Interactive learning on earthing system in low voltage system / Mohd Fahmi Sobrie Faudzi.

INTERACTIVE LEARNING ON EARTHING SYSTEM
IN
LOW VOLTAGE SYSTEM
MOHD FAHMI SOBRIE BIN FAUDZI

MAY 2009
I hereby declared that I have read through this report and found that it has comply that partial fulfillment for awarding the degree of Bachelor of Electrical Engineering.

(Power Electronics and Drive)

Signature : [Signature]

Supervisor Name: Puan Aida Fazliana bt Abdul Kadir

Date : 11 May 2009
Saya akui bahawa telah membaca karya ini, pada pandangan saya karya ini memadai dari skop dan kualiti untuk tujuan penganugerahan Ijazah Sarjana Muda Kejuruteraan Elektrik.

(Elektronik Kuasa dan Pemacu)

Signature : __________________

Supervisor Name: Puan Aida Fazliana bt Abdul Kadir

Date : 11 May 2009
DESIGN AN INTERACTIVE LEARNING ON EARTHING IN LOW VOLTAGE SYSTEM

MOHD FAHMI SOBRIЕ BIN FAUDZI

Thesis submitted in accordance with the partial requirements of the
Universiti Teknikal Malaysia Melaka for the
Bachelor of Electrical Engineering
(Power Electronic and Drive)

Faculty of Electrical Engineering
Universiti Teknikal Malaysia Melaka

MAY 2009
DECLARATION OF THESIS

I hereby, declare that this thesis entitled “Design an Interactive Learning on Earthing in Low Voltage System” is a result of my own research, design and idea except for works that have been cited in the references.

Signature : 

Name : MOHD FAHMI SOBRIE BIN FAUDZI

Date : May 2009
ACKNOWLEDGEMENT

Alhamdulillah...Thank You Allah...

I have a sign of relief after finished up my report of *Projek Sarjana Muda* 2 successfully. Although I felt very pleasure but I do not forget to express my appreciation to those who have helped me a lot in my final project.

First of all, I would like to express my gratitude and thanks to my supervisor, Pn Aida Fazliana Bt Abdul Kadir for invaluable advice and guidance throughout the period of this semester. Guidance in this project will remain forever.

My appreciation also to my parents, En Faudzi Bin Hamat and Puan Hasimah Binti Mahammad, who have been so tolerant and supports me all these years. Thanks for the encouragement, love and emotional supports.

Nevertheless, my great appreciation dedicated to all my friends and those whom involve directly or indirectly in the development of this project. There is no such meaningful word than.....Thank You So Much.
ABSTRACT

An earthing system is similar about the protection in our building. Earthing can be described as a system of electrical connections to the general mass of earth. There are two purposes about earthing that is to provide protection for persons or animals against the danger of electric shock. Secondary is to maintain the proper function of the electrical system. The objective of this project is to design a courseware of earthing system to make the user easily understand. This project also wills analyses the earthing system and the awareness and effective of the e-learning. By designing this courseware; it will provide an attractive and effective teaching of earthing system. In designing this courseware, the Macromedia Flash had been used because it is more flexible, user friendly and the graphics are more interesting to design the courseware of e-learning. The scopes of this project are the type of earthing system, characteristics of soil and tutorial of earthing system. The significance of this courseware is the user can get the information easily and the contents it delivered in the interactive and attractive way.
ABSTRAK

# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ACKNOWLEDGEMENT</td>
<td>iii</td>
</tr>
<tr>
<td></td>
<td>ABSTRACT</td>
<td>iv</td>
</tr>
<tr>
<td></td>
<td>TABLE OF CONTENT</td>
<td>vi</td>
</tr>
<tr>
<td></td>
<td>LIST OF TABLES</td>
<td>ix</td>
</tr>
<tr>
<td></td>
<td>LIST OF FIGURES</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>LIST OF APPENDIXS</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>INTRODUCTION</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Project Background</td>
<td>1</td>
</tr>
<tr>
<td>1.2</td>
<td>Problem Statement</td>
<td>2</td>
</tr>
<tr>
<td>1.3</td>
<td>Project Objectives</td>
<td>2</td>
</tr>
<tr>
<td>1.3.1</td>
<td>To design a courseware</td>
<td>2</td>
</tr>
<tr>
<td>1.3.2</td>
<td>To analysis of earthing system</td>
<td>2</td>
</tr>
<tr>
<td>1.3.3</td>
<td>To analysis the awareness of E-Learning and</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>the effectives of the courseware</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>Project Scope</td>
<td>3</td>
</tr>
<tr>
<td>2.0</td>
<td>LITERATURE REVIEW</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Introduction</td>
<td>4</td>
</tr>
<tr>
<td>2.2</td>
<td>What is e-learning</td>
<td>4</td>
</tr>
</tbody>
</table>
## 2.3 Benefits of e-learning

Page: 6

## 2.4 Review on Professor Teaches Flash CS3 Professional.

Page: 7

## 2.5 Review on Operation of Single Phase Kilowatt Hour Meter

Page: 9

### 3.0 BACKGROUND

#### 3.1 Introduction

Page: 11

#### 3.2 Earthing system in low voltage

Page: 11

#### 3.3 Type of Earthing System

Page: 12

- **3.3.1 TN System**
- **3.3.2 TN-S System**
- **3.3.3 TN-C System**
- **3.3.4 TN-C-S System**
- **3.3.5 TT System**
- **3.3.6 IT System**

Page: 12, 13, 14, 14, 15, 16

### 4.0 PROJECT METHODOLOGY

#### 4.1 Project Methodology

Page: 17

#### 4.2 Gantt Chart

Page: 21

#### 4.3 Tool

Page: 21

- **4.3.1 Software**

Page: 21

### 5.0 RESULTS AND ANALYSIS

#### 5.1 Final Product Development

Page: 22

#### 5.1.1 E-Learning design- front end user interfaces

Page: 22
5.1.2 System Contents and functions 23
5.1.3 Analysis of product 31
5.1.4 Analysis of Earthing System 36

6.0 CONCLUSION
6.1 Conclusion 38
6.2 Recommendations 38

REFERENCES 40
APPENDIX A 42
APPENDIX B 45
APPENDIX C 51
APPENDIX D 57
APPENDIX E 59
APPENDIX F 61
APPENDIX G 62
<table>
<thead>
<tr>
<th>TABLE</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2</td>
<td>Gantt chart for project planning</td>
<td>61</td>
</tr>
<tr>
<td>5.1</td>
<td>Questionnaire</td>
<td>30</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 2.4</td>
<td>Interface of Professor Teaches Flash CS3 Professional</td>
<td>8</td>
</tr>
<tr>
<td>Figure 2.4.1</td>
<td>Page of How to use this courseware</td>
<td>8</td>
</tr>
<tr>
<td>Figure 2.5</td>
<td>Interface of Operation of Single Phase Kilowatt Hour Meter</td>
<td>9</td>
</tr>
<tr>
<td>Figure 2.5.1</td>
<td>Operation meter circuit</td>
<td>10</td>
</tr>
<tr>
<td>Figure 2.5.2</td>
<td>Operation page</td>
<td>10</td>
</tr>
<tr>
<td>Figure 3.3.1</td>
<td>TN System</td>
<td>12</td>
</tr>
<tr>
<td>Figure 3.3.2</td>
<td>TN-S System connection</td>
<td>13</td>
</tr>
<tr>
<td>Figure 3.3.3</td>
<td>TN-C System connection</td>
<td>14</td>
</tr>
<tr>
<td>Figure 3.5.4</td>
<td>TN-S-C System connection</td>
<td>14</td>
</tr>
<tr>
<td>Figure 3.3.5</td>
<td>TT System</td>
<td>15</td>
</tr>
<tr>
<td>Figure 3.3.6</td>
<td>IT System</td>
<td>16</td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>Flow Chart of Project Methodology</td>
<td>18</td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>Interface of Macromedia Flash CS4</td>
<td>20</td>
</tr>
<tr>
<td>Figure 5.1.2</td>
<td>Front page of courseware</td>
<td>23</td>
</tr>
<tr>
<td>Figure 5.1.3</td>
<td>Earthing System Main Page</td>
<td>24</td>
</tr>
<tr>
<td>Figure 5.1.4</td>
<td>First page of Introduction</td>
<td>25</td>
</tr>
<tr>
<td>Figure 5.1.5</td>
<td>Second page of Introduction</td>
<td>25</td>
</tr>
<tr>
<td>Figure 5.1.6</td>
<td>Third page of Introduction</td>
<td>26</td>
</tr>
<tr>
<td>Figure 5.1.7</td>
<td>Page of Type of earthing</td>
<td>27</td>
</tr>
<tr>
<td>Figure 5.1.8</td>
<td>Animation of TT system</td>
<td>27</td>
</tr>
<tr>
<td>Figure 5.1.9</td>
<td>Earth path page</td>
<td>28</td>
</tr>
<tr>
<td>Figure 5.1.9(a)</td>
<td>Animation of arrangement for test</td>
<td>29</td>
</tr>
<tr>
<td>Figure 5.1.9(b)</td>
<td>Tutorial main page</td>
<td>29</td>
</tr>
<tr>
<td>Figure 5.1.9(c)</td>
<td>Question page</td>
<td>30</td>
</tr>
<tr>
<td>FIGURE</td>
<td>TITLE</td>
<td>PAGE</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Figure 5.1.9(d)</td>
<td>Page for correct answer</td>
<td>30</td>
</tr>
<tr>
<td>Figure 5.1.9(e)</td>
<td>Page for wrong answer</td>
<td>31</td>
</tr>
<tr>
<td>Figure 5.1.3(a)</td>
<td>Percentages Chart for Question 1</td>
<td>32</td>
</tr>
<tr>
<td>Figure 5.1.3(b)</td>
<td>Comparisons for question 2 and question 8</td>
<td>33</td>
</tr>
<tr>
<td>Figure 5.1.3(c)</td>
<td>Comparisons agrees and disagrees answers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>for questions 4, 5 and 7</td>
<td>34</td>
</tr>
<tr>
<td>Figure 5.1.3(d)</td>
<td>Comparisons answers for questions 6 and 10</td>
<td>35</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

1.1 Project background

Interactive learning on Earthing in Low Voltage system courseware has been developed as an approach to introduce the Earthing System. This courseware will help users to gather information and knowledge needed about earthing system. By design this courseware; it will handle a lack of information of earthing system. The benefit this courseware is the learner can learn from wherever they are and wherever they want to. This courseware also provides access to more information and allows learners to use their own initiative to find it. This courseware is simply a different way of learning, which some learner enjoys. By using this courseware, it making easy to learner knows where to go to get the information they need and can get it. An earthing system is similar about the protection in our building. Earthing defined as a system of electrical connections to the general mass of earth. There are two purposes about earthing, that is to provide protection for persons or animals against the danger of electric shock. Secondary is to maintain the proper functions of the electrical system. To develop this courseware, multimedia develops will be use such as Macromedia Flash, Microsoft Visual Basics and Adobe Photoshop Cs (Creative Suits).
1.2 Problem Statement

From the study experience, gather information for assignment, report and note for some topic is so difficult. The information got also full with unused information and a way deliver the information make quickly boring. The information explanation is so long for sub topic that need, this waste time for doing another work to get information. From observation and studies done on earthing system, the information earthing system is still hard to get it. The overall explanation about earthing system is still not enough and need to find one by one.

By develop this courseware; it will handle lack of information and knowledge of the earthing system. The method courseware used to deliver the information will make user enjoy and not boring by using the animation explanation. Moreover, the user can get information of what their required.

1.3 Project Objectives

The project based on these objectives:

1.3.1 To design a courseware

By using multimedia development, a courseware of earthing system will be design to deliver the information of earthing system

1.3.2 To analyses of earthing system

This project wills analysis the earthing system in TT, IT and TN system and analysis the characteristic of conductor (soil, rod)

1.3.3 To analyses the awareness of E-Learning and the effectives of the courseware
1.4 Project Scopes

After largely study on the Earthing System concept, there are many issues to consider producing a preliminary design of Interactive learning on Earthing in Low Voltage system. The scopes of this project are:

i. Type of earthing
ii. Tutorial
iii. Virtual lab
CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter is consisting of explanation and revision of the past projects to an idea about the project design, conception and any information that related to improve the project. This will provide a clearer understanding of the system and its design. This project is all about the e-learning for earthing system in low voltage.

2.2 What is e-learning

There are lot meanings of e-learning. Hall and Snider [1] define e-learning as the process of learning via computers over the Internet and intranets. [1] Extended that e-learning is also referred to as web-based training, online training, distributed learning or technology for learning. As a new concept of teaching to delivery of learning, training or education by electronics means. Yong Lian [2] stated that e-learning is well suited for engineering subject in a large class and contains 3 major components; conceptual visualizing, just-in-time teaching, and knowledge transferring. Yong Lian extended that the new method brings a new learning experience to students in a learner centered environment. Urdan & Weggen [3] related that technology, the rapid obsolescence of knowledge and training, the need for just in time training delivery, and the search for cost-effective ways to meet learning needs of a globally distributed workforce have redefined the processes that underlie design, development and delivery of training and education in the workplace. Urdan & Weggen also shared that e-learning covers a wide set of applications and processes, including computer-based learning, web-based learning, virtual classrooms, and digital collaborations using content via all
electronic media, including the Internet, satellite broadcast, audio/video tape, interactive TV, and CD-ROM. Derek Stockley [4] define e-learning as the delivery of a learning, training or education program by electronic means. E-learning involves the use of a computer or electronic device (e.g. a mobile phone) in some way to provide training, educational or learning material.

According to Cowley and others [5], a successful e-learning course requires taking the following elements:

a. Environment - learners need a certain environment (PC, Connection, software) and some preparation needs to be done to make sure that the student has that.
b. Teach skills - learners need to know something about how to use whatever learning system exists.
c. Subject matter skills - learners need to have some skills to benefit from the course.
d. Support - there has to be a mechanism to get support when learners run into problems.
e. Content - must be designed for interaction.
f. Instructor - aware of learners' needs/concerns and involvement levels, attempts to draw learners into discussion early, organizes schedule, provides resources for learners in need of additional learning (remedial).
g. Technology - should play a servant role.
h. Organization - focused on learning, time and resources made available, learners supported through help-desk

Merrill Lynch and other [6], stated e-Learning is Internet-enabled learning. Components can include content delivery in multiple formats, management of the learning experience, and a networked community of learners, content developers and experts. E-Learning provides faster learning at reduced costs, increased access to learning, and clear accountability for all participants in the learning process. In today's fast-paced culture, organizations that implement e-Learning provide their work force with the ability to turn change into an advantage
2.3 Benefits of e-learning

According to Joanne Capper [7] there are a numbers benefits to learning online that are unique to the medium:

a. Any time. A participant can access the learning program at any time that is convenient—not just during the specific 1-3-hour period that is set for a conventional course. The episodes can be quick snatches at odd times or long late-night sessions. Cross-time-zone communication, difficult to arrange in real time, is as easy as talking to someone across town when using the Internet.

b. Any place. The participants do not have to meet. That means they can be anywhere. International sharing is feasible. Individuals can log on at work, home, the library, in a community learning center or from their hotel when traveling.

c. Asynchronous interaction. Unlike face-to-face or telephone conversations, electronic mail does not require participants to respond immediately. As a result, interactions can be more succinct and to-the-point, discussion can stay more on-track, and people can get a chance to craft their responses. This can lead to more thoughtful and creative conversations.

d. Group collaboration. Electronic messaging creates new opportunities for groups to work together, creating shared electronic conversations that can be thoughtful and more permanent than voice conversations. Sometimes aided by on-line moderators, these net seminars can be powerful for learning and problem-solving.

e. New educational approaches. Many new options and learning strategies become economically feasible through online courses. For instance, the technology makes it feasible to utilize faculty anywhere in the world and to put together faculty teams that include master teachers, researchers, scientists, and experienced professional developers. Online courses also can provide unique opportunities for teachers to share innovations in their own work with the immediate support of electronic groups and expert faculty.

f. Integration of computers. The online learner has access to a computer, so computer applications can be used without excluding some participants. This means, for instance, that a mathematical model implemented in a spreadsheet can easily be
incorporated into a lesson and downloaded so all participants can run, explore, and refine the model and then share their findings and improvements.

Thomas [8], success in technology-based learning programs is based on an orientation to the learner is not the instructor. A strong focus on the learner and the learning environment is a shift from traditional instructional design and development techniques. Norton and Wilburg [9] believed that learner-based tools should be selected based on the way that they help students learn. The most important thing is how well the tool supports the learning process.

2.4. Review on Professor Teaches Flash CS3 Professional,

Professor Teaches Flash CS3 Professionals is a complete courseware to anyone who wants to learn Macromedia Flash CS3 Professional. This courseware let user build skill and learn everything user need, from beginning to advanced topics. This courseware use real-world setting and accurate simulation to help user apply the knowledge directly to their tasks. Figure 2.4 below show the menu page of this program. At menu section, there are six learning objective had been specific to guide user.
At the menu page, there also had the how to use the courseware button. The function of this button is to guide the user how to use this program. All explanation to use this courseware had been specific as shown in figure 2.4.1.
From the research on this program, there are few factors that can be benefits:

- The explanation and arrangement information is easy to understand.
- Colorful graphics and clear instructions keep users interested.
- Interactive Exercises


This courseware is presented operation of single phase kilowatt hour meter. This courseware consists of the overall information of single phase kilowatt hour meter from definition, type, operation, and circuit of single phase kilowatt hour meter as shown in figure 2.5.

![Image](image.png)

**Figure 2.5: Interface of Operation of Single Phase Kilowatt Hour Meter**

This courseware also teaches the user a way to read a kilowatt hour meter. However, animation of single phase kilowatt meter doesn’t have any explanations about the circuit as shown in figure 2.5.1 below. User takes a time to understand the operation meter circuit.
There are also weaknesses in the operation section as shown in figure 2.5.2; the colour of font is unattractive with background. Name of part is not point actually at the part and the arrangement of explanation is no suitable to deliver the information.