereka dengan termometer inframerah. Pada asasnya, jika terdapat anomali atau bacaan suhu yang tinggi (Gejala Covid-19) maka akses untuk pekerja tertentu itu akan dinafikan. Selain itu, data yang diterima akan diterima masuk ke laman web syarikat yang memantau jadual waktu dan suhu pekerja. Sejak penularan wabak Covid-19, premis telah melaksanakan penggunaan pemeriksa suhu untuk mengesan suhu pekerja mereka untuk langkah keselamatan. Walau bagaimanapun, kaedah ini menyediakan pelarasan sementara kerana ia hanya boleh berfungsi secara kasar berdasarkan fungsi asasnya. Di samping itu, kaedah ini tidak mempunyai keupayaan untuk merekod dan memaklumkan premis kesihatan pekerja. Oleh itu, penambahbaikan sudah lama tertangguh berdasarkan keadaan. Oleh itu, sistem yang lebih teliti diperlukan untuk mempertingkatkan lagi sistem untuk persekitaran selamat bekerja yang lebih baik.

UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ACKNOWLEDGEMENT

First and foremost, all praise to ALLAH S.W.T for His blessing in giving me the chance to accomplish this work.

I would like to express my sincere gratitude to Ma Tien Choon, my beloved supervisor, for all his encouragement, guidance, inspiration, suggestions, and assistance throughout my project, Development of Smart Body Temperature Recording System Using RFID Tag, which is part of my Final Year Project (FYP). He also shared all his experiences and professional knowledge with me and provided the best guidance for me to successfully complete my project. Throughout my bachelor's degree studies, he has kept me motivated and provided me with advice on improving my research skills to finish this work.

I'd also like to thank the Faculty of Electrical and Electronic Engineering (FTKEE) for offering a complete thesis template with methodical methods, Technologist Doctor Rostam Affendi Bin Hamzah, Technologist Ahmad Fairuz Bin Muhammad Amin and members of my panels for both Seminar I and Seminar II, for their constructive remarks and evaluations, and all lecturers for their support, encouragement, and assistance along the road.

Thousand gratitude to my friends and colleagues, Muhammad Syafiq Bin Yaakob, Muhammad Hilmi Bin Zakaria and Muhammad Hisham Bin Ahmad Asri, Muhammad Luqman Bin Jamal Abd Nasir, Muhammad Firhad Bin Abu Bakar who assisted and supported me along the way.

I am grateful to the Universiti Teknikal Malaysia Melaka (UTeM) for allowing me to pursue my interest in engineering field studies while also allowing me to provide some things for the university's future reference.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TABLE OF CONTENTS

Contents **Page**

DECLARATION .....
APPROVAL .....
DEDICATION .....
ABSTRACT i
ABSTRAK ii
ACKNOWLEDGEMENT iii
TABLE OF CONTENTS iv
LIST OF TABLES vii
LIST OF FIGURES viii
CHAPTER 1 1
INTRODUCTION 1
1.0 Background 1
1.2 Problem statement 2
1.3 Project Objective 2
1.4 Scope Research 2
1.5 Project Outline 3
CHAPTER 2 4
LITERATURE REVIEW 4
2.1 Introduction 4
2.2 Temperature of the Human Body 5
2.3 Comparison of Different Measurement Places for Body Temperature 7
2.4 Thermometer 9
2.4.1 Comparison of Contactless and Contact Thermometer 9
2.4.2 Comparison of Different Contactless Infrared Thermometer 12
2.5 Principle of Contactless Infrared Temperature Measurement 13
2.5.1 Emissivity 13
2.5.2 Distance to Spot Ratio 14
2.5.3 Field of View 14
2.6 Previous Related Projects 15
2.6.1 Contactless Portable Infrared Thermometer 16
2.6.2 Contactless Temperature Monitoring for Campus 17
2.6.3 IoT Contactless Body Temperature Measurement System 18
2.6.4 Contactless Body Temperature Monitoring of In-Patient Department (IPD) 19

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.6.5 IoT-Based Smart Health Monitoring System for COVID-19 Patients 20
2.7 Comparison Parameter Summarization 21
CHAPTER 3 23
METHODOLOGY 23
3.0 PROJECT OVERVIEW 23
3.1 PLANNING 24
3.2 DATA COLLECTION 25
3.2.1 COST ESTIMATION 25
3.3 Hardware 26
3.3.1 Arduino MKR Wi-Fi 1000 26
3.3.2 Mifare RC522 RFID 28
3.3.3 OLED I2C 0.96-inch 128x64 29
3.3.4 Non-Contact Infrared Temperature Sensor MLX90614 30
3.3.5 SG90 Micro Servo 32
3.4 Software 33
3.4.1 Arduino IDE 33
3.4.2 XAMPP Control Panel 34
3.4.3 Fritzing 35
3.5 Flowchart 36
3.5.1 Flowchart of FYP 1 36
3.5.2 Software Implementation Flowchart: 37
3.5.3 Hardware Implementation Flowchart: 38
3.6 Block Diagram 39
3.7 Prototype Setup 40
3.7.1 Simulation using Proteus 40
3.7.2 Hardware Pin Configuration 41
3.7.3 Schematic Design Using Fritzing 42
3.7.4 Prototype Assembly 42
3.7.5 Apparatus Assembly 46
3.8 Prototype Development 47
3.8.1 Coding 47
3.8.2 Website Implementation 55
3.9 Database MySQL 55
3.10 Summary 57
CHAPTER 4 58
RESULTS AND DISCUSSION 58

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

4.1 Introduction 58
4.2 Initial Distance Calibration and Setting Setup 58
4.2.1 Data Collected 58
4.3 Multiple Distances Calibration Setup 60
4.3.1 Data Collected 60
4.4 Prototype Evaluation and Testing 62
4.4.1 Percentage of Escapees 63
4.5 Final Prototype 66
4.5.1 System Boot Up 66
4.5.2 System Stand By and idle 67
4.5.3 System Detect RFID Card 67
4.5.4 System Detect Valid with Normal Temperature 68
4.5.5 System Detect Valid with High Temperature 73
4.5.6 System Detect Invalid 75
4.5 Summary 77
CHAPTER 5 78
CONCLUSION AND RECOMMENDATIONS 78
5.1 Conclusion 78
5.2 Future Works 78
REFERENCES 79
APPENDICES 81

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Human Body Temperature for Different Ages	6
Table 2.2	Pros and Cons of the body temperature measurement based on different descriptions	8
Table 2.3	Comparison between Contactless and Contact Thermometer	11
Table 2.4	Comparison of Different Contactless Infrared Thermometer	12
Table 2.5	Comparison Table	22
Table 3.1	Task Description	24
Table 3.2	Estimated Cost	25
Table 3.3	Specification of Arduino MKR Wifi 1000	27
Table 3.4	Specification of Mifare RC552 RFID	29
Table 3.5	Specification of OLED I2C 0.96-inch 128 x 64	30
Table 3.6	Pinout description of MLX96014	31
Table 3.7	Specification of MLX96014	31
Table 3.8	Specification of SG90 Micro Servo	32
Table 3.9	Pin Configuration Layout	41
Table 4.1	Data Collected	59
Table 4.2	Average Temperature Measured at Different Measuring Distance	60
Table 4.3	Temperature Differences with Respect to Reference	61
Table 4.4	Reference Table to Detect Escapee	63
Table 4.5	Data Collected with Percentage Escapee Calculation	64

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1	Body Temperature Measurement Range	6
Figure 2.2	Mercury in glass thermometer	10
Figure 2.3	Difference forms of infrared energy	13
Figure 2.4	Relationship Between Distance to Spot Area	14
Figure 2.5	Field of View	15
Figure 2.6	Block diagram of the Contactless Portable Infrared Thermometer	16
Figure 2.7	System Overview of the Contactless Temperature Monitoring for Campus	17
Figure 2.8	Functional Block Diagram for the IoT Contactless Body Temperature Measurement System	18
Figure 2.9	IoT-CBTM system flow diagram	19
Figure 2.10	Block Diagram of the IoT-Based Smart Health Monitoring System for Covid-19 patients	20
Figure 3.1	Arduino MKR WiFi 1000	27
Figure 3.2	Mifare RC522 RFID	28
Figure 3.3	OLED I2C 0.96-inch 128 x 64	30
Figure 3.4	MLX96014 Infrared Temperature Sensor	31
Figure 3.5	Internal block diagram of MLX96014	31
Figure 3.6	SG90 Micro Servo	32
Figure 3.7	Arduino IDE	33
Figure 3.8	XAMPP Control Panel	34
Figure 3.9	Fritzing	35
Figure 3.10	Improvise simulation using Proteus ISIS	40

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 3.11	Schematic Design of The Smart Body Temperature Recording System Using RFID Tag	42
Figure 3.12	Initial design based on breadboard	42
Figure 3.13	Initial design based on breadboard with RFID added	43
Figure 3.14	RFID test scan for multiple cards	43
Figure 3.15	Initial design with casing embroidered	44
Figure 3.16	Initial design with servo connected	44
Figure 3.17	Final prototype design	45
Figure 3.18	Final prototype design inside	45
Figure 3.19	Tools to construct the mini door	46
Figure 3.20	Initial design of door	46
Figure 3.21	Final design of door	46
Figure 3.22	Library Definition Segment	47
Figure 3.23	Connection credentials definition segment	48
Figure 3.24	Variable declarations	48
Figure 3.25	Variable declarations	49
Figure 3.26	Case 0	50
Figure 3.27	Case 1	50
Figure 3.28	Case 2	51
Figure 3.29	Case 3	51
Figure 3.30	Case 4	52
Figure 3.31	Case 5	52
Figure 3.32	Case 6	53
Figure 3.33	printWiFiStatus()	53
Figure 3.34	send_uid_to_server()	54

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 3.35	int command and send_display function	55
Figure 3.36	Database Overview	56
Figure 3.37	Table Temp	56
Figure 3.38	Table Users	56
Figure 4.1	Average Temperature Measured at Different Measuring Distances	61
Figure 4.2	Prototype Evaluation using Human as Subject	62
Figure 4.3	System Boot Up	66
Figure 4.4	OLED displays “ok”	66
Figure 4.5	Standing by	67
Figure 4.6	RFID sensor read the card	67
Figure 4.7	System contacting the server (MySQL)	68
Figure 4.8	System contacting the server (MySQL)	68
Figure 4.9	MLX90614 sensor warmup	69
Figure 4.10	MLX90614 sensor scanning for temperature	69
Figure 4.11	System validate the temperature data	70
Figure 4.12	Access granted	70
Figure 4.13	Door Locked	71
Figure 4.14	Back view of Locked Door	71
Figure 4.15	Back view of unlocked door	71
Figure 4.16	Door Unlocked	71
Figure 4.17	Database before update	72
Figure 4.18	Database updated	72
Figure 4.19	System on standby	72
Figure 4.20	Scanning for temperature	73

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 4.21	System validate the temperature data	73
Figure 4.22	Access Denied	74
Figure 4.23	Door will remain locked	74
Figure 4.24	Database updated	75
Figure 4.25	RFID card read	75
Figure 4.26	Verifying the validity of card	76
Figure 4.27	Status Invalid	76

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 1

INTRODUCTION

This chapter will study about the background of the project, problem statement, objectives, scope of the project and the project outline.

1.0 Background

As of late, the Novel Coronavirus or COVID-19 pandemic has been one of the major global issues felled upon most countries worldwide. Infecting a large sum of populations in such a short period of time. It is of concern that temperature and humidity variations anonymously became an important topic since symptoms of COVID-19 include heightened body temperature and fever. Precautions have been made and applied such as the use of face masks, sanitizers, social distancing, commence of SOP (Standard Operating Procedure) and many more. However, one such precautions that proved to be vital in the effort to stop the spreading is the need to scan body temperature before entering a publishment or building. Undoubtedly, in most situations, guards would have been posted and stationed to hinder infected person from entering the compound. This setting would have been ideal to open places but is not to narrow and close places. Hence, this paper will focus on an IoT based system that effectively monitor body temperature using sensors and IoT based technologies that will automatically blocked entrance towards infected persons without using any human resources. Moreover, the data collected from the various scans are stored in an online database that can be monitored by the administrator of the publishment or building.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

1.2 Problem statement

The existing method of procedure for entering establishment or publishment with narrow entrance proved to be inefficient in its setting which tempted for improvement. Narrow spaces such as entrance to the vicinity of an office located at the corner of the corridor or restricted places tend to avoid the usage of personal because of the lack of spaces available. Moreover, existing method of procedure also lacks the ability to record the scans. Requirement of human resource would be due for false admittance due to human error. Furthermore, human resource is more expensive in regard to value compared to automated system.

1.3 Project Objective

The main aim of this project is to propose a systematic and effective application that would scan and record body temperatures before logging the data into the database. The objectives are as follows:

1. To develop a monitoring system that will scan and record data into the database using IoT technologies.
2. To create a system that will block entrance to suspected individual.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

1.4 Scope Research

The scope research of this projects outlines the use of IoT technologies, Arduino MKR1000, temperature sensor (MLX90614) to scan and detect body temperature. The servo would act as a door that open and close depending on the scan result. The scan data will be recorded into an online database (MySQL) for the administrator to log and access. The setting would otherwise be the same as existing temperature scanner with the individual need to line their forehead with the temperature scanner to communicate with the sensor. The sensor is connected to the mainboard Arduino MKR1000 and the board will hence processed the data and deduced whether the individual is affiliated with COVID-19. If a spike of temperature is detected, the board will close the door (servo) thus denying entrance whilst if the temperature is normal, the board will open the door (servo). The data collected from the scans would be recorded by the board and send to the database (MySQL) via Wi-Fi.

1.5 Project Outline

This report is divided into five chapters that detail the "Development of smart body temperature recording system using RFID tag" project's implementation. This project is divided into five (5) chapters based on the objectives that have been previously stated and the strategy that has been provided.

- The background of the development of the development of smart body temperature recording system using RFID tag is presented in first chapter. To begin, a problem statement is given, along with a set of objectives to be met to address the difficulties. Moreover, this chapter discusses the study scope and project outline.

- The literature review is based on the second chapter. This section discusses relevant research undertaken by researchers as it relates to the project's implementation and functionality. The projects are compared to define the underlying concept, theory, and provide a broad image of the essence of execution that is appropriate for this research.

- The methodology to conduct the project is presented in the third chapter. Following a series of methods to develop this project while keeping to the provided objectives is the strategy. A flowchart is also prepared to demonstrate how the complete project system works.

- In the fourth chapter, the specifics of the outcomes obtained from the completion of this project are described. Furthermore, the analysis based on the project's outcomes and discoveries is clearly finished in this chapter.

- The last chapter effectively sums everything up and emphasises the key aspects, as well as deciding if the project's output satisfied the stated objectives. Finally, this chapter will include proposals for future improvements to this project utilising emerging technology.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 2

LITERATURE REVIEW

This section detailed the literature review based on the research and studies on the available information and details for this project. Primarily, these information and research were taken from various resources such as journals, articles, the Internet, book, and other related previous studies. Thus, this chapter covers the aspects of temperature recording system using. In retrospect, this chapter is necessary for this project as it defined the primary purpose.

2.1 Introduction

Diseases and ailment often affected the environment and without a doubt, the society. In the latest case, the widespread infection of the COVID-19 pandemic has affected the world in many ways. Causing irreversible damage to some and bringing ailments to others. Countermeasures were taken and vaccines were provided to the netizens but in some cases, such as in the working environment, the measures that were taken are not efficient in the effort to prevent the spread. Thus, by installing this project which utilized a fully automated body temperature recording system, the risk of infection could be further hindered by a calculated margin. The purpose of this project is to automate the body temperature recording system and to record the scanned data into the database. Since mostly, in a secluded or private working environment, most entrance were narrow and required an automated system rather than using human resource. Also, most of the already implemented temperature system lack the ability to record the scanned data into the database. This could be rectified by installing this device. Based on this remark, it can be concluded that this project will play a significant function in the effort to prevent the spread of COVID-19.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2 Temperature of the Human Body

The degree of heat intensity is measured by temperature. One of the most essential indicators of health is the body temperature. The goal of the body temperature surveillance or monitoring is to look for signs of systemic or viral illness when a person has a fever, and their body temperature is higher than normal [1]. Additionally, it was one of the first clinical signs of sickness in humans and one of the most common reasons for seeking medical help. During an infection, our immunisation system will raise the body temperature to thwart the illness and activate immunological response.

Furthermore, it is imperative that the body temperature be kept in a relatively restricted range to ensure proper operation. The hypothalamus is a component of the brain that is responsible for maintaining an optimal body function environment by constantly adjusting and regulating human body temperature. The thermoregulation process controls heat loss and uptake to keep the body temperature within a narrow range. The human body temperature is mostly stable and independent of the ambient temperature.

Body temperatures in healthy people can vary depending on the biological and surrounding factors such ambient activity level, temperature, gender, and age. Nevertheless, it is known that the individual's age and the ambient temperature which undoubtedly have the greatest impact on body temperature [2]. The average body temperature range for various ages is shown in Table 2.1. Despite the variations, a healthy and normal human's body temperature should be maintained within the range of 36.5 to 37.5 degrees Celsius [3].

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Moreover, there are two extreme states of temperature cases that had to be noted which are hyperthermia and hypothermia. Hyperthermia occurs when a person's body temperature rises significantly above the usual temperature range's maximum limit. Hypothermia, on the other hand, happens when a person's body temperature falls below the typical temperature range's minimal limit. Inability and failure to give an immediate medical treatment and response for both hypothermia and heat might result in death. The normal body temperature measurement range is shown in Figure 2.1.

Table 2.1: Human Body Temperature for Different Ages [1]

Body Temperature Range	Hypothermia	Normal	Hyperthermia
Baby (Birth to 2 years old)	36.00 °C	36.00 °C – 37.00 °C	37.00 °C – 38.00 °C
Children (3 to 12 years old)	36.00 °C	36.0 °C – 36.77 °C	38.00 °C
Adult (13 to 40 years old)	36.10 °C	36.1 °C – 37.20 °C	37.50 °C
Elder (above 40 years old)	35.00 °C	35.77 °C – 36.94 °C	37.44 °C – 37.94 °C

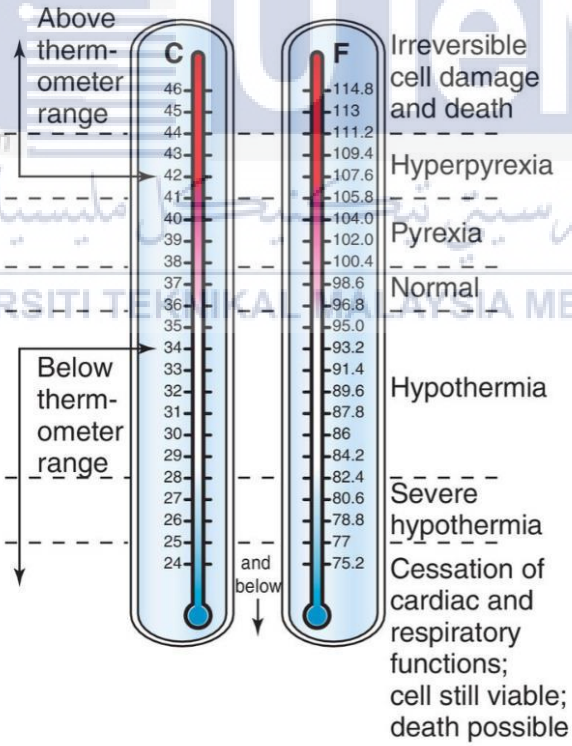

Figure 2.1: Body Temperature Measurement Range[4]

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.3 Comparison of Different Measurement Places for Body Temperature

Table 2.2: Pros and Cons of the body temperature measurement based on different descriptions.

Invasiveness	Location	Pros	Cons
Non-invasive	Forehead Skin	▪ Easily accessible and safe	▪ Sensitive to a variety of variables, including sunlight, cold air, and perspiration
	Axillary	▪ Safe and easily accessible	▪ Due to the lack of conspicuous blood arteries, this measuring site is unreliable ▪ Tendency to introduce inaccuracies and errors
Minimally Invasive	Oral	▪ Easily accessible and practical ▪ In response to a change in core body temperature, act promptly	▪ Foods, mucosal inflammation, and circulating air can all impact oral temperature
	Rectal	▪ As it immediately reflects the core body temperature, this is a potential place for exact body temperature measurement	▪ When there is a fast change in core body temperature due to poor blood circulation, there is a prolonged latency

UNIVERSITI TEKNIKAL MALAYSIA MELAKA