



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DESIGN AND DEVELOP INTELLIGENT LIGHTING  
SYSTEM INTEGRATED WITH PV SOLAR**

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

by

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## **APPROVAL**

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Automotive) with Honours. The member of the supervisory is as follow:

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## ABSTRAK

Tujuan utama projek ini adalah mengenai *development of intelligent lighting system integrated with PV solar* untuk penggunaan skala kecil seperti bilik tidur, ruang tamu, ruang – ruang di dalam rumah dan bilik air. *Development of intelligent lighting system integrated with PV solar* untuk kajian ini adalah tahap radiasi matahari, jenis solar panel, jenis bateri, jenis pengesan pergerakan dan jenis pengecas bateri. Tujuan projek ini adalah untuk mengenal pasti tentang penjimatan tenaga elektrik yang boleh dihasilkan melalui sistem solar dan kepintaran pengesan pergerakan sebagai suis lampu. Proses bermula dengan mengetahui radiasi matahari di Malaysia, untuk mengetahui radiasi matahari di Malaysia terdapat dua cara iaitu menggunakan *pyranometer* untuk mengesan radiasi secara manual atau menggunakan data dari NASA untuk mengetahui radiasi di Malaysia. Kemudian itu, selepas mendapatkan data radiasi tersebut, proses seterusnya ialah penggunaan panel solar yang sesuai. Penggunaan panel solar yang sesuai mempunyai kiraan yang tersendiri dengan menggunakan data bermula dari jumlah beban elektrik yang digunakan. Selepas pengiraan dilakukan kesesuaian panel solar boleh ditentukan melalui jumlah watt yang digunakan. Selepas itu penggunaan solar sel yang sesuai ialah menggunakan sel solar *monocrystalline* kerana solar sel tersebut mempunyai kecekapan yang tinggi, tahan lama dan mempunyai penyerapan radiasi cahaya matahari yang tinggi. Setelah itu, pemilihan terhadap bateri juga memerlukan pengiraan supaya penggunaan bateri yang sesuai dapat dibuat. Di dalam projek ini bateri yang digunakan adalah bateri jenis *Lithium – Ion*, kerana bateri ini dapat menyimpan tenaga elektrik dengan cepat, pelepasan tenaga yang cekap dan mempunyai ketahanan yang tinggi. Selepas itu, pengiraan untuk pengecas bateri. Pengecas bateri juga amat penting di dalam projek ini kerana ia berfungsi untuk mengawal keluar masuk tenaga elektrik dengan mengawal voltan dan arus. Selepas mendapatkan kesemua kesesuaian untuk solar panel, sel solar bateri dan pengecas bateri, perisian *Multisim* digunakan untuk mereka litar untuk solar sistem. Litar yang direka melalui penggunaan *Multisim* sangat tepat dan boleh mengesan kerosakan atau kesilapan semasa litar sedang dijalankan. Sehubungan dengan itu, beban yang digunakan adalah lampu *LED* yang mempunyai beban sebanyak 1 watt, jumlah keseluruhan adalah 10 lampu *LED* dan jumlah watt adalah 10. Selepas itu, pemilihan untuk pengesan pergerakan menggunakan spesifikasi yang ada di pasaran. Pengesan pergerakan yang tepat adalah *passive infrared* ini kerana dari segi kecekapan yang tinggi dan keluasan pengesan yang besar. Selepas itu, pemasangan yang penuh bermula dari sistem solar hingga ke beban serta pengesan pergerakan. Dengan berbuat demikian, keputusan untuk kelancaran sistem solar, beban dan pengesan pergerakan akan dinilai dengan menggunakan meter voltan dan arus untuk memastikan bahawa *development of intelligent lighting system integrated with PV solar* berjalan dengan lancar.

## ABSTRACT

The main purpose of this project is the development of intelligent lighting system integrated with PV solar for small scale applications such as bedroom, living room, space in the house and bathroom. Development of intelligent lighting system integrated with PV solar for this study is the level of solar radiation, solar panel type, battery type, type of motion detector and battery charger type. The purpose of the project is to identify the electrical energy savings that can be generated through the solar system and the intelligence detector's intelligence as a switch. The process begins with knowing solar radiation in Malaysia, to find solar radiation in Malaysia there are two ways to use pyranometer to detect radiation manually or use data from NASA to find out radiation in Malaysia. Then, after obtaining the radiation data, the next process is the use of appropriate solar panels. The use of appropriate solar panels has its own unique calculation using data ranging from the total electric load used. After calculations the suitability of solar panels can be determined by the amount of watts used. After that, the use of suitable solar cells is to use monocrystalline solar cells because the solar cells have high efficiency, durability and have high absorption of sunlight. After that, battery selection also requires calculation so that appropriate battery usage can be made. In this project the battery used is a Lithium - Ion type battery, as it can store electricity fast, efficient and high energy durability. After that, calculations for the battery charger. Battery chargers are also very important in this project as it works to control the energy of incoming electricity by controlling the voltage and current. After getting all the suitability for solar panels, solar battery cells and battery chargers, Multisim software is used for their circuitry for solar systems. Circuits designed through the use of Multisim are very accurate and can detect faults or errors while the circuit is in progress. Accordingly, the load applied is LED light that has a load of 1 watts, the total is 10 LED lights and the total watts are 10. After that, the selection for the motion detector uses the specs available on the market. The precise movement detector is passive infrared because in terms of high efficiency and large detector area. After that, full installation starts from the solar system to the load and movement detector. In doing so, the decision to smooth the solar system, load and motion detector will be evaluated by using voltage and current meters to ensure that the development of intelligent lighting system integrated with PV solar runs smoothly.

## **DEDICATION**

**Special dedicated to my beloved father and mother,**

Abu Kamal Bin Ghazali

Suzana Binti Sharie

**My supportive siblings,**

Nurul Ain Syuhada Binti Abu Kamal

Muhammad Azrai Aizad Bin Abu Kamal

**For my supervisor,**

Puan Kamilah Binti Jaffar (Lecturer)

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## LIST OF SYMBOLS

<b>V</b>	-	Voltage
<b>A</b>	-	Ampere
<b>I</b>	-	Current
<b>W</b>	-	Watt
<b>Lux</b>	-	Lumen
<b>Ah</b>		Ampere/hour
<b>°</b>		Degree
<b>°C</b>		Celsius
<b>mm</b>		Millimetre
<b>kg</b>		Kilogram
<b>%</b>		Percentage

## LIST OF ABBREVIATIONS

<b>PCA</b>	Principal Component Analysis
<b>UV</b>	Ultra Violet
<b>PV</b>	Photovoltaic
<b>PWM</b>	Pulse Width Modulation
<b>Nutrient D3</b>	Vitamin D
<b>Si</b>	Silicon
<b>IT</b>	Information Technology
<b>P type</b>	Silicon PNP
<b>N type</b>	Silicon NPN
<b>VOC</b>	Voltage Open Circuit
<b>TF</b>	Thin Film
<b>CdTe</b>	Cadmium Telluride
<b>CIGS</b>	Copper Indium Gallium Diselenide
<b>a-Si/TF-Si</b>	Nebulous Slight Film Silicon
<b>nm</b>	Nano Meter
<b>µm</b>	Micro Meter
<b>c-Si</b>	Cell Silicon
<b>PIR</b>	Passive Infrared
<b>MW</b>	Microwave
<b>LIB</b>	Li – Ion Battery
<b>DC</b>	Direct Current

<b>DoD</b>	Depth Of Discharge
<b>LED</b>	Light Emitting Diode

## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

This part will examine the foundation of study , issue proclamation , objective , the extent of study , the criticalness of study , postulation layout and expected aftereffect of the undertaking so as to finish the examination and build up the plan. In light of the foundation of the examination , the goal of the venture will be resolved from the issue articulation.

This part is critical to clarify the essential or by and large of the venture.

#### 1.2 Background of study

Solar power is a one of renewable energy that using the UV light from sun. Nowadays , almost in every houses using solar power system to decrease of using primary electricity source. As we know when the primary electricity source in high usage they need to recover it by using the easiest way to generate electricity such as hot pressure air for the turbin moving. By using this way our world will have extreme global warming because the heat that generate from hot air pressure system are affected.

Sun based power is the change of vitality from daylight into power, either straightforwardly utilizing photovoltaics (PV), in a roundabout way utilizing concentrated sun based power, or a blend. Concentrated sun based power frameworks use focal points or mirrors and following frameworks to center an extensive region of daylight into a little bar. Photovoltaic cells convert light into an electric flow utilizing the photovoltaic impact.