



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DEVELOPMENT OF WATER QUALITY MONITORING  
AND FISH FEEDINGS SYSTEM BY USING ARDUINO  
MEGA**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY (INDUSTRIAL POWER) WITH HONOURS.

by  
اونيورسيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**MOHAMMAD AIMAN AFIQ BIN ABDULLAH**

**B071710263**

**950910026023**

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING  
TECHNOLOGY

2020

**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

Tajuk: DEVELOPMENT OF WATER QUALITY MONITORING AND FISH FEEDINGS SYSTEM BY USING ARDUINO MEGA

Sesi Pengajian: 2020

Saya **Mohammad Aiman Afiq Bin Abdullah** 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,

Disahkan oleh penyelia:

.....*Aiman Afiq*.....

  
.....

Mohammad Aiman Afiq Bin Abdullah

Puan Kamillah Binti Jaffar

Alamat Tetap:

Cop Rasmi Penyelia

No.30 Taman Kenanga



Jalan Telok Malik

06000 Jitra, Kedah.

Tarikh: 15 January 2021

Tarikh: 15 January 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

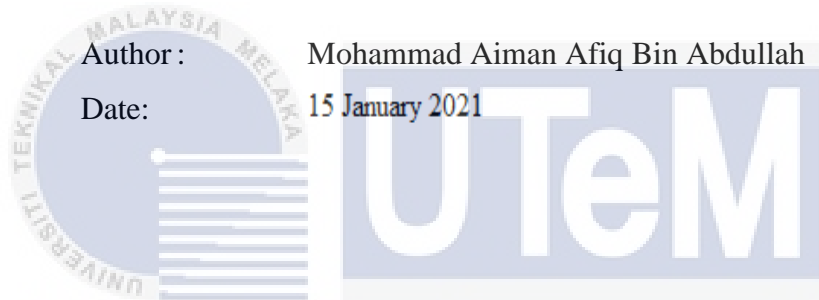
## DECLARATION

I hereby, declared this report entitled DEVELOPMENT OF WATER QUALITY MONITORING AND FISH FEEDINGS SYSTEM BY USING ARDUINO MEGA is the results of my own research except as cited in references.

Signature: .....*Aiman Afiq*.....

Author : Mohammad Aiman Afiq Bin Abdullah

Date: 15 January 2021





اونيورسيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## 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 POWER) WITH HONOURS. The member of the supervisory is as follow:

 Signature: .....  
Supervisor : Puan Kamilah Binti Jaffar



اونيورسيتي تيكنيكل مليسيا ملاك  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Signature: .....  
Co-supervisor: Puan Rohaina Binti Jaffar

## ABSTRAK

Kualiti Air akan dicirikan berdasarkan fakta bahawa zat, sifat fizikal dan semula jadi air, sebagai peraturan mengenai kesesuaiannya untuk penggunaan yang ditentukan. Seperti yang kita ketahui secara keseluruhan, air memiliki banyak kegunaan, seperti hiburan, minum, perikanan, agribisnis dan industri. Setiap penggunaan yang diberikan ini mempunyai pelbagai ramuan, norma fizikal dan organik yang penting untuk membantu penggunaannya. misalnya, kita mengharapkan harapan yang lebih baik untuk air yang kita minum, berenang dan digunakan dalam hortikultur dan industri.

Alat pengukur kualiti air diletakkan di situ untuk memastikan penggunaan air yang mahir untuk alasan yang ditentukan. Penyelidikan kualiti air adalah untuk menggunakan parameter air yang telah ditentukan, menjaga strategi standard, untuk menguji apakah itu sesuai dengan kualitas. Hari ini Internet of Things (IoT) dan kaedah pengesanan jarak jauh digunakan di berbagai wilayah penyelidikan untuk memeriksa, mengumpulkan dan memeriksa maklumat dari daerah terpencil. kerana peningkatan besar dalam hasil moden di seluruh dunia, pengapungan desa ke bandar dan dengan cara ini penggunaan aset tanah dan lautan yang berlebihan, standard air yang dapat diakses oleh individu telah runtuh. Penggunaan baja yang tinggi di ladang dan juga sebatian sintetik yang berbeza di bahagian seperti perlombongan dan pembangunan telah banyak menyumbang kepada penurunan kualiti air secara umum.

Air adalah keperluan penting untuk daya tahan manusia, oleh itu mesti ada instrumen yang ditempatkan di situ untuk menguji tahap air yang bertenaga untuk diminum di sekitar dan bekalan yang dijelaskan di bandar dan di samping alasan bahawa sungai, sungai dan pantai yang merangkumi bandar-bandar kita dan masyarakat bandar. Pengaturan air berkualiti yang luar biasa adalah asas dalam mencegah berlakunya penyakit bawaan air di samping meningkatkan taraf hidup.

Makanan ikan yang diprogramkan dapat menjadi alat yang akhirnya memberi makan ikan pada waktu yang telah ditentukan sebelumnya. Seperti dulu, ini adalah untuk mengarahkan ikan mengurus tindakan dengan menggunakan pengumpan ikan yang bergabung dengan kerangka mekanik dan kerangka elektrik untuk membuat alat dan bukannya secara fisik merawat ikan dengan tangan. Pemilik ikan yang berada dalam jarak yang lama akan mengalami kesukaran untuk mengetahui perkara-perkara di tasik atau akuarium. Dengan cara ini, alat sedemikian sangat membantu. Pada masa yang tidak dapat dibezakan, alam merangkumi air mesti diperiksa.

Untuk laporan ini, saya akan memantau lingkungan dari segi sensor pH, sensor kekeruhan, sensor suhu & sensor paras air. Pertama, peranti ini terdiri daripada motor, dudukan, penyimpanan ikan, PLC (Programmable Logic Circuit) dan GSM (Sistem Global untuk Mudah Alih). Peranti akan memberi makan ikan dengan menjatuhkan makanan dari tempat simpanan melalui lubang. Ukuran lubang dikendalikan oleh sekeping blok yang disambungkan ke motor. Pemasa digunakan untuk mengawal bilangan masa makan pada selang waktu. Selain itu, terdapat sistem maklum balas yang merasakan tahap suapan yang tersisa dalam simpanan. Ini akan memberi peringatan

kepada pengguna melalui SMS (Perkhidmatan Pesanan Ringkas) sehingga pengguna akan memasukkan umpan baru ke dalam simpanan.

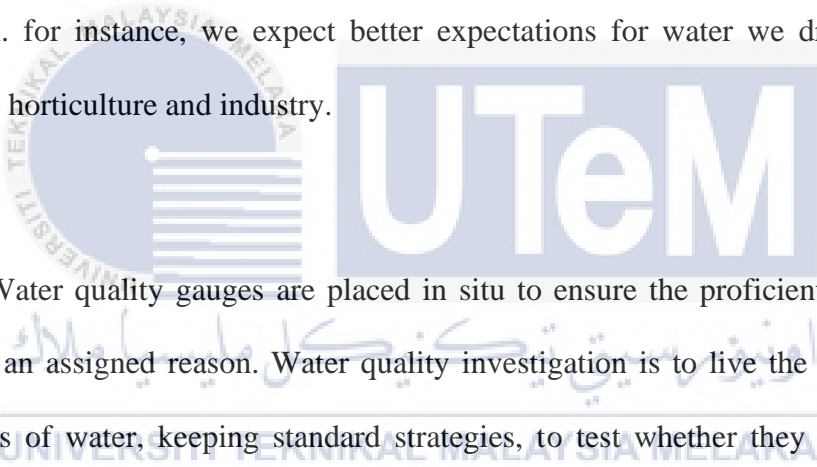
Makanan





## ABSTRACT

Water Quality will be characterized in light of the fact that the substance, physical and natural attributes of water, as a rule concerning its appropriateness for an assigned use. As we as a whole know, water has numerous utilizations, as for amusement, drinking, fisheries, agribusiness and industry. Every one of these assigned uses has diverse characterized concoction, physical and organic norms important to help that utilization. for instance, we expect better expectations for water we drink,swim and utilized in horticulture and industry.



Water quality gauges are placed in situ to ensure the proficient utilization of water for an assigned reason. Water quality investigation is to live the predetermined parameters of water, keeping standard strategies, to test whether they are as per the quality. These days Internet of Things (IoT) and remote detecting methods are utilized in various region of research for checking, gathering and examination information from remote areas. because of the huge increment in worldwide modern yield, rustic to urban float and in this manner the over-usage of land and ocean assets, the standard of water accessible to individuals has crumbled incredibly. The high utilization of manures in ranches additionally different synthetic compounds in parts like mining and development have contributed enormously to the general decrease of water quality universally.

Water is an essential requirement for human endurance thus there must be instruments placed in situ to energetically test the standard of water that made accessible for drinking around and city explained supplies and in addition on the grounds that the streams, rivulets and shoreline that encompass our towns and urban communities. the arrangement of astounding quality water is fundamental in forestalling flare-ups of water-borne sicknesses in addition as improving the standard of life.

A programmed fish feedings could be a gadget that consequently feed the fish at a foreordained time. As it were, it's to direct the fish taking care of action by utilizing a fish feeder that joined the mechanical framework and electrical framework to make an instrument instead of physically taking care of the fish by hand. Fish proprietors who are away for an extended time will experience difficulty knowing things of the lake or aquarium. In this way, such gadget is unbelievably helpful. At the indistinguishable time, nature incorporates water must be checked.

For this report, I will monitor the environment in term of pH sensor, turbidity sensor, temperature sensor & water level sensor. First, the device will consist of a motor, stand, fish storage, PLC (Programmable Logic Circuit) and a GSM (Global System for Mobile). The device will feed the fish by dropping the feed from the storage through a hole. The size of the hole is controlled by a piece of block connected to a motor. A timer is used to control the number of feeding time at an interval of time. Plus, there is a feedback system that sense the level of feed left in storage. It will give warning to the user through SMS (Short Messaging Service) so the user will put new feed into the storage.

## DEDICATION

I dedicate my dissertation work to my family and many friends. A special feeling of gratitude to my loving parents, Puan Che Ruhana Binti Lazim whose words of encouragement and push for tenacity ring in my ears. Also to my beloved supervisor and co-supervisor, Puan Kamilah Binti Jaffar and Puan Rohaina Binti Jaffar who helps me a lot during this report progression.

I also dedicate this dissertation to my many friends and classmates who have supported me throughout the process. I will always appreciate all they have done. There are a number of people without whom this report might not have been written, and to whom I am greatly indebted.

Millions of thanks to Universiti Malaysia Teknikal Melaka (UTeM) for giving me the opportunity to get an education here while allowing me to successfully complete this report. Thanks again, nothing can repay this good service without god permission ALLAH SWT.

## ACKNOWLEDGEMENTS

I am grateful to the God for the good health and wellbeing that were necessary to complete this report.

I place on record, my sincere thank you to Ts. Dr. Rostam Affendi Dean of the Faculty, for the continuous encouragement.

I am also grateful to all my lecturer, in the Department of Faculty of Electrical and Electronic Engineering Technology. I am extremely thankful and indebted to him for sharing expertise, and sincere and valuable guidance and encouragement extended to me.

I take this opportunity to express gratitude to all the Department faculty members for their help and support. I also thank my parents for the unceasing encouragement, support, and attention. I am also grateful to my partner with same supervisor who supported me through this venture.

I also place on record, my sense of gratitude to one and all, who directly or indirectly, have lent their hand in this venture. Thank you so much.

## TABLE OF CONTENTS

	<b>PAGE</b>
<b>TABLE OF CONTENTS</b>	<b>xiiiiv</b>
<b>LIST OF TABLES</b>	<b>xvi</b>
<b>LIST OF FIGURES</b>	<b>xviii</b>
<b>LIST OF APPENDICES</b>	<b>xix</b>
<b>LIST OF SYMBOLS</b>	<b>xx</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xxi</b>
<b>LIST OF PUBLICATIONS</b>	<b>xxii</b>
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
1.1 Background Study	1
1.2 Problem Statement	3
1.3 Objective of study	4
1.4 Scope of study	4
<b>CHAPTER 2 LITERATURE REVIEW</b>	<b>5</b>
2.1 Introduction	<b>Error! Bookmark not defined.</b>
2.2 General Project	<b>Error! Bookmark not defined.</b>
2.3 Example of techniques fully an automated water quality monitoring system	<b>Error! Bookmark not defined.</b>

2.3.1	Residual Chlorine Sensor	7
2.3.2	Total Organic Carbon (TOC) Sensor	8
2.3.3	Turbidity Sensor	8
2.3.4	Conductivity Sensor	9
2.3.5	pH Sensor	9
2.4	Example of techniques fully an automated fish feedings system	10
2.4.1	555 Timer IC	10
2.4.2	Servo Motor	11
2.5	Internet of Things (IoT) comparison	11
2.6	Literature review from the previous project	12
<b>CHAPTER 3</b>	<b>METHODOLOGY</b>	<b>15</b>
3.1	Introduction	15
3.2	Hardware Implementation	18
3.2.1	Arduino Uno Board	18
3.2.2	GPS/GPRS Module	18
3.2.3	pH Sensor	19
3.2.4	Turbidity Sensor	19
3.2.5	Temperature Sensor	20
3.2.6	Water Level Sensor	20
3.2.7	555 Timer Integrated Circuit (IC)	21
3.2.8	LCD Display	21
3.2.9	Jumper Wires	22
3.3	Software Development	22
3.3.1	Arduino Uno Software (IDE)	22
3.4	Motor	23
3.4.1	DC Motor	23

3.4.2	Servo Motor	23
<b>CHAPTER 4</b>	<b>RESULTS &amp; DATA ANALYSIS</b>	<b>24</b>
4.1	Introduction	24
4.2	Overall Project Description	25
4.3	Water Level, Water Temperature, and Water Turbidity Sensors Results and Data Analysis within the LCD & Alarm	27
4.3.1	Water Level Sensor Results and Data Analysis	27
4.3.2	Water Temperature Sensor Result and Data Analysis	29
4.3.3	Water Turbidity Sensor Result and Data Analysis	31
4.3.4	An Automated Fish Feedings System by using Servo Motor	33
4.3.4	Outdoor Test	35
4.4	Water Level, Water Temperature, and Water Turbidity Sensors Results and Data Analysis within the Serial Monitor screen in the Arduino IDE	37
4.4.1	Normal Condition (low level of the water, normal room temperature of the water and clean water turbidity level)	38
4.4.2	Extreme Condition (high level of the water, hot temperature of the water, and dirty water turbidity level)	39
4.5	Connection of the Project with details	40
4.5.1	Arduino Mega 2560	41
4.5.2	Liquid Crystal Display (LCD) (16x2) with Potentiometer	42
4.5.3	SIM808 GSM GPRS GPS Module	43
4.5.4	Three (3) Main Sensor as Output	45
4.5.5	Piezo Buzzer Alarm (Digital PWM)	46
5.0	CONCLUSION	47
5.1	Conclusion	47
5.2	Recommendation for the Future Project Improvement	49
<b>REFERENCES</b>		<b>50</b>
<b>APPENDIX</b>		<b>53</b>

## LIST OF TABLES

TABLE	TITLE	PAGE
-------	-------	------





## LIST OF FIGURES

FIGURE	TITLE	PAGE
4.2.1	Overall Prototype	25
4.2.2	External power supply and foodbank	25
4.2.3	Sensors and cable route through the box	26
4.3.1.1	Water level result on the 'left' cup of water	27
4.3.1.2	Water level result on the 'right' cup of water	28
4.3.2.1	Water temperature result on the 'left' cup of water	29
4.3.2.2	Water temperature result on the 'right' cup of water	30
4.3.3.1	Water turbidity level result on the 'left' cup of water	31
4.3.3.2	Water turbidity level result on the 'right' cup of water	32
4.3.4.1	Default position of the foodbank	33
4.3.4.2	Movement position of the foodbank, from left to right	34
4.3.5.1	Overall outdoor test description	35
4.3.5.2	Result of the water level and temperature detector	35
4.3.5.3	Result of the voltage and NTU level	36
4.4.1	Result obtained by the sensor with normal condition	37
4.4.2	Result obtained by the sensor with extreme condition	38
4.5.1.1	Arduino Mega prototype	39
4.5.1.2	Arduino Mega pinout datasheet connection	40
4.5.2.1	LCD Display prototype	41
4.5.2.2	LCD Display pinout datasheet	41
4.5.2.3	Potentiometer pinout datasheet	42
4.5.3.1	SIM808 prototype	43
4.5.3.2	SIM808 pinout datasheet	44
4.5.4	All sensors circuit, diagram and connection	45
4.5.5	Piezo buzzer alarm diagram	46

## LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Datasheet 1	Arduino Mega pinout datasheet connection	52
Datasheet 2	LCD Display and Potentiometer pinout datasheet	53
Datasheet 3	SIM808 pinout datasheet	54
Datasheet 4	Sensors pinout datasheet	55
Datasheet 5	Piezo buzzer alarm pinout datasheet	55



## LIST OF SYMBOLS

<b>D, d</b>	-	Diameter
<b>F</b>	-	Force
<b>g</b>	-	Gravity = 9.81 m/s
<b>I</b>	-	Moment of inertia
<b>l</b>	-	Length
<b>m</b>	-	Mass
<b>N</b>	-	Rotational velocity
<b>P</b>	-	Pressure
<b>Q</b>	-	Volumetric flowrate
<b>r</b>	-	Radius
<b>T</b>	-	Torque
<b>Re</b>	-	Reynold number
<b>V</b>	-	Velocity
<b>w</b>	-	Angular velocity
<b>x</b>	-	Displacement
<b>z</b>	-	Height
<b>q</b>	-	Angle

## LIST OF ABBREVIATIONS

IoT	Internet of Things
SMS	Short Message Services
PLC	Programmable Logic Circuit
GPS	Global Positioning System
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
NWQS	National Water Quality Standard
IDE	Integrated development environment
LCD	Liquid-crystal display
TOC	Total Organic Carbon
IC	Integrated Circuit
DC	Direct Current
T/C	Thermocouple

## LIST OF PUBLICATIONS



# CHAPTER 1

## INTRODUCTION

### 1.1 Background Study

Water is one of the most significant things that are required by every living thing on the planet. This sort of component is a significant need to the most worldwide client in our day by day life. As we as a whole know, our earth comprises by secured of 71% of water incorporates seas, streams, lakes, marshes and others. Contrasted with the entirety of that, a large portion of them are salt water (seas) while just 2.5% left are freshwater which can be utilized channel for drinkable. Anyway just 1% of water are unadulterated drinkable without channel actually from characteristic ecological mountains. Besides, water requests of utilized only not for people yet additionally utilized for other people, which are creatures even microbacteria lives relies upon it.

The vast majority of individuals simply don't realize that water has three significant qualities which are physical, synthetic and organic attributes. The crude rewarded water (terrible freshwater) completely can be seen by unaided eye which connected to physical qualities. While another two attributes should be tried (model utilizing water quality sensor) to know their conditions and characteristics. In any case, every one of those attributes must have comparative (great condition) to passed their quality. Doesn't mean when we took a gander at those dismal water to be appears to be fine and safe. The another tried must be done accurately as well. Means it is same to (AND) door adage make all the positive qualities to find positive solution.

Water likewise goes about as a significant for financial matters movement, for example, horticulture, fisheries, mining area, transport and a travel industry need water as their water assets. These days in our day by day life by increments of urbanization (human progress) implies we are required huge amounts of freshwater each and every day to be utilized and this causes welcomed a terrible impact on both surface and ground water and it will quickly diminish the water quality in term of its physical, substance and organic attributes. From all history the we had learned previously, the vast majority of old development are drawing nearer to water sources on the grounds that without it, human progress can't be effective and heavenly. Not simply that, those component of nature of water are likewise imperative to get us far from getting ailment that are spreading through water to human and creatures. Indeed, even in this new period, got more than 1 billion individuals everywhere throughout the world generally in creating nation shortage of innovation to get progressively sheltered water (freshwater) prompting the presence of different ailments spread by contaminated water. In this way, what we as a whole needs are exceptionally sound states of water (freshwater) to keeps us goes on in our day by day existence without stress the nature of water.

This report study was conducted to monitoring the quality of water by using few sensor and fully an automated provides food for fish for every single days in a green house that are fully taking care by us. This green house literally acts as a habitat and natural environmental with most of fully an automated system to make this project successful.

## 1.2 Problem Statement

Nowadays, lots of people are busy and got less time and forgot to keeps on right track with their passion of hobby. Still, with unpredictable weather causing other problems too. Right now, if the drought season is too long, it can make lead anything goes to the highest percentage of worst scenario while if the winter season is too long the same scenario as above could be happen too. The same goes for look after the animals which is fish, we created an automated fish feedings. Without this project, those fish can be dead if no proper care are given. So, in order to avoid above scenario to be happen. We build a green house fully with an automated system. This project leads as solutions for the below problem statement;

- 1) Causes of contaminated water due to environmental conditions and human error which leads to water poisoning.
- 2) Lacks of free time in a day for human to maintain a good condition of their water quality and fish feedings.
- 3) The weather in the country is uncertain leads to various of other negative things which is prolonged drought.