

**UNIVERSITI TEKNOLOGI MARA  
CAWANGAN PULAU PINANG**

**DEVELOPMENT OF EXCEL  
GRAPHICAL USER INTERFACE  
(GUI) FOR TRACKING AMPLITUDE  
OF FAULT CURRENT SIGNALS**

**NURSYARINA BINTI ZAINOL ABIDIN**

**Faculty of Electrical Engineering**

July 2017

## **ABSTRACT**

A digital protective relay for tracking of amplitude of fault can be analysed using several tools such as Matlab and Excel. The objective of this paper is to develop for tracking amplitude of fault current signal using Excel VBA. This is because Excel VBA is low cost software and widely used. The amplitude of fault current needs some analysis, commonly using DFT measurement algorithms. Excel VBA provides an easy way to perform the analysis and create graph to visualize the fault current signal. In this paper, Excel VBA has been used with several cases studies for calculating fault current, creating sinusoidal wave from data and also will be generating from amplitude and time of fault current. It can be conclude that the created GUI can save a lots of time, easy to use and reduce errors.

## ACKNOWLEDGEMENT

Alhamdulillah, all praises to Allah for giving me the strength, guidance and patience for me to be able finished my Final Year Project for the last 2 semester of my degree. This is to full-fill my course requirement in order for me to graduate with Bachelor of Engineering Electrics and Electronics.

Firstly, all thanks given to my supervisor, Dr Mohammad Nizam bin Ibrahim for all the sharing and time that he had spent throughout the research. I am grateful for him dedication, patience and support along my research.

Besides, I would like to express my deeply thankfulness to my parents, En. Zainol Abidin bin Ibrahim and Pn. Salehah binti Md. Taib, as well as my siblings which had given me full support in every aspect. Last but not least, I would like to extend my gratitude to my friends who had been involved directly and indirectly.

Thank you.

## TABLE OF CONTENT

CHAPTER	TITLE	PAGE
	<b>AUTHOR'S DECLARATION</b>	<b>i</b>
	<b>ABSTRACT</b>	<b>ii</b>
	<b>ACKNOWLEDGEMENT</b>	<b>iii</b>
	<b>TABLE OF CONTENT</b>	<b>iv</b>
	<b>LIST OF TABLES</b>	<b>vi</b>
	<b>LIST OF FIGURES</b>	<b>vii</b>
	<b>LIST OF SYMBOLS</b>	<b>viii</b>
	<b>LIST OF ABBREVIATIONS</b>	<b>xi</b>
<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
	1.1 Background Study	1
	1.2 Problems Statement	2
	1.3 Objectives	3
	1.4 The Scope of Study	3
	1.5 The Relevancy of The Project	3
<b>2</b>	<b>LITERATURE REVIEW</b>	<b>5</b>
	2.1 Introduction	5
	2.2 Fault Current	6
	2.3 Consequences of Faults	7
	2.4 Digital and DFT Algorithms	8
	2.5 Discrete Fourier Transform	10
	2.6 Introduction of Filters	11
	2.6.1 FIR Filter	12
	2.6.2 IIR Filter	12
	2.6.3 Advantages Of FIR Filter Over IIR Filter	12
	2.6.4 Advantages Of IIR Filter Over FIR Filter	13
	2.7 The Full-Cycle DFT	13

# CHAPTER 1

## INTRODUCTION

### 1.1 BACKGROUND STUDY

Since 1970, algorithms for fault tracking in numerical protection relays have been of industrial and academic alertness. Previously, one has proposed a Sample and First-derivative measurement algorithm in 1971 [1, 2]. This algorithm uses the first sample and derivative values to approach the amplitude of the peak signal current and voltage. The conventional Discrete Fourier Transform (DFT) is most commonly used to extract the fundamental components from the measured waveforms [14-19].

The initial algorithm is usually controlled by a computer presentation that was presented at that time. Today, computer simulation has the potentials to implement algorithms in high-level languages like C, C ++ or Visual Basic for Application (VBA) and so allows the use of the same software on different microprocessors. The project includes a brief explanation about the digital protection relay using some algorithm to detect the amplitude of the current measurement errors [3, 4]. The measurement algorithm includes a full DFT cycle and a half DFT cycle where these algorithms are programmed in VBA to calculate the time response to the current error and the results can be graphically observed in the GUI.

Researchers have developed several mathematical methods and analysing complex signals that have a lot of different frequencies present. The Fourier transform is one of the more popular sizes. However, reproducing mathematical steps required in the microprocessor or computer-based instruments rather difficult. Fourier Fast Transform (FFT), or Fourier Discrete Transform (DFT) is a more compatible process for use. This method only works properly if the signal is composed of frequency harmonics in the frequency range of interest (called the Nyquist frequency, which is half the sampling frequency) and base. Rated frequency may not be changed during the measurement period.