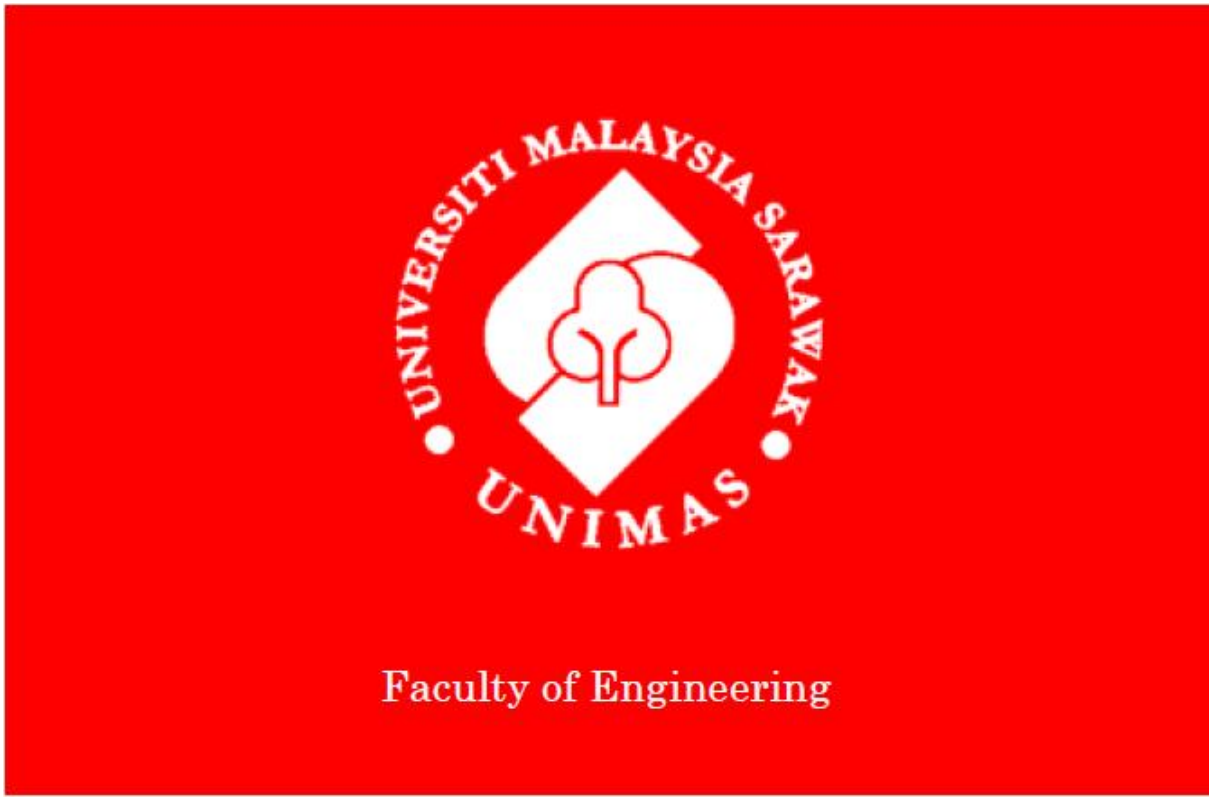

CONCEPTUAL AXIOMATIC DESIGN ON ERGONOMIC ELECTRIC SCOOTER

OOI YONG MIN

Bachelor of Engineering with Honour's

(Mechanical and Manufacturing Engineering)

2010

UNIVERSITI MALAYSIA SARAWAK

R13a

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Judul: **Conceptual Axiomatic Design On Ergonomic Electric Scooter**

SESI PENGAJIAN: 2009/2010

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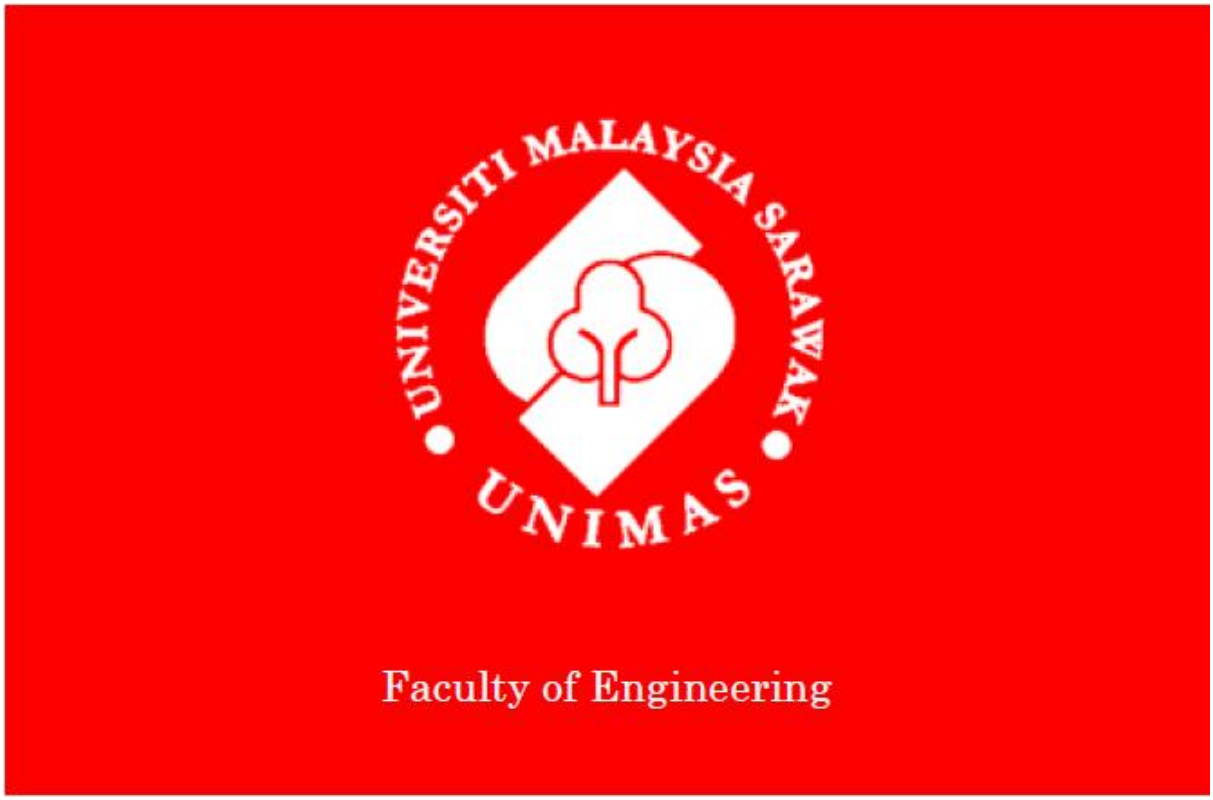
Project Supervisor

Date



CONCEPTUAL AXIOMATISED DESIGN ON ERGONOMIC ELECTRIC SCOOTER

OOI YONG MIN

Bachelor of Engineering with Honour's

(Mechanical and Manufacturing Engineering)

2010

UNIVERSITI MALAYSIA SARAWAK

R13a

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Name : Ooi Yong Min

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is hereby read and approved by:

_____ _____

Dr. Syed Tarmizi Syed Shazali Date

Project Supervisor

CONCEPTUAL AXIOMATISED DESIGN ON ERGONOMIC ELECTRIC SCOOTER

OOI YONG MIN

Thesis is submitted to

Faculty of Engineering, University Malaysia Sarawak

In Partial Fulfillment of the Requirements

For the Degree of Bachelor of Engineering

With Honours (Mechanical and Manufacturing Engineering) 2010

To my beloved family and friends

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Finally, I am also thankful to my parents who always give me their endless support while doing this project.

ABSTRACT

The conceptual design of Ergonomic Electric Scooter is developed based on axiomatised design parameters. Axiomatised design parameters are all of the possible area of designs, systems, components and parts that can exist in a concept design. Axiomatised design parameters are obtained based on benchmarking from existing products, designs, systems, components, and etc. in nowadays markets and technologies. After the axiomatised design parameters are obtained, market survey is needed to obtain the most preferred functional requirements by customers and users. Based on the functional requirements listed, the highest weight functional requirements will be set as the concept selection priority based on the axiomatised design parameters. Mutually exclusive design parameters will be analysed based on priority. Elimination of impossible design parameters will be carried out and the finalised design parameters will serve as the base reference when conceptual design and detailed design are carried out in the design phase. Once the detailed designs are obtained, a prototype will be fabricated in order to evaluate the design performance and functionality based on the objectives and aims of this project.

ABSTRAK

Konsep rekacipta untuk Skuter Ergonomik Electrik adalah dibangunkan berdasarkan parameter rekacipta aksiomatik. Parameter rekacipta aksiomatik adalah seluruh kawasan rekacipta, sistem, komponen dan bahagian-bahagian yang berkemungkinan yang boleh wujud dalam konsep rekacipta. Parameter rekacipta aksiomatik adalah diperolehi berdasarkan pembandingan daripada produk, rekacipta, sistem, komponen, dan lain-lain yang telah wujud di dalam pasaran dan teknologi kini. Setelah parameter rekacipta aksiomatik diperolehi, kajian pasaran adalah diperlukan untuk mendapatkan keperluan fungsi yang paling banyak dipilih oleh pelanggan dan pengguna. Berdasarkan keperluan fungsi yang disenaraikan, kuantiti mengikut berat bagi keperluan fungsi yang tertinggi akan ditetapkan sebagai keutamaan pemilihan konsep berdasarkan parameter rekacipta aksiomatik. Parameter rekacipta yang eksklusif antara satu sama lain akan dianalisis berdasarkan keutamaan. Penghapusan parameter rekacipta yang tidak berkemungkinan akan dilakukan dan parameter rekacipta terakhir akan menjadi dasar rujukan ketika konsep rekacipta dan rekacipta terperinci dilakukan pada tahap perekaciptaan. Setelah rekacipta terperinci diperolehi, prototaip akan dibuat untuk menilai prestasi dan fungsi rekacipta sekiranya sesuai dengan tujuan dan matlamat projek ini.

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INTRODUCTION

CHAPTER 1

INTRODUCTION

1.0 Introduction

In this thesis, the author has developed a project in designing an ergonomic electric scooter which is suitable to be used by students inside the UNIMAS. In this introduction, the author will discuss about the background of electric scooter, the objective of this project and the problem statements with respect to the development of the project.

1.1 Background of Project

Electric vehicles have become the second alternative of transportation around the world after the fuel gas combustion vehicles. People are started to taking concern about the mean of transportation as the depleting fossil fuel and petroleum resources around the world have started to get the attention from everyone. The American Petroleum Institute estimated in 2004 that the total world reserves were estimated to be 1.25 trillion barrels and daily consumption was about 85 million barrels, hence computed that the estimated oil depletion year will be in 2057 (Energy Information Administration / International Energy Outlook, 2006). Besides, the emission of exhaust gases from fossil fuel combustion around the world has also causing the issue of global warming and greenhouse effect to become more and more severe. Hence, in order to face these global issues, people around the world have started to develop electric vehicles, such as electric scooters.

In nowadays market, there are many kinds of electric scooters available from many varieties, from two-wheeled to three- wheeled, from light-and-compact to heavy-duty, and etc. in order to meet the demand from people. In this project, the design of the electric scooter will be focused mainly for the use of students inside the campus of UNIMAS. Transportation for students inside a campus is relatively important in order for students to arrive in lecture hall punctually. Hence, for the ease of students, electric scooter can be introduced inside university campus other than the university buses. Among the reasons that electric scooter is suitable for in-campus use are: simplicity, green machine, affordability, and safety.

1.2 Objectives of the Project

The aim of the project is to develop a conceptual design of an electric scooter with a few characteristics:

- A brand new design which is not yet developed by anyone or not yet available in market.
- An ergonomic design for a greater comfort and a correct posture of riding.
- User friendly as the scooter is relatively easy to manage and handle.

1.3 Problem Statements

The main problem in this project is to develop a complete scale of electric scooter from skeleton design, suspension system, joints, exterior shapes and covers, wiring of electric components, and the methodology used in fabrication. Besides, stress analysis, weight distribution, reliability, safety factor and electricity distribution are also the measures needed to be developed in this project in order to design a safe and reliable electric scooter.

1.4 Summary

This chapter is basically defined the reasons this project is carried out. Besides, in order to carry out this project, objectives have been defined in order to make this project has a direction to achieve without deviating from its primary purpose. Problem statements have been defined so that more attention can be given in the particular scopes in order to succeed this project.

CHAPTER 2

LITERATURE REVIEW

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this literature review, the author will make some reviews onto scope of users of the ergonomics electric scooter design, together with a few scooters from various companies to make comparison. Besides, the author will also review scooters in sub-sections, which will include the frame materials, suspension system, braking system, tyres, steering system, and the term *ergonomics*.