



## **UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

### **Development of Monitoring System in Energy Harvesting from Burning Process via IoT Based System**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Telecommunication) with Honours.

by

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## BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **DEVELOPMENT OF MONITORING SYSTEM IN ENERGY HARVESTING FROM BURNING PROCESS VIA IOT BASED SYSTEM**

SESI PENGAJIAN: **2018/19 Semester 1**

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## 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 Electronic Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

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## ABSTRAK

Produk ini terutamanya berkembang untuk penggunaan pelbagai tujuan seperti semasa penggunaan luar, semasa bencana alam dan apabila berlaku gangguan bekalan elektrik. Objektif projek ini adalah untuk memahami tentang penuaian tenaga dengan menggunakan modul TEG melalui proses pembakaran dan membangunkan produk yang memenuhi keperluan masyarakat dalam pelbagai usaha. Selain itu, sistem pengawasan yang disepadukan dengan sistem berasaskan IoT adalah untuk tujuan untuk mengumpulkan pelbagai data dari segi suhu, voltan yang dihasilkan oleh TEG berdasarkan bahan untuk jangka masa, parameter asap yang telah ditapis nilai semasa dan berat bahan. Selain itu, seperti yang dinyatakan sebelum ini, kaedah yang digunakan dalam projek ini adalah dengan menuai tenaga haba dan menukarnya kepada tenaga elektrik dengan proses pembakaran, dan ditambah dengan sistem pemantauan yang membantu untuk mengenal pasti keluaran berdasarkan dari sensor yang tetap seperti voltan, arus, berat, suhu dan asap. Semua data yang dikumpulkan, akan disimpan dalam sistem awan yang memudahkan untuk menganalisis dan menghasilkan pelbagai graf analisis. Selain itu, Arduino IDE digunakan untuk menulis program sistem manakala pencipta App MIT digunakan untuk membangunkan aplikasi Android. Pelayan Blynk digunakan untuk menyimpan data dan menghasilkan graf analisis yang berbeza seperti voltan dan graf kuasa. Data mentah yang dikumpulkan disimpan dalam Blynk dan data tersebut adalah dalam nilai deskriptif yang dapat menentukan jenis graf yang perlu dianalisis. Oleh itu, bahan biomas yang berbeza digunakan dalam projek ini, dan arang dipilih sebagai bahan terbaik yang menghasilkan pelepasan kuasa tinggi. Oleh itu, untuk membuktikan kenyataan itu, analisis regresi dijalankan dan garis regresi korelasi positif yang kuat dihasilkan.

## ABSTRACT

This product mainly develop for multiple purpose usage such as during outdoor activities use, during disaster and when there is power outage happens. The objective of this project is to understand about energy harvesting by using the TEG module through burning process and developing a product that serve the community needs in various ventures. Moreover , a monitoring system integrated with IoT based system is to be prior for the purpose to collect variety of data in terms of temperature, voltage that produce by TEG based on the material for a span of time ,smoke parameter that been filter current value and weight of material. Besides that as mention earlier, the method use in this project is by harvesting the heat energy and convert it to electrical energy by burning process, and added with a monitoring system that help to identify the output based on the variable gain from the sensors that fixed such as voltage, current, temperature weight and smoke. As a result, all the data that is collected, will be save in a cloud system that ease us to analyze and produce various analytical graph. Furthermore, Arduino IDE was used to write the program of the system while MIT App inventor was used to develop the Android apps. Blynk server is use for store the data and to produce different analytical graph such as voltage and power graph. The raw data that are collected are stored in the Blynk cloud and that data are in descriptive value that can determine types of graph that need to be analyze. Thus, different biomass material are use in this project, and charcoal are selected as best material that produce high power emission. Hence to prove the statement, a regression analysis are conducted and a strong positive correlation regression line was produced.

## **DEDICATION**

This thesis is dedicated to:

My beloved parents,

My supervisors,

My lecturers,

My family,

And all my friends,

Thank you for the guidance, encouragements and support.

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## LIST OF ABBREVIATIONS AND SYMBOLS

|      |   |  |
|------|---|--|
| A    | - | Ampere                                 |
| AC   | - | Alternative Current                    |
| ADC  | - | Analog to Digital Conversion           |
| API  | - | Application of interface               |
| DC   | - | Direct Current                         |
| ESP  | - | Espressif Systems                      |
| GSM  | - | Global system for Mobile Communication |
| GUI  | - | Graphic User Interface                 |
| HTML | - | Hypertext Markup Language              |
| I    | - | Current                                |
| IoT  | - | Information of Technology              |
| kWh  | - | Kilowatt per hour                      |
| LCD  | - | Liquid Crystal Display                 |
| MCU  | - | Microcontroller Unit                   |
| MIT  | - | Massachusetts Institute of Technology  |
| MPPT | - | Maximum power point tracking           |
| °C   | - | Celcius                                |
| P    | - | Power                                  |
| PCB  | - | Printed Circuit Board                  |
| PWM  | - | Pulse Width Modulation                 |
| RF   | - | Radio Frequency                        |
| TEG  | - | Thermoelectric Generator               |
| V    | - | Voltage                                |
| W    | - | Watt                                   |
| WSN  | - | Wireless sensor network                |

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# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

In this chapter project background, problem statement, objectives and scope that clarifies the main conceptual in developing and designing the monitoring system in energy harvesting from burning process via IoT based system.

### 1.1 Project Background

Energy has dependably been a most imperative thing for the advancement of economy and social development in nation. It is never again seen as luxuriousness as it used to be however it has turned into an impulse in our regular daily activities. Malaysia is gifted with renewable energy sources, for example as hydro, wind, solar, geothermal and tidal wave but most of these renewable energy resources are not fully used(Azman *et al.*, 2011). Greater improvement of these assets will be required focusing different perspectives and huge test. Solar is one of the most use technique that can be seen implementing most of the place in Malaysia. Solar energy has been the most used renewable energy in Malaysia because it's easy implementation and the way of use .Most of the companies and household in Malaysia has use solar energy as their alternative source other than the typical electricity that currently they have(Fayaza *et al.*, 2011). But at a point, solar panel cost high when it's come to the maintenance and the amount of solar tile used and the size of the tile is big and