



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN AND FABRICATION OF VEHICLE TRAINER KIT FOR
EDUCATIONAL PURPOSE (SUSPENSION SYSTEM) WITH
AIDE OF COMPUTER AIDED ANALYSIS**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Automotive) 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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Supervisor: TS. LUQMAN HAKIM BIN HAMZAH

ABSTRAK

Laporan akhir ini membentangkan aplikasi kit jurulatih kenderaan untuk tujuan pendidikan. Kit jurulatih adalah satu projek yang dapat membantu pelajar memahami di dalam pelajaran terutamanya tertakluk kepada berkaitan kereta. Idea ini datang dari pengalaman pelajar sambil belajar teori di dalam kelas dan hasilnya, mereka tidak faham dengan baik tentang apa yang mereka belajar di kelas dan tidak boleh mengaitkan dengan perkara sebenar (tugas praktikal). Bagaimanapun, di Malaysia ramai pekerja kurang mahir. Tambahan pula, tujuan utama membina kit jurulatih kenderaan adalah untuk membantu pelajar memahami dengan baik dalam pengajian mereka dan boleh dikaitkan dengan praktikal dan meminimumkan bilangan kekurangan pekerja mahir di Malaysia. Seseengah kaedah digunakan untuk menyiapkan projek ini. Pertama, untuk mendapatkan data yang betul mengenai pernyataan masalah, satu tinjauan telah dilakukan kepada semua pelajar automotif pada tahun 4. Dalam kaji selidik itu, masukkan soalan tentang masalah semasa pengajian dalam kursus kejuruteraan, bahagian kereta dan keperluan kit jurulatih untuk membantu mereka belajar. Selain itu, kriteria kit jurulatih juga dipersoalkan dalam tinjauan. Seterusnya, kriteria reka bentuk dan pemilihan bahan dipilih berdasarkan analisis. Selepas itu, CAD untuk struktur dibuat di CATIA v5. Untuk tahap ini, struktur mesti dilakukan dengan bahagian kereta yang sebenar. Fabrikasi telah dilakukan selepas reka bentuk CAD. Selain itu, untuk struktur analisis kit jurulatih (sistem penggantungan) adalah ujian dalam perisian SIMSOLID. Di sana, tekanan, magnitud anjakan, tegasan ricih dan faktor keselamatan dianalisis. Keputusan menunjukkan nilai maksimum dan minimum untuk semua ujian ujian. Sebagai kesimpulan, dari analisis bahan dan struktur dapat dianalisis dari segi pemilihan dan bahan sisa.

ABSTRACT

This final report present an application of vehicle trainer kit for education purpose. Trainer kit is a project that can help students for their understanding in studies especially subject in related with car. This idea came from experience of student while studies theory in classroom and the results, they do not understand well about what their study in class. Besides that, they also can't related from the theory lesson to real thing (practical task). Although, in Malaysia many worker lack of skilled. Furthermore, the main point of build vehicle trainer kit are to help students understand well in their studies and can related with practical and to minimize the number of lack skilled worker in Malaysia. Some method being used to complete this project. Firstly, to get the correct data on problem statement, one survey has been done to all automotive student in year 4. In the survey, include question about the problem while studies in engineering course, car part and needed of trainer kit to help them studies. Other than that, the criteria of trainer kit also ben question in survey. Next, design criteria and material selection are chosen by analysis. After that, CAD for structure is make in CATIA v5. For this stage the structure must tally with real car part. To finish, fabrication has done following CAD design. Addition, for the analysis structure of trainer kit (suspension system) is test in SIMSOLID software. In there, stress, displacement magnitude, shear stress and safety factor being analyse. Result show the maximum and minimum value for all analysis test. In conclusion, from analysis the material and structure can be analyse in term of choosing and waste material.

DEDICATION

To my beloved parents

YAHYA BIN IBRAHIM

ROHAIDAH BINTI ABDULLAH

Thank you for all support, sacrifices, enduring and willingness to share with me.

To my honored supervisor and co-supervisor,

Ts. Luqman Hakim Bin Hamzah,

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and all friends in UTeM,

thank you for always giving me a supervision and persistent help to finish this
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LIST OF SYMBOL

kN	-	Kilo newton.
MPa	-	Mega pascal.
mm	-	Mille meter.

LIST OF ABBREVIATIONS.

MTUN	-	Malaysian Technical University Network.
UTeM	-	Universiti Teknikal Malaysia Melaka.
KUiTTHO	-	Kolej Universiti Teknologi Tun Hussein Onn.
KUTKM	-	Kolej Universiti Teknikal Kebangsaan Malaysia.
KUKTEM	-	Kolej Universiti Kejuruteraan Dan Teknikal Malaysia.
KUKUM	-	Kolej Universiti Kejuruteraan Utara Malaysia.
UTHM	-	Universiti Tun Hussein Onn Malaysia.
UMP	-	Universiti Malaysia Pahang.
UniMAP	-	Universiti Malaysia Perlis.
FTKMP	-	Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan.
FTKEE	-	Faculty of Electrical and Electronic Engineering Technology.
CAD	-	Computer aided design
CAE	-	Computer aided engineering.
CATIA	-	Computer-aided three-dimensional interactive application.

CHAPTER 1

INTRODUCTION

1.1 Project background.

The main purpose for this project is to make a vehicle trainer kit for FTKMP automotive student's education. This trainer kit is used in vehicle service laboratory to teach students about automotive subjects by hand-on learning. For example, vehicle dynamic teach how the suspension work but not practically done by student. Not all students will catch up what they study in classroom. This project was carried out through a number of journal, articles, web site and papers.

The research was performed on third-year automotive students about how hand-on will help their studies. This is because the project needs student input to create it possible or not to carry out this project. A study type was developed and circulated to learners in order to get input from the automotive students. The survey results were charted as below:

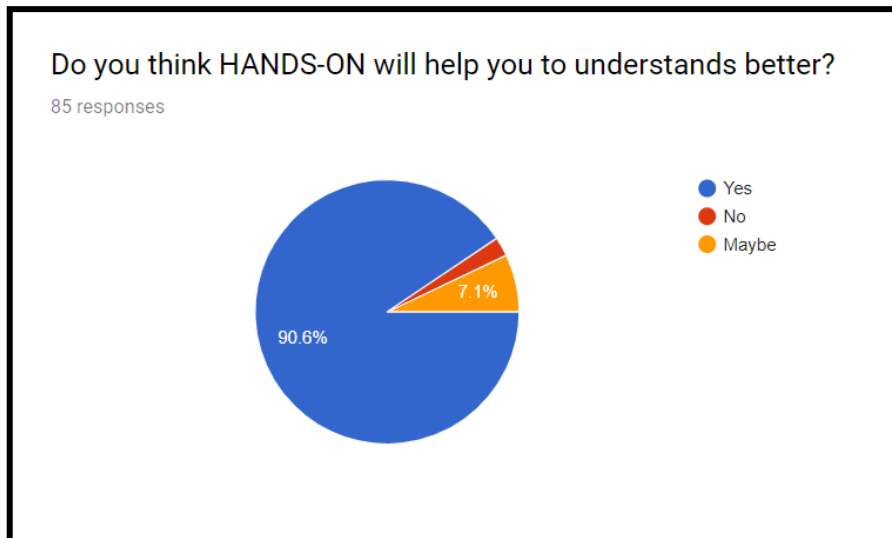


Figure 1.1: Pie chart from the survey.

Based on the pie chart, 90.6% of third year FTKMP automotive student agreed about hand-on can help to improved learning process in classroom. On the other hand, 7.1% answer maybe for that question and 2.3% for no. As result students are agreed with hand-on education and trainer kit needed to be done for education purpose. The important part about this project is it can used not only for third automotive students but for future student use. It's very useful for engineering automotive course learn theoretical and practical at the same time.

1.2 Problem statement.

FTKMP automotive students face some issues in learning in classroom. There are the problem such as:

1. Students do not understand well about certain subject from classroom.
2. Can't relate theoretical part into real thing.
3. Don't have much time to industrial visit or talk.

1.3 Project aim and objective.

1.3.1 Aim.

The aim for this research is to investigate the problem automotive student about understanding engineering subject in classroom. This project will focus roughly how to improve student knowledge and experience in learning process.

1.3.2 Project objective.

Based on the background and problem statement specified above, the objectives of this project are stated below:

1. To improve student's studies by hand-on purpose.
2. To gain experience and skilled from trainer kit.
3. Analysis the structure trainer kit (suspension system).
4. Students acknowledge about all car part.

1.4 Project scope.

Several scopes have been recognized to accomplish this project's goal:

1. Design trainer kit chassis and suspension structure in CATIA software.
2. Load test in SIMSOLID software.
3. Double wishbone suspension only because not enough time to make another suspension type.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview.

In this chapter, will introduce about design and fabricate vehicle trainer kit for education purpose: suspension system. Many graduated students, after leave from university they have problem about lack of experience and don't know to working. This project targets FTKMP automotive students in UTeM to improve studies in university. Trainer kit were include car part, brake system, suspension system and many more. Although, trainer kit will help students to understand more about what they learn theoretically in classroom. To make this project, some main part and equipment being used for example mild steel and actual car part. Some research and references are used to guide in making this project.

2.2 Skilled labour in Malaysia.

Skilled labour is a segment of the workforce with specialized know-how, training and experience to carry out more-complex physical or mental tasks than routine job functions. Skilled labour is generally characterized by higher education, expertise levels attained through training and experience, and higher wages (Unnes, 2010). Skilled labour lack transpired overall including United States, United Kingdom, Canada, India, Bahamas and Malaysia. Government and business organisation of Canada recommended immigration of skilled worker as a technique to manage deficiency issue. This problem can be solve in a