ISOEVA-2022

6th INTERNATIONAL SYMPOSIUM OF EDUCATION AND VALUES

(6. ULUSLARARASI EĞİTİM VE DEĞERLER SEMPOZYUMU)

27-30 Ekim/October 2022

Kemer/ANTALYA

TAM METİN KİTABI

(FULL TEXT BOOK)

ISBN: 978-605-73901-6-5

KORİNT YAYINCILIK

RC DYNO TRAINER

Mohd Nasir Bin Kamaruddin
Politeknik Sultan Salahuddin Abdul Aziz Shah 40150 Shah Alam, Selangor, Malaysia
Email: nasir.jkmpsa@gmail.com

Nurhidaya Binti Musa
Politeknik Sultan Salahuddin Abdul Aziz Shah 40150 Shah Alam, Selangor, Malaysia
Email: nasir.kamarudin@psa.edu.my

ABSTRACT

This RC Dyno Trainer is a teaching aid for Mechanical Engineering students' that focus on the final year projects of Department of Mechanical Engineering, Polytechnic of Sultan Salahuddin Abdul Aziz Shah, Selangor. The main objective of this innovation **is to apply this existing RC Dyno Machine into a learning kit (Trainer)** that is able to improve students' knowledge in mechanical systems involving the measurement of force, torque and IoT applications using Ardruino UNO which is suitable for remote control racing cars. In 2016, a lecturer from the Department of Mechanical Engineering, Polytechnic of Sultan Salahuddin Abdul Aziz Shah developed an innovation project called the RC Dyno Machine. The purpose of this RC Dyno machine is to measure the torque of RC cars. The measurement results are displayed on a computer application using IoT Arduino UNO technology. The results of this analysis will help users tune RC cars involving caster, camber, spring rate and suspension to achieve optimal performance. Indirectly, it can reduce the operating cost of RC car engine maintenance. The mechanical system involving materials, installation, fabrication, torsional force, sensors and Ardruino applications is very suitable to be used as a Trainer kit for students **to improve their understanding and innovation technology** on RC Dyno Test Machine. The production of this innovation is applied in the learning and teaching process to help boost the creativity and innovation of students in developing projects that have an impact, especially focusing on IR4.0 technology. It is a good learning strategy innovation to improve student's achievement. The process of managing the implementation of this innovation project is planned and organised to achieve an impact on the learning program in the Department of Mechanical Engineering and is named as "**RC Dyno Trainer**".

Keywords: Arduino, IR4.0, RC, Mechanical

1.0 INTRODUCTION

The RC Club was established in 2015, with 30 members. The club continues to grow by gaining achievements such as participating in FEMCA GT ASIA in 2016. The Dyno Test Trainer was the brainchild after being active in a racing car competition organised by the RC Club of Sultan Salahuddin Abdul Aziz Shah Polytechnic. Problems arose when dyno testing needed to be carried out on the racing car. The existing tools were only suitable for real cars, whereas these controlled racing cars are much smaller in size. As a result, the students had difficulty understanding the principles of power and torque tuning are important elements to ensure the engine operates at an optimal rate. At the learning session, students were exposed to the knowledge and calculation of these two elements. However, students are not able to practice that knowledge in the application of the mechanical system of a product. After carrying out market research, it was found that there is no Trainer that can carry out dyno testing wholly as it is implemented on real cars. Therefore, the rationale for developing an RC DYNO TRAINER to support the learning of mini dyno testing for remote control cars is sustainable enough to be exposed before students complete their end-of-year projects.

OBJECTIVES

The purposes for the development of this innovation project are:

i. To improve students' understanding of mechanical systems and IOT for the development of RC Dyno Machine kits.

i. To increase students' creativity and innovation to develop end-of-year projects based on the IoT concept.

iii. To improve CLO for Final Year Project course (DJJ5141).

iv. To increase the marketability of engineering and IOT careers

BENEFITS OF RC DYNO TRAINER

Students

I. Improving student knowledge and skills focusing on IR4.0 (IoT) technology

II. Provide ideas and guidance to students in developing End of Year Projects

III. Increase students' interest in building a career in the field of IR4.0 technology

Department

I. Improve the PPI Programme in the form of knowledge sharing regarding IR4.0 technology

II. Improvement of Course Learning Outcome (CLO) and indirectly assist to improve Programme Learning Outcome (PLO) and Programme Education Objective (PEO)

Polytechnic

I. Improve the quality of End-of-Year Projects under Polytechnics such as the PSA INVENTION AND INNOVATION TECHNOLOGY EXPOSITION (PITEX) which involves a combination of various industries.

II. Boost PSA's image by entering national level competitions and international level symposiums

III. Support to achieve PSA's Vision, which is the Polytechnic to be a leading TVET Institution

IV. Produce more quality TVET graduates in line with Core 1 in the JPPKK Strategic Plan. The lifelong learning received by graduates can then be applied in self-employment, being more independent and balanced as a result of involvement with the industry and the community while testing the effectiveness of this innovation.

Polytechnic

I. Reduce the cost of using external/private services since lecturer's expertise is used.

II. In line with Core 2 of the JPPKK Strategic Plan which is to sustain conducive institutions, the institution has indirectly provided relevant infrastructure and equipment which at the same time complies with the cost effectiveness that has been set.

III. This innovation has been proven to be cheaper and easier to obtain than the costly and hard-to-find alternatives

METHOD AND MATERIAL

Implementation Chart

The implementation of training or exposure to students is done in the middle of the semester of Project 1. That period is ideal for students to choose the appropriate project title to develop when taking Project 2 in the next semester. This training can build confidence in students to make the best decisions in producing innovative projects over time. Learning in terms of installation, operating systems, engineering applications, control systems and the Internet of Things (IoT) using Ardruino to develop an RC Dyno test machine (made as a Trainer kit) is given to students to ensure that the planned impact can be achieved. Process implementation show on **Chart 1**.

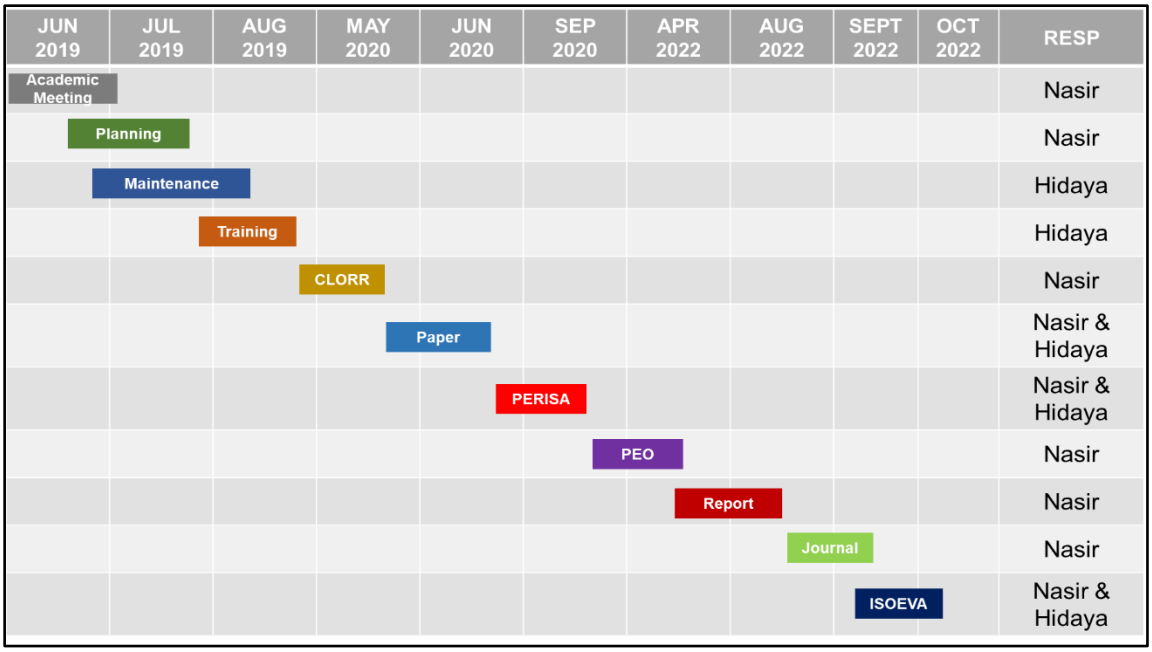

Chart 1: Gantt Chart

TRAINNIG KIT & OPERATION PROCESS

The following **Figure 1** is the Trainer that has been developed

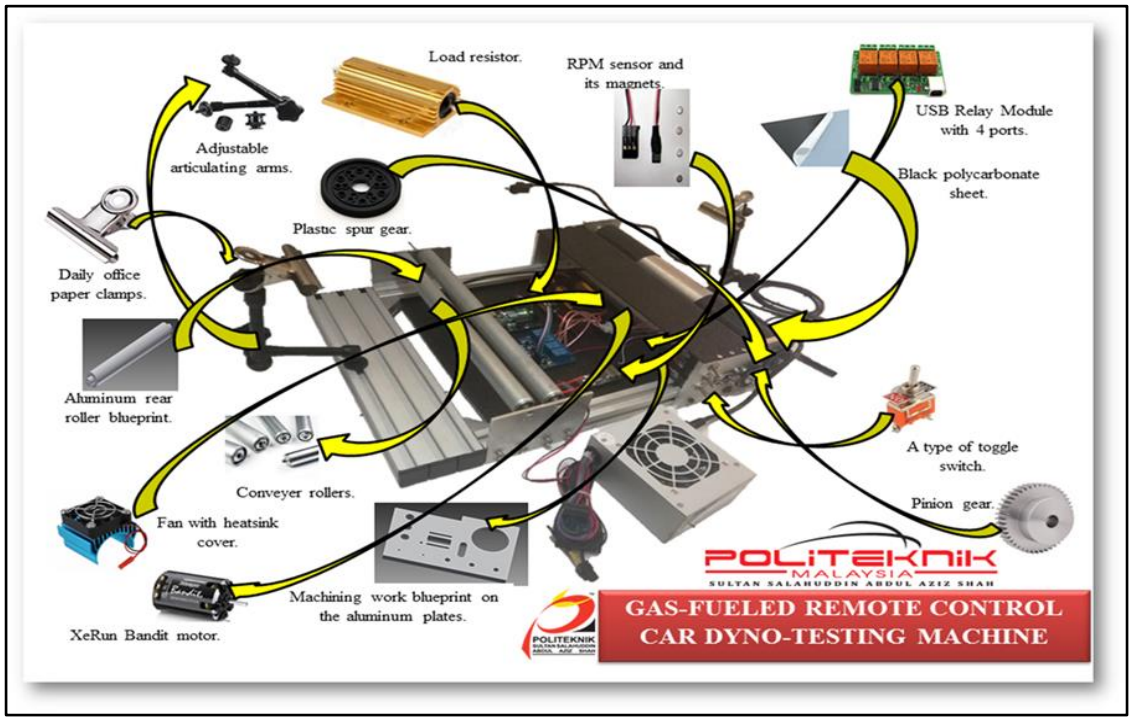

Figure 1: Training Kit

Skills Application Program in Teaching and Learning

The execution of training is carried out in class during the mid-semester break in preparation for the final semester for the implementation of the End of Year Project. Learning involves the use of:

I. Theoretical modules related to intellectual property registration, entrepreneurial concepts, mechanical components, use of torque and use of Eagle Tree eLogger and Advanced Dyno Station applications. **Figure 2** and **Figure 3** shown systems and graph simulation

II. Practical implementation of Dyno test machine installation in groups as shown on **Figure 4**, tuning to achieve optimal performance and periodic maintenance.

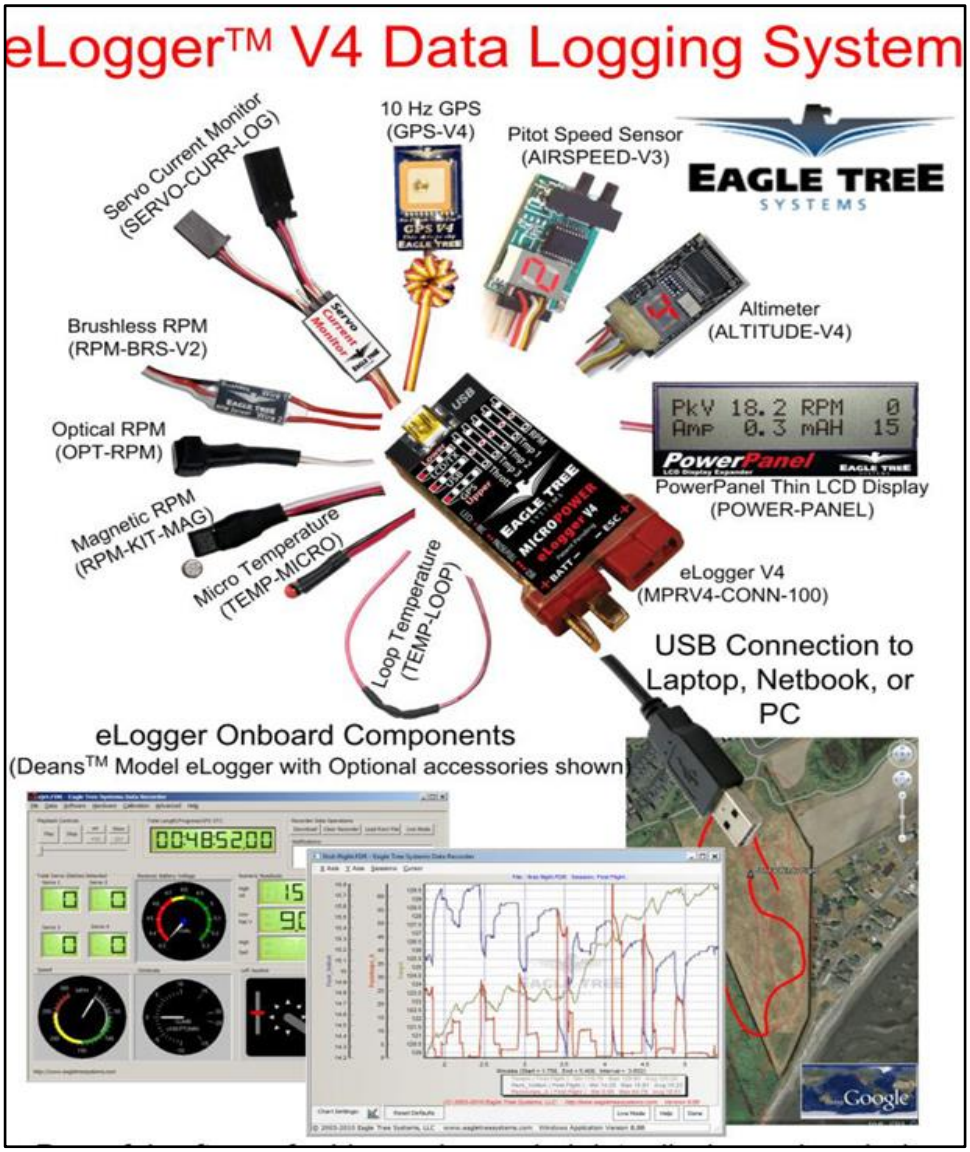

Figure 2: eLogger System

Figure 3: Advanced Dyno Station Graph Simulation

Figure 4: RC Dyno Trainer Deployment Activity in Teaching and Learning

FINDINGS

Innovation ideas began to be discussed in July 2019 as a result of the Academic Meeting of the Mechanical Engineering Diploma Programme. The outcomes of the meeting found that most of the Students' Final Project

Titles lack the concept of IR4.0, whereas IR4.0 was first introduced by MOSTI in 2018. To support the government's policy towards IR4.0, a method was discussed to ensure that students are exposed to this technology before developing the End-of-Year Project. 83.3% strongly agree to help students in determining the selection of the End of Year Project (**Chart 2)**. 79.2% strongly agree to help students in determining career planning (**Chart 3)**.

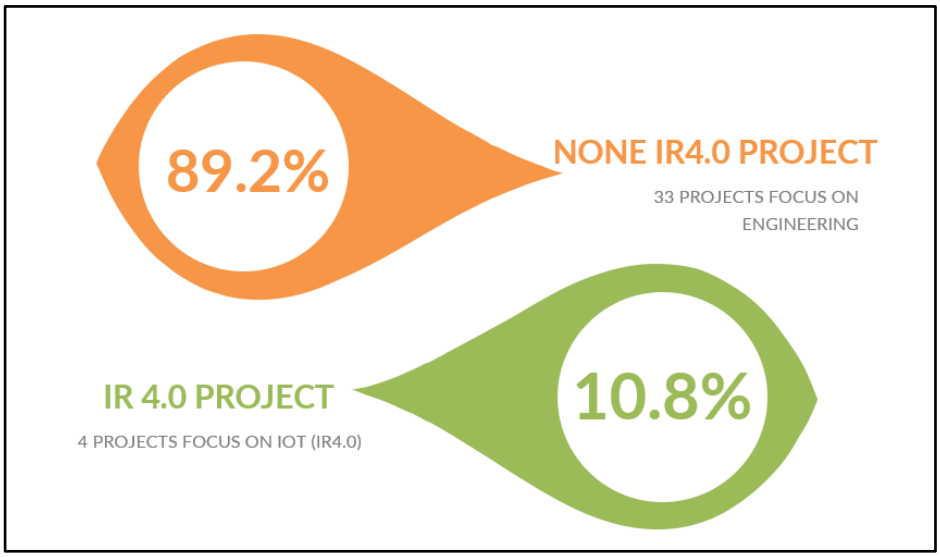

Chart 2: Selection of Tittle

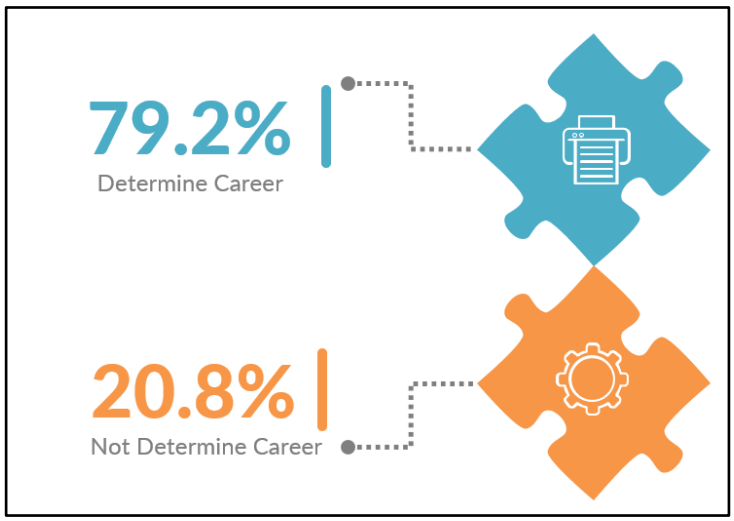

Chart 3: Enhance Future Career

This project also increased Course Learning Outcomes Percentage Achievement for Dec 2019 Session as shown on **Chart 4** (After). This achievement comprises the increase of all Six (6) CLOs.

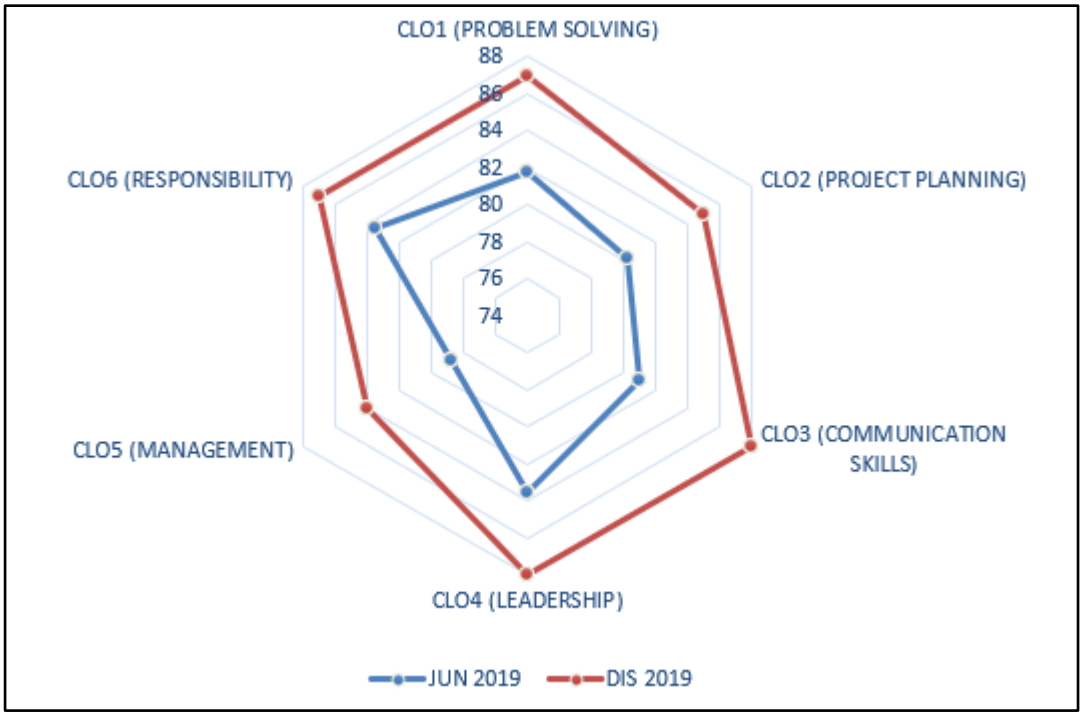

Chart 4: CLOs Performance

CONCLUSION AND DISCUSSION

This RC Dyno Trainer has successfully improved students' understanding of rpm, amps, and torque measurements. Since the introduction of dyno testing on remote control racing cars, that knowledge was successfully applied in building various other innovations related to force and torque control on motors or machines. The use of this Trainer has also successfully aroused the interest of students in the Department of Mechanical Engineering, Sultan Salahudin Abdul Aziz Shah Polytechnic to venture further in the field of IR4.0. Therefore, it can be concluded that this innovation project needs to be continued by the lecturers who teach the Final Project course in the upcoming face-to-face sessions because they can improve the quality of effectiveness and excellence of teaching and learning. This RC Dyno Trainer strategy can improve innovative thinking ability, increase student's initiative in project preparation and internal motivation to learn, and can improve interpersonal relationships in teamwork. It is expected to be able to meet the required targets in line with the Polytechnic's vision, which is to become a leading TVET Institution.

RECOMMENDATIONS

This RC Dyno Trainer is a trainer produced to measure car speed in rpm units and the current used in amps units as well as the resulting torque in torque units. These three elements are important to ensure that the remote-control racing car can function at its maximum capacity. However, some improvements can be made to this Trainer. The first is in terms of construction materials. The existing trainer uses compressed aluminium to ensure

the stability of the trainer when testing is carried out. Therefore, it is quite heavy to take to any race site or to the classroom for learning demonstrations. The use of magnesium alloy is suggested to overcome this kind of problem. Next, is the use of the interface to make it easier for users to interpret the data that has been analysed. A user interface that displays the information read from Advanced Dyno Systems allows the user to view the information needed to be displayed on the computer. However, the interface can be upgraded using a more user-friendly interface such as Dynostar. The next suggestion is to diversify the interface display not only for Windows operation but also applied to Android and IOS smartphones. The use of smartphones makes it easier for this trainer kit to be widely used. The last suggestion is to encourage students at the end of the semester to get involved in the presentation of papers at the international level such as the free symposium organised by ISOEVA every year either face-to-face or online.

ETHICAL TEXT

"In this article, the journal writing rules, publication principles, research and publication ethics, and journal ethical rules were followed. The responsibility belongs to the author (s) for any violations that may arise regarding the article."

REFERENCES

AW Dynamometer, Inc. (2013). AW Dynamometer. (AW Dynamometer, Inc) Retrieved from http://www.awdynamometer.com/home

BY-SA, C. (n.d.). Directory of Open Access Journals. Retrieved from https://doaj.org/

DigiKey Electronics. (2017). 4 Band Resistor Color Code Calculator and Chart. (DigiKey Electronics) Retrieved from DigiKey Electronics: http://www.digikey.com/en/resources/conversion-calculators/conversion-calculator-resistor-color-code-4-band

Elegant E-Learning, I. (n.d.). What's Up Doc? The Importance of Routine Tune-Ups. Retrieved from http://driving-tests.org/beginner-drivers/importance-of-routine-tune-ups/

Faculty of Computer Science & Information Technology, U. o. (n.d.). Electronic Journal University of Malaya (EJUM). Retrieved from http://ejum.fsktm.um.edu.my/VolumeListing.aspx?JournalID=19

Faculty of Computer Science & Information Technology, U. o. (n.d.). Electronic Journal University of Malaya (EJUM). Retrieved from http://ejum.fsktm.um.edu.my/VolumeListing.aspx?JournalID=14

HighWire Press, I. (n.d.). HighWire Free Online Full-text Articles. Retrieved from http://highwire.stanford.edu/lists/freeart.dtl

International Journal of Automotive and Mechanical Engineering. (n.d.). Retrieved from http://ijame.ump.edu.my/

LLC, S. (n.d.). What does Torque in a Car do? – Starts With A Bang. Retrieved from http://scienceblogs.com/startswithabang/2009/04/21/what-does-torque-in-a-car-do/

Ltd., c. (n.d.). What is horsepower? HP, BHP & PS explained | carwow. Retrieved from https://www.carwow.co.uk/guides/glossary/what-is-horsepower

Magtrol, Inc. (2016). Dynamometers for Motor Testing. (Magtrol, Inc) Retrieved from http://www.magtrol.com/motortest/dynamometers.html

Malaysia, J. P. (n.d.). Portal Rasmi Perpustakaan Negara Malaysia. Retrieved from http://www.pnm.gov.my/index.php

ME Mechanical Team. (15 March, 2016). Dynamometer: Introduction and Types. Retrieved from https://me-mechanicalengineering.com/dynamometer-introduction-types/

Nast, C. (n.d.). Object of Interest: Remote Control - The New Yorker. Retrieved from http://www.newyorker.com/tech/elements/object-of-interest-remote-control

Open Access Journals Search Engine (OAJSE). (n.d.). Retrieved from http://oajse.com/

Pololu Corporation. (2017). Pololu Robotics & Electronics. (Pololu Corporation) Retrieved from https://www.pololu.com/

Pusat Teknologi Maklumat & Komunikasi, U. (n.d.). Journal of Mechanical Engineering and Science. Retrieved from http://jmes.ump.edu.my/

RCCarTips.com. (n.d.). RC Car Dyno - Cheap, DIY, Free Software, Home Built, Tutorial. Retrieved from http://www.rccartips.com/rc-car-dyno-cheap.htm

Regensburg, U. L. (n.d.). Journal List by Subject | Electronic Journals Library. Retrieved from http://rzblx1.uni-regensburg.de/ezeit/index.phtml?bibid=AAAAA&colors=7&lang=en

Tarrant, G. (2017). Pulley Calculator. RPM, Belt Length, Speed, Animated Diagrams. Retrieved from blocklayer.com: http://www.blocklayer.com/pulley-belteng.aspx