# XILINX (FPGA) DESIGN FOR SINGLE PHASE DC-AC MATRIX CONVERTER WITH SINUSOIDAL PULSE WIDTH MODULATION (SPWM)

This thesis is presented in partial fulfillment for the award of the Bachelor of Electrical Engineering (Honours)

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## ABSTRACT

This project illustrates the design and development of synchronous pulse-width modulation (SPWM) generator suitable to control the single phase matrix converter. The SPMC as a direct frequency changer were used in this work. The SPMC circuit composed from four ideal power switches used as a frequency converter. The desire output voltage will be synthesized using SPWM technique.

The target of this project is to generate the Sinusoidal Pulse-width Modulation switching Pattern using Xilinx FPGA that is suitable to control the single-phase matrix converter. One sine waveform with one carrier waveforms is used to generate the PWM. The PWM pattern proposes occupies less FPGA block cell hence more space could be used for other control algorithm. Results are provided to demonstrate the effectiveness of the design. Using Pspice and MATlab/Simulink showed the behavior of matrix converter operation. While the Xilinx FPGA show the result of SPMC using SPWM pattern.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

Power electronic has applications that span the whole field of electrical power systems, with the power range of applications extending from a few VA/Watts to several MVA/MW. The main task of power electronics is to control and convert electrical power from one form to another. Amongst techniques that could be explored includes; a) the use of Power System Block Set in MATLAB/Simulink relating to physical representation of models, b) use of Pspice in modeling and simulation. To ascertain validity of other proposals prior to developing other applications, the SPMC as a direct frequency changer in [1] were used in this work as a comparison. The output is being synthesized using the well-known SPWM technique.

## 1.2 Scope of the Thesis

This project report concern on the development and other related information for the main model in this project. This project also emphasized on the design and development of sinusoidal pulse width modulation (SPWM) generator suitable for the Single-Phase Matrix Converter. One sine waveform with one carrier waveform is used to generate the PWM. The PWM pattern proposed occupies less FPGA block cell hence more space could be used for other control algorithm.