

**COMPUTER AIDED EDUCATION ON  
SPECIAL TRANSFORMER**

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**7 MEI 2007**

“I hereby certify that I have read and understood the following project thesis. To my opinion, this thesis is sufficient in term of scope and quality in term of scope and quality to achieve partial fulfillment of requirement for the Degree of Bachelor in Electrical Engineering (Industrial Power).”

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## ABSTRACT

As the technology grown fast, e-learning have been use widely as study module it is because learn using it very effective and attractive for user to use it. Therefore, in this project, e-learning software that covered topic of special transformer has been developed. This project software called 'CAEOST' which stand for computer aided education on special transformer. Transformer is an equipment that play main role in power system because its function to step up or step down voltage and current in power system. Another function for transformer, it also been use as protection equipment in high voltage, medium voltage and low voltage. The special transformer that include in this 'CAEOST' is autotransformer and instrument transformer which is current transformer and voltage transformer. In develop this project, software 'Macromedia Flash 8.0' have been use. The interactive animations graphic can be build by using this software, would be the main reason for choosing it. Another advantage of using this software, it can help to make this 'CAEOST' user friendly software, as example the button that can link other scene or external movie clip which contain special transformer content can be build by this software. In this 'CAEOST', the interactive information have been added in order to make user attract to use it and understand the content included inside. Tutorial also have been included as it will help user to do exercise or test what they have learn from this 'CAEOST'. Another extra application that would help user is virtual lab, user can easily simulate the chosen experiment which has been animate interactively. As the result from this 'CAEOST', it would help user gain their knowledge in equipment that have been use in power system.

## ABSTRAK

Sejajar dengan kemajuan teknologi masa kini, e-pembelajaran telah digunakan secara meluas sebagai modul pembelajaran kerana pembelajaran menggunakannya amat berkesan dan menarik pengguna menggunakannya. Justeru itu, di dalam projek ini, e-pembelajaran mengenai pengubah istimewa telah dibangunkan. Perisian projek ini dinamakan 'CAEOST' yang mewakili pembelajaran mengenai pengubah istimewa dengan bantuan komputer. Pengubah merupakan peralatan penting di dalam sistem kuasa, ini adalah kerana tugas utama pengubah yang menurun atau menaik voltan dan arus di dalam sistem kuasa. Selain itu, pengubah juga digunakan sebagai peralatan perlindungan untuk voltan tinggi, voltan sederhana dan voltan rendah. Pengubah istimewa yang terlibat di dalam 'CAEOST' adalah pengubah automatik dan pengubah peralatan iaitu pengubah arus dan pengubah voltan. Untuk membina projek, perisian "Macromedia Flash 8.0" telah digunakan. Animasi interaktif yang dapat dibina menggunakan perisian ini merupakan sebab utama perisian ini dipilih. Selain itu, kelebihan perisian ini adalah dapat membina perisian yang mesra pengguna sebagai contoh, butang yang dapat menghubungkan babak atau klip wayang luar di mana isi pengubah istimewa terdapat di dalamnya dapat dibina menggunakan perisian ini. Di dalam 'CAEOST', informasi interaktif telah dibina untuk menarik pengguna menggunakannya dan memahami isi yang terdapat di dalamnya. Latihan tutorial telah dibina sebagai latihan untuk pengguna mengaplikasikan apa yang telah dipelajari daripada 'CAEOST'. Aplikasi tambahan yang dapat membantu pengguna di dalam perisian ini adalah makmal maya, pengguna dapat simulasikan ujikaji terpilih di mana ujikaji tersebut telah dianimasikan secara interaktif. Hasil daripada projek ini di harap dapat menambah pengetahuan pengguna mengenai peralatan yang digunakan di dalam sistem kuasa.

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**LIST OF ABRIDGEMENT**

CT	- Current Transformer
VT	- Voltage Transformer
CAEOST	- Computer Aided Education On Special Transformer
CVT	- Capacitive Voltage Transformer
AC	- Alternate Current
DC	- Direct Current
M.M.F	- Magneto-motive Force
E.M.F	- Electromotive Force
AFSC	- Active ferroresonance-suppression circuits
PFSC	- Passive ferroresonance-suppression circuits

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Overview

Learning using computer is very popular lately, it because of the effectiveness of using it and affect user easily to understand what they learn. It not also come with interactive interface, it also attract people who don't have more time to go to library and other place for study. It also easily to be found and study because the application can be used through the internet which offer unlimited access to over all place in the world as long as the connection through it exist. Nowadays, several universities offer online student support services, such as online advising and registration, e-counseling, online textbook purchase, student governments and student newspapers.

In this project, the information about special transformer has been applied to the study module. The project is to exposed people with device that have been use in our recent power system. The project also come with interactive learning which offer the user, tutorial and virtual lab so they don't have to go other place to find the material, all user need is computer with internet connection than surf this computer aided education.

In this project, researches for special transformer have been done in order to give user information about this special transformer. These researches have been done with make tutorial that relate to this topic and make experiment to analyze the characteristic of this device. To develop this project, software "Macromedia Flash

8.0” has been use, as this software offer integrated animation and other interactive things.

## 1.2 Problem Statement

Each thing that we do must have a reason, same as this project as the problem arise it lead the new idea to make this learn ware. The main reason that will be highlight is about user difficulties to find the information about special transformer. As example, when user surf the internet and type current transformer to search the information about it, the result would not be as user want. The web just display current transformer product by electrical company, which the purpose is to introduce their product and sell it. Other than that, the website that contains information of current transformer is not complete for example some website just explains the basic information of current transformer without their characteristics.

References for this special transformer also difficult to be found, some book only write a little bit about the information needed and some of the information is not complete. User whom doesn't have basic electrical knowledge will feel hard to understand the information that written in the book. The information in books are limited as example for voltage transformer, the information just introduce to the equipment and not explain the characteristic, the operation and etc.

Another reason that leads to the development of this 'CAEOST' is the difficulties for user to do experiment that relate with special transformer. For example, the materials such as current transformer must be order first from electrical company in order to the test it. If user have this material, it also bring problem to user because of the limited equipment to test this special transformer. For user whom doesn't have basic electrical knowledge will feel difficult to make this experiment, they need to find more information before do the test or find people who have experience in doing the test.

### 1.3 Project Objective

These projects have their own objective to achieve and overcome the problems that arise before these projects have been developed. One of the main objectives of this is to build software which has information about this special transformer. The information not just the theory, basic operation it also include tutorial for user to make exercise when they feel ready, after gain the knowledge from this software. The interesting about this software is to build the virtual lab that will study the data or characteristic about this special transformer. This virtual lab could help user who feel difficult in make experiment about special transformer.

Another objective of this project is to analyze the characteristic, operation and application of the special transformer, in this project special transformer that takes part is autotransformer, current transformer and voltage transformer. Each of them has their own unique characteristic and should be discover as the information can be aided in developing this project. Each of these special transformers also has their own application and study of it will give benefit for user whom doesn't know their application.

Other than that, the purpose of this software development is to attract people learn about special transformer. It also helps people whom doesn't like electrical subject to feel that learning electrical subject is not bored and give more benefit to them. The expose of this knowledge will realize us about how important these equipment in our live, a study to these equipment will help to improve the power system nowadays which dealing with many problem such as fault, harmonic and problem occur in distribution and generation.

### 1.4 Project Scope

The study of these projects will be limited to certain level as the study that involves these special transformers is big enough to explore. The study of the autotransformer has been concentrated on their application and operation. For current transformer, the study scope for it has been limited to their application, operation and

characteristics. Scope study for voltage transformer also has been limit to their application, operation and characteristics.

In other hand, to develop this project, guide line must be highlight so the project software develops will not in wrong position or run from the objective. The project software that has been developed can make a simple calculation from application of theory that relates with special transformer, it has been added in tutorial section. This project software scope also to make virtual lab that will simulate experiment which relate with special transformer such as current transformer and autotransformer. The virtual lab scope experiment is about the certain special transformer characteristic, as example the magnetizing graph for current transformers. Another experiment that has been highlighted is application of autotransformer as it has been use in starting method for motor.

### **1.5 Project Summarize**

In this project summarize, an overview from every chapter will be explained. In the chapter 1, it is about overview for the project that reader can understand overall of the project. Problem statement give a problem that occur and the solution come with the project that has been suggested. In project objective, the objective to this project has been explained. Else is project scope which clearly explains about project objective, it also limits and be the guideline for this project.

On the chapter 2 it's about the research for project, paper work, book and other information that related with the topic that has been suggest. The literature review that have been done come with the summary and analysis which can help in develop this project.

Special transformer in chapter 3 explains the theory for current transformer, voltage transformer, and autotransformer. Circuit diagram explain each of the special transformer in this project.

Chapter 4 in this report will show the project methodology. It also shows how the project software has been develop from the collecting information till the report. In chapter 5, the software development has been explained. In this chapter it explained about how this project software has been developed.

Chapter 6 covered the result and analysis from this project software. The results that achieve the objective of this project have been showed. It also showed the analysis from this project. The last chapter in this report will discuss about the project and evaluation of it. Suggestion also been added so that, the project can be added with more information in the future. Conclusion on the last will explain the summary for this project.

## CHAPTER 2

### LITERATURE REVIEW

Literature review was an activity for researcher to research about project or paper work that have been done by some one else. The research must be done in their scope of project, which means the research must be related to the projects that have been suggested. In order to make the project successful, advantage and disadvantage must be taken as a guideline. From the topic that have been suggested “ Computer Aided Education On Special Transformer” we know that, computer have been use as equipment in learning, so project that based on e-learning must be taken in order to do the literature review. Paper work or journal that related with special transformer should be take, as it can help in the future if problem occur, it also help in collecting theory background because journal or paper work is new from the theory that we get in book.

In other word literature review has been done to make sure;

- i. It can give reader the overview of the project that has been suggested from the project that already been done by someone else.
- ii. The research will highlight the advantage or disadvantage of the project before.
- iii. The process or methodology that has been use for the project before can be implementing to the project that have been suggested.
- iv. The information that not in the project before can be adds to make the project better.

## 2.1 An Interactive Learning on AC Power Transformer

The topic above is the e-learning that already have been done and publish by Gabriel Jatu. E-learning that already has been developed is similar to this project. From the project observations that have been did will be divide by two parts, it is the advantage and disadvantage of his project. Advantage that can be highlight from the author of project is the content of the project which full with theory, attractive information, practical analysis and tutorial. The methods that author use very effective, as example the author use an interactive animation to explain the theory and relate it with visual lab so the information will be easy to understand by user. Tutorial interactive that include inside the software is very entertaining and effective to the user, this approach help user so they don't have to find tutorial or exercise related to the topic. Another interactive thing that include inside the software is virtual lab, as user don't have enough time to collect equipment or do experiment in the lab, the author figure out the easiest way which he do the experiment than he put the lab in his software so user can simulate the lab from his software. Disadvantage from the author project is from the aspect user friendly, an e-learning should be user friendly as the target for e-learning is for users easy to use it. As example that can be highlight is if users go into the sub menu some of the button were go directly to the main menu if user want to go back to main menu they must browse to the sub menu which have button that go to the main menu. From the visual lab that include inside the software are using one source data only, user can't see or make comparison if the data display just from one data only. In real experiment we use more than one data source to compare the result with the theory

## 2.2 Three Phase System

It is another sample project of e-learning that successful finish and has been published by Professor Dr. Marizan, Zainuddin Mat Isa, and Azrita Alias. This project is information about 3 phase system which exists in our power system network. As a result from the observation, the software is full with content that related with the topic above. Animation that have been use for explaining the theory also attract user to use and understand it. As example for phase sequence, the author

describes it with angle and motion to explain there is a different between phases. Formula that relate to theory also been given to user understand it, as example for unbalance load section, formula to calculate neutral current have been explain one by one which need to recognize each phase voltage, then from voltage divide by load we can get the current for each phase after that neutral current can be calculate. The conclusions that inside this software also explain briefly about 3 Phase System that user has been learning from their software. Where there is advantage, disadvantage also can be look from this e-learning. The obviously thing that can be look is from creativity author, graphic colors that have been use just one colors if it compare from the [1] there is a lot of different. Tutorial for user not include in this software, user must find exercise or tutorial which relate to the topic from other source such a book and internet. Visual lab also not include in this software, this can be look as one of the disadvantage, as example for the certain theory when voltage divide by a resistive load can give a current in a real world we know its exist, but it will be more effective for the user that don't have basic electrical knowledge if visual lab include in this software. Experiment to measure current can be shown to understand user from where the current come in.

### **2.3 Integrated Process Design for E-Learning: A Case Study**

This paper research has been done by Hartini Ahmad, Zulkifli Mohamed Udin, and Rushami Zien Yusoff is to examine the nature of learner's demand in e-learning process such as in registration project. In this paper, the author have decide to discuss the matter of e-learning use in higher education (HE) institution from the consequence about implementing and improve the way learn with using it. In this paper also tell about history of e-learning, the pioneer university that evaluate about using this method to use as a learn ware. Group from the author have describe the way to develop a good e-learning for user. Before develop the e-learning, research have been done to know what will be in future e-learning that they want to build. While they got the result from the research, problem occurs also arise and must be consider then overcome it. In this paper also shown figure that explain the problem, in this paper they suggested e-learning in registration process. The figure show the problem when the course registrations process by manual, online and then the