



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**BDSL: THE DEVELOPMENT OF AN ELECTRONIC  
EDUCATIONAL KIT WITH ANDROID APPLICATION  
THAT TEST KNOWLEDGE ON BLOCK DIAGRAM IN  
CONTROL PRINCIPLE**

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

by

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I hereby, declared this report entitled BDSL: The Development of An Electronic Educational Kit with Android Application That Test Knowledge on Block Diagram in Control Principle is the results of my own research except as cited in references.

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## APPROVAL

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

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## ABSTRAK

Prinsip kawalan adalah merupakan mata pelajaran wajib yang dipelajari dalam Teknologi Kejuruteraan Elektronik. Rajah blok adalah salah satu daripada subtopik dan asas untuk prinsip kawalan. Diagram Blok Pintar Belajar adalah reka bentuk untuk menguji pengetahuan pelajar pada rajah blok untuk Prinsip Kawalan subjek dengan menggunakan bluetooth. Fungsi kit pendidikan ini sebagai salah satu peralatan yang digunakan sebagai bantuan untuk membantu pensyarah atau pelajar cemerlang dalam pengajian mereka. Kit pendidikan ini menggunakan Arduino Mega sebagai pusat kit, telefon mudah alih dengan aplikasi Diagram Blok Pintar Belajar yang dipasang dan Modul Bluetooth sebagai medium komunikasi antara Arduino Mega dan telefon bimbit. Fungsi kit akan disahkan dengan menjalankan ujian senario pada kit. Hasil soalan kajian yang terdiri daripada 23 soalan menunjukkan bahawa kit pendidikan memainkan peranan penting dalam pembelajaran pelajar.

## ABSTRACT

Control principle is one of the compulsory subject that learned in Electronic Engineering Technology. Block diagram is one of the subtopic and basic for control principle. Block Diagram Smart Learner is design to test student's knowledge on block diagram for subject Control Principle by using Bluetooth. The function of this educational kit as one of an equipment that used as an aid in order to help lecturer or student to excel in their study. This educational kit used Arduino Mega as the heart of the kit, mobile phone with installed Block Diagram Smart Learner application and Bluetooth Module as medium of communication between Arduino Mega and mobile phones. The functionality of the kit will be verified by performing scenario test on the kit. The results of the survey which consists of 23 questions shows that the educational kit play important rule in students' learning.

## **DEDICATION**

To my beloved Moon Moo Taekwondo ITF team. Thanks for always cheer me up whenever I feel down. Hope we stay as a team forever.

Thank you.



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# LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

<b>AC</b>	-	Alternative Current
<b>BDSL</b>	-	Block Diagram Smart Learner
<b>BEEE</b>	-	Bachelor of Electronics Engineering Technology (Industrial Electronics)
<b>BEET</b>	-	Bachelor of Electronics Engineering Technology (Telecommunications)
<b>DC</b>	-	Direct Current
<b>DIY</b>	-	Do It Yourself
<b>EDK</b>	-	Educational Design Kit
<b>FTKEE</b>	-	Fakulty of Electric and Electronic Engineering Technology
<b>FTKMP</b>	-	Fakulty of Mechanical and Manufacturing Engineering Technology
<b>GND</b>	-	Ground
<b>I/O</b>	-	Input / Output
<b>IC</b>	-	Integrated Circuit
<b>IDE</b>	-	Integrated Development Environment
<b>LED</b>	-	Light Emitting Diode
<b>MCU SLK</b>	-	Microcontroller Student Learning Kit
<b>MHz</b>	-	Mega Hertz
<b>OpAmp</b>	-	Operational Amplifier
<b>PC</b>	-	Personal Computer
<b>PCB</b>	-	Printed Circuit Board
<b>PWM</b>	-	Pulse-Width Modulation
<b>TV</b>	-	Television
<b>USB</b>	-	Universal Serial Bus
<b>UTeM</b>	-	Universiti Teknikal Malaysia Melaka
<b>V</b>	-	Voltage

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

This chapter aim on creating the framework and introduce the brief idea of the project. It focused on the overview of the project, detailing the objectives, briefly the problem statements, scope and provide outcome of the project.

### 1.2 Background

Nowadays, educational kits is one of the essential that must be created or provided by a teacher in helping him or her in a learning session. Electronic kits can be expressed as a teaching tool used to reinforce the understanding of a subject of theoretical classes that have been taught in the classroom. It is a direct communication medium of the teachers, students and the tools. As listed in the Scopus.com there are about 60 journal and research papers that are related with educational kits including robotic, photographic, disaster kit, electrical, electronic and others.

By referring to Udey (2009) “To control means to regulated, to direct or to command. Hence a control system is an arrangement of different physical element connected in such a manner to regulate, direct or command itself or some other system.”. Control principle is a compulsory subject that must be taken by electronic and electrical

engineering student. For this project, it will focused on the closed loop of the block diagram of control principles subject.

This educational kit is named as Block Diagram Smart Learner (BDSL) which consist of four set of question together with picture. The question will be display by mobile phones using BDSL application. User have to make a connection from the input until the output. The connection will be check when user click button at the application. The application will display the answer of the connection that had been done.

### **1.3 Problem Statement**

As mentioned earlier, Control Principle is one of compulsory subject that must be taken for all electronic and electrical engineering student. In Faculty of Engineering Technology, student courses of BEET and BEEE. In general, this subject is taught using two methods by attending theoretical classes and practical laboratory session. For theoretical classes, student are exposed with lecture and tutorial for two hours per week and for practical , student will taught in laboratory session for three hours per week.

Since the lectures are held in a hall together with all student, some students cannot stay focus during the lecture. Theory was taught using Power Point slide that have been prepared. More theory compared to hand on work cause student unable to understand the topic. After end of the chapter, exercises are given and only one or two person are come out to write their answer in front of the classes. Based on this, not all student able to understand the theory and application that are related to it. The same concept for tutorial class, the questions given sometimes are not related with work, applications and lab sessions and required a lot of time for students to understand and answer the question.

For lab session, students are divided into groups and conducted the session together, this is because lack of equipment that are provided in the lab. For every lab session, it is supervise by the lecturer, student unable to run the lab session without the supervision from the lecturer even with provided lab instruction as a guidance.

#### **1.4 Objective**

The main objective of this project is to develop of an electronic educational kit for testing student knowledge on Control Principles subject that related to block diagram.

There are several sub-objectives that are going to be achieve as below:

1. To design an educational kits casing using AutoCAD and Proteus for circuit design using Arduino Mega that can help student in better understanding of Control Principles subject.

This educational kit will be focus on closed loop block diagram subtopic and student should able to use the kit without the supervision from the lecturer.

2. To build a compatible and low cost educational kit together with input and output port.

This kit will be easy to carry since the weight is less than one kilogram and the estimated cost for one complete kit is less than RM 300 and the kit will used Arduino Mega as the brain of the kit and Bluetooth communication for transfer data from Arduino to Android's application that had been created using MIT APP Inventor.

3. To verify the functionality of the educational kit.

The verification is done by performing several test to the kit. The test are dropping test and temperature test.

4. To validate the effectiveness of the educational kit in learning the Block Diagram topic.

The validation will be done by conducting a survey consists of 23 questions to 50 respondents which consists of FTKEE and FTKMP, UTeM students. The survey was conduct to measure the effectiveness of the kit.

## **1.5 Scope of Work**

In designing the educational kit, this project had limited certain criteria in order to accommodate the time limitation in executing the project.

For subject Control Principle, it will focus more on Chapter One which related to Block Diagram of Closed Loop. The set of question that will provided for the educational quiz board will up to four questions. Android-based operating system mobile phone will be used to display the questions where the application is developing by using MIT APP Inventor.

There are limitation on term of external hardware casing. For the casing, weight of the kit is less than one kilograms will be choose and the size of the kit is 30cm X 16cm X 11cm thus it will be easy to hold or handle by the student or user and nicely design that represented the idea of this Final Year Project. Arduino is a perfect development program with its own standards, mixed development environment and programming interface. Arduino Mega is select because the digital input and output pin are much more than

Arduino Uno which has 28 pins less than 54 pins of Arduino Mega. Survey will be conducted for 40 students which consists 23 of question that are related about educational kit and Control Principles.

## **1.6 Project Contribution**

This project is about learning and understanding the block diagram of Control Principles subject by closed loop system. Student may applied all the theory that had been learned in the class.

By doing this project, student able to more understand about the subject especially on open and closed loop system. The it able to changes the environment id the classroom, make the learning more effective and give deep knowledge to the student itself.

In the market view, there is no educational kit that have the same function as the BDSL are available. Thus, this kit can be used to ease and help the lecturer while attending the class.