



**Faculty of Electrical and Electronic Engineering Technology**



**DEVELOPMENT OF PLANT AUTOMATED MONITORING AND  
SELF-WATERING SYSTEM**

**MARLINA BINTI JAHAVA**

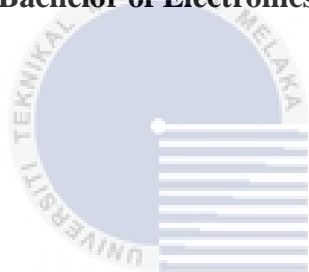
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**DEVELOPMENT OF PLANT AUTOMATED MONITORING AND SELF-  
WATERING SYSTEM**

**MARLINA BINTI JAHAVA**

**A project report submitted  
in partial fulfillment of the requirements for the degree of  
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**Faculty of Electrical and Electronic Engineering Technology**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

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I declare that this project report entitled “Development of plant Automated Monitoring and Self-watering 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.

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## APPROVAL

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## DEDICATION

I'd like to sincerely dedicate, honour, and thank both of my parents, Jahava and Kasiyana, for their love, encouragement, support, and sacrifices throughout my life and always pushing me to do better work. I could not have reached this point without their efforts and encouragement. Not forgetting, I want to say thank you to nine of my siblings that have never left my side and are incredibly special people. Furthermore, I dedicate this thank you to all the UTEM lecturers who motivated me to complete my project and guided me throughout my studies, especially this special thank you to my supervisor for guiding me through this process, as well as those who always taught me to keep track. Hence, this project is also dedicated to all of my friends who have meant and continue to mean so much to me. Despite the fact that we are no longer studying at UTEM, the memories that we create together will continue to be a great experience for all of my life.



## ABSTRACT

The plant is not only important for human life but it also can use as a decoration because it's suitable to put at the house and workplace. Moreover, Gardening not only can help people to reduce their stress but also can improve mental health no matter by growing plants indoor or outdoor. The title of this project is Development of Plant Automated Monitoring and Self-Watering System. The process of the watering plant can be done in 2 types of different ways which is can be done manually or automatically. To determine whether the crops need water or not, it's quite difficult to know if it is done manually. This is because watering the plants needs an appropriate volume of water to make sure the crops are always in good condition. Besides, busy life is one of the reasons why users face problems taking care of their plants. They also may not be able to refill the tank because of working abroad or traveling for a long time. Therefore, this project is to create a system that should be able to monitor the water level at the main water tank and involves a system from manual to automatic watering. The technology will integrate all data from the crop's built-in monitoring system to an automatic management system. Each subsystem component is equipped with devices and several sensors, as well as wireless communication modules that allow the server and IoT platform to communicate with one another. Aside from that, this device was developed and implemented with a design and a low cost with a wide range of functionality of free energy method, where the system capable to refill the main tank automatic was successfully obtained in this project. This project is also suitable for those who do not have enough time to take care of their crops.

## ***ABSTRAK***

Tumbuhan bukan sahaja penting untuk kehidupan manusia tetapi ia juga boleh digunakan sebagai hiasan kerana ia sesuai untuk diletakkan di rumah dan tempat kerja. Selain itu, tanaman bukan sahaja dapat membantu orang ramai mengurangkan tekanan mereka tetapi ia juga boleh meningkatkan kesihatan mental manusia tidak kira dengan menanam tumbuhan di dalam atau di luar rumah. Tajuk projek ini ialah Pembangunan Sistem Pemantauan Tanaman secara Automatik dan Sistem Penyiraman Sendiri. Proses penyiraman tanaman boleh dilakukan dengan menggunakan 2 jenis cara yang berbeza iaitu boleh dilakukan secara manual atau automatik. Untuk menentukan sama ada tanaman memerlukan air atau tidak, ia agak sukar untuk diketahui sekiranya dilakukan secara manual. Ini kerana menyiram tanaman memerlukan isipadu air yang sesuai bagi memastikan tanaman sentiasa dalam keadaan baik. Selain itu, kehidupan yang agak sibuk merupakan salah satu sebab mengapa pengguna menghadapi masalah untuk menjaga tanaman mereka. Mereka juga mungkin tidak dapat mengisi semula tangki kerana bekerja di luar negara atau melancong dalam tempoh yang agak lama. Oleh itu, projek ini adalah untuk mewujudkan sebuah sistem yang dapat memantau paras air di tangki air utama dan melibatkan sistem penyiraman secara manual ke automatik. Teknologi ini akan menggabungkan semua data daripada sistem pemantauan yang dibina dalam tanaman kepada sistem pengurusan automatik. Setiap komponen subsistem dilengkapi dengan peranti dan beberapa penderia, serta modul komunikasi tanpa wayar yang membolehkan pengguna dan platform IoT berkomunikasi antara satu sama lain. Selain itu, peranti ini dibangunkan dan dilaksanakan dengan reka bentuk dan kos yang rendah dengan pelbagai fungsi kaedah tenaga bebas, di mana sistem ini mampu mengisi semula tangki utama secara automatik telah berjaya diperolehi dalam projek ini. Projek ini juga sesuai untuk mereka yang tidak mempunyai masa yang cukup untuk menjaga tanaman mereka.



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## LIST OF SYMBOLS

°C	-	Temperature
>	-	Greather than
<	-	Less than
%	-	Percentage
A	-	Current
kg	-	Kilogram
mm	-	Mili meter



## LIST OF ABBREVIATIONS

V	-	Voltage
LED	-	Light Emitting Diode
IoT	-	Internet of Things
m	-	Length
MB	-	MegaBytes
kB	-	KiloBytes



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# CHAPTER 1

## INTRODUCTION

### 1.1 Background

The plant is not only important for human life but it also can use as a decoration because it's suitable to put at the house and workplace. Moreover, Gardening not only can help people to reduce their stress but also can improve mental health no matter by growing plants indoor or outdoor. However, to keep maintaining plant health is requires high discipline [1]. Development of Plant Automated Monitoring and Self-Watering System suitable for those who want a fresh environment when at home or work but at the same time is in a very simple, easier ways and able to save time. This system is designed to detect humidity soil so as not to dry or too moisture by maintaining crops fertility by using several types different sensor, which is soil moisture sensor, temperature, humidity sensor, etc. In several related research, the process of the watering plant can be done in 2 types of different ways which is can be done manually or automatically. However, this project will be showing the design of a system that waters the plant automatically.

Furthermore, the main project Development of Plant Automated Monitoring and Self-Watering System is to design a device that can detect soil moisture and water plants automatically depending on crops needed to ensure humidity of the soil. Moreover, it is also able to detect the temperature and humidity surrounding the plant, several different types of sensors to be used that will be connecting to Arduino Uno. Furthermore, this project discussed implementing a free energy method to ensure that the water at the main water tank 2 does not shortage of water, method of free energy will be applied. By using this method, a

user does not have to worry about the water level on the main water tank because this method is like a second hope for those who are not at home/work for the long term.

Lastly, by using a Blynk application that will be sending the data or notification to the user because this IoT platform was linked to Arduino Uno by using a Wi-Fi module, this is to ensure that the user does not have to feel hesitant or worried. For the build, this system will need to properly connect.

## **1.2 Problem Statement**

Plant health is a key condition for sustainable land. Watering the plants is a task that plant lovers must perform to care for their plants. Moreover, to determine whether the crops need water or not, it's quite difficult to know if it is done manually. This is because watering the plants needs an appropriate volume of water to make sure the crops are always in good condition. The development of plant automated monitoring and self-watering systems will not only check soil moisture and health but will also ensure when and how much plants need water automatically.

Furthermore, busy life is one of the reasons why users face problems taking care of their plants, sometimes they forget to water them. Besides, even if the user has a plant monitoring and watering system, they may not be able to refill the tank because of working abroad or traveling for a long time. Users can't go to check the condition of the plants due to time constraints.

### 1.3 Project Objective

The purpose of this project was to develop a watering system that could maintain plants fertility and the ability to control the moisture of the soil. Besides, with the development of technology, smartphones have become a necessity for every people in this world, for example, to monitor systems no matter what kind of system humans use. Overall, using sensor and other equipment to build a Development of Plant Automated Monitoring and Self-Watering System need a proper connection, which can make it easier for the user to monitor the plant especially for those who do not have enough time to take care of their plants. Furthermore, the main objective of this project is to introduce a project monitoring and watering plant system that targets the audience or user by identifying the reasons and problems that people facing in a greener environment. This chapter is a detailed list of objectives of the project:

- a) To design a watering system for the plant by implementing a hardware and software device.
- b) To develop an IoT device that is capable of automatically watering the plants based on soil moisture need and detecting water level along with water tank able to self-refilling the tank with automatic by using the free energy method.
- c) To evaluate the status of plants from time to time by allowing the user to monitor the status of soil moisture and water level at the main tank.

## 1.4 Scope of Project

The scope of this project are as follows:

- a) Will be able to read value and monitor the soil moisture at the plant by using a soil moisture sensor. Considering that the project will be focusing on indoor plants, DHT-11 will be used to detect humidity and temperature surrounding the plants.
- b) Create a system that should be able to monitor the water level at the main water tank and involves a system from manual to automatic watering.
- c) The main water tank should be automatically refilled by connecting to some other extra water tank by using a free energy method without electricity that will be connected to the PVC switch, shut-off valve, etc, to make it easier for users who work outside for a long time
- d) The project will be covered into two types of implementation which is software and hardware, where the system will develop into Arduino programming language, sensor system, and output
- e) User will be receiving notifications through the Blynk application through smartphone about the condition of soil moisture and the condition of water in the main water tank.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

This chapter will discuss in detail about Development of Plant Automated Monitoring and Self-Watering System consumption, function, and benefit of using Plant Automated Monitoring and Self-Watering systems. As the result of studies, there are several related works presented, articles to this project, and related journals that will be explained.

The project overview of this research consists of several systems involving measured, watering systems, and controlled systems. Nowadays, everything has been innovated to the point where many things rely on the internet. However, there are still have people who use manual processes to manage their flowers and plants.

#### 2.2 Internet of Things (IoT)

Internet of Things (IoT) refers to a system of interrelated, internet-connected objects that are able to collect and transfer data over a wireless network. IoT monitors such watering system is can be done by using a water flow sensor, which can be easier to IoT monitor to detect the condition of the system. Smartphone apps can be used to track the condition of the system. In watering system, the most important thing to communicate between the system and user are by using IoT networking architecture [2].