



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN AND FABRICATION THE ELECTRIC MINI
SCOOTER FOLDING**

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

by

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I declare that this thesis entitled DESIGN AND FABRICATION THE ELECTRIC MINI SCOOTER FOLDING is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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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 (Mechanical) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Projek ini adalah untuk mengkaji semula reka bentuk yang paling sesuai yang boleh digunakan oleh orang-orang yang tidak mempunyai ruang yang cukup pada kereta mereka untuk membawa skuter mini elektrik. Selepas menganalisis reka bentuk yang paling sesuai, ia akan dilukis menggunakan perisian SOLIDWORK. Lukisan itu akan digunakan sebagai rujukan untuk menghasilkan produk yang dikehendaki untuk orang ramai. Skuter mini untuk orang yang mahukan skuter kompak yang menggabungkan konsep dengan skuter mini. Sistem pergerakan skuter elektrik disesuaikan daripada skuter mini biasa dengan motor elektrik. Reka bentuk ini disesuaikan dengan reka bentuk asal konsep tiga roda, di mana ruang boleh disimpan dengan melipat skuter.

ABSTRACT

This project is to review the most suitable design that can be used by people who do not have enough space on their car to carry the electric mini scooter. After analyzing the best suited design, it will be drawn using SOLIDWORK software. The drawing will be used as a reference in order to manufacture the desired product for people. The mini-scooter for people who want a compact scooter that combines a concept with a mini-scooter. The electric scooter movement system is adapted from an ordinary mini scooter with an electric motor. The design is adapted from the original design of a three-cycle concept, in which space can be saved by folding the scooter

DEDICATION

This study is wholeheartedly dedicated to my beloved parents, Hamsiah Binti Junit and Mohd Johaidi Bin Mohd Baharuddin that always encourage and support me. Who has been my inspiration and gave me strength not to giving up and keep continuously provide their spiritual, moral and emotional support during this project. Besides that, I would like to thank to my honored supervisor Mr Mohd Sulhan Bin Mokhtar who guided me through the entire process and advise me to overcome most of the difficulties and challenges in order to finish this study. Lastly, I would like to thanks all people which contributes to my Bachelor Degree Project for their comments and suggestion, and also to my all friends.

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CHAPTER 1

INTRODUCTION

The structure of the report describing chapter divisions and related contents for that particular chapter is provided in this chapter. Furthermore, on this chapter provides a background to the problem statement and the goal of the project, as well as the scope for the study that clearly defines the studying boundaries or limits. In general, the progress of the entire project is summarized and the completion of this project is described in certain times.

1.0 Background of study

Electric scooter is an electric motor powered vehicle that moves. It is also called an e-scooter. Some countries used different power for the electric motor's power source because it depends on national law. The batteries used in rechargeable e-scooters can generate engine power and are capable of operating at 40 to 65 km / h, basically. Electric scooter invention is evidence of further development in the engineering field, and electric scooter invention replaces the old scooter that is now available on the market. While the electric scooters use electric engines, they still call scooters instead of motorcycles. This is because it is still identity as a scooter, which is mostly scooter like. Not included in the

transport law requiring as a good motor vehicle certification and operation. The electrical scooter does not require a license.

The electric scooter is not a fully powered vehicle, but just a semi-motorized scooter with a brake and frame design, and so on. This electric scooter uses a chargeable battery, a common energy supply for the electric scooter. A battery that they usually use know as a nickel metal hydride battery. This type of battery is rechargeable and a lighter density battery makes it easier and easier to design an electric scooter. In many concepts, the electric scooter is not like a motorcycle, whether it is designed or powered. In addition, lower power is used in the electric motor compared to a scooter use combustion engine. There is a certain type of electric scooter that all people usually use in terms of weight and frame type. The scooter weight also plays an important part in scooter speed. It is used for competition either so there are few common weights used for the scooter. The weight of the scooter depends on the purpose of a scooter. The scooter weighs 50 or 60 kg on an older scooter, which was already older today before the scooter's technology was not yet updated. For the present electric scooter, scooter weights have been improved, scooter weights decreased to approximately 35 and 45 kilograms. The weight of the scooter is enhanced for the purpose of handling the scooter and speed.

There are few materials popular for developing scooter frames for the main frame or scooter chassis, intended to make the scooter lighter and more robust. Carbon fibre, which describes this material as the most common material used in developing scooter frames, contains various different composites, including various polymers, carbon and graphite, which are connected by an epoxy-resin matrix which sometimes holds metals or ceramics. Carbon fiber, steel and titanium are the types of materials used for scooter frames. This carbon fiber is one of the advanced composites that offer large possibilities for light weight

and high performance, as the composite layer can only be inserted where necessary. Fiber also is a material called whiskers used on the various part of the frame to stabilize dynamic forces by various degrees and directions

Steel, also used for the development of a scooter frame and used for many scooter frames. Steels provides an easy ride, while a steel frame can serve as a spring to store energy when the rider flexes the frame in several pieces. Steel is the material for many frames used by scooters. Many scooter designers employed their long experience in the refinement of steel scooter design. A low cost steel frame can be repaired and a steel scooter can show or reveal stress injuries to frame before the frame breaks if damages occur. Steel frame scooter breaks slowly as against a frame made of aluminium which suddenly breaks when the frame has failed. Alloyed with chromium and molybdenum, sometimes even manganese and molybdenum, most of the high quality scooter frames are made of steel tube. Titanium is also one of the most popular materials for the development of scooter frame. The titanium's characteristic as a scooter frame is nearly like steel but has more benefits than both carbon fiber and steel. Titanium is lighter than carbon fiber and steel, and the strength of stress by force or impact is greater than steel, and titanium fatigue life is greater than steel. While titanium gains all aspect for scooter frame development, the cost to developing titanium frame is higher than steel and carbon fiber.

1.1 Problem Statement

A problem statement is a short description of the problems a team must address and present to them so they will try to resolve a problem. Small scooters nowadays are popular during recreation, relaxation and exercise after they have faced their job. There is a lot of a scooter like sitting or standing while riding a scooter around us. Most of this is motor electric

operation or just the use of our leg to move scooters like skateboards. The problem is, although it has become small, most of the scooter is not flexible. Although some manufacturers are able to make it flip, only a few parts are like the seat, the handle and sometimes the arm bar. The majority of the small flip scooters are operate through a swinging leg to move it. Some of the scooter did not look that ergonomic and could not be used for long. Most of that cannot be flip even for an electric scooter. In general, only seat and handle can be up and down to flip. Sometimes this can take a lot of storage space and make it difficult to get away from home and put it into the car. Figure 1 shown a foldable electric scooter.



Figure 1: foldable electric scooter

(Source: <https://cdn.shopify.com/s/files/1/0940/9948/products/electric-scooter-for-adult.jpg?v=1533537464>)

1.2 Project Objective

The objective of this study are as follow based on the introduction and problem statement of this study:

- To design the electric mini scooter suitable for small space and easy to carry.
- To fabricate design that has been drawn into a real product.

1.3 Scope

This research/investigation project will focus on mainly on the most suitable well designed scooter for small storage space. This mini scooter is design specifically for people who wasn't carry a heavy weight item. In addition, an electrical system will be apply inside the mini scooter to make people move become much easier. Besides, it also can save more time and energy. Other than that, the electric mini scooter has designed to be ride by one passenger only. Furthermore, the electric mini scooter created must needs its own effort to stand.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter discuss about the previous literature studies and research about the design and fabrication the electric mini scooter folding. Before beginning of this project, there are numerous angles that should be considered and assessed deliberately to guarantee that a project is running easily. The review included from reference books, perception, discourses and assets from web. The project will be actualized based on the data gotten with a specific end goal to keep running as a manual for completing the project. In this chapter, the focus falls on theory research of electric scooter. This review helps in deeper understanding of project development and gave general ideas of how it will help in the current project implementation.

2.1 History of Scooter

The first kick scooters have been invented with the help of roller skates and a small wooden board. A handle with the 2x4 was built and possibly the handlebars were built from splitting the 2x4 or a piece of pipe was attached to the top of the board for handlebars, as crude as it had been. The idea takes about 100 years, as many other modes of self-transportation have received greater demand from the public.

The bike has been vamped to satisfy the needs of both children and adults, skateboarding has become more popular and scooters have become somewhat lost in its history. Wim Ouboter saw a need for a push scooter only in 1990 because one leg was shorter than another for his sister's leg. She was having difficulty cycling, but could move a scooter, he took on the original idea and created a more solid version. A commonly homework version is made of roller skate wheel sets that are attached to a board with certain handles, usually an old box. It may turn or connect to a second board with a crude pivot, it was all-wooden with 3-4 "steel ball bearings wheels. Another advantage of this design, as a "real" vehicle, was loud noise. Another construction consists of a roller skate clamp in front of and rear, which is fitted to a wood beam.



Figure 2: Example of earliest kick scooter

(Source: <https://thegioitienganhvietnam.files.wordpress.com/2014/08/early-scooter.jpg>)

While scooter were producing, most of the older children were made out of miscellaneous used parts, they were also known as children's vehicles from since before 1919. Modern scooters include not only push-scooters that require some work such as exercise, but also electric and gas powered models. Technological advances have made