

# **Proposal for a Tutorial on Analysis of Power Electronic Circuits using the Switching Function Technique**

## ***Who should attend?***

Educators and Researchers

## ***What is the Switching Function Technique Method of Analysis?***

It is an analytical method based on the switching function technique applied to all power electronic circuits. Simple simulation models for PSPICE or MATLAB are derived together with extended analysis. The simulation models are fast and simple to derive giving the full response of the system. The extended analysis gives the mathematical expressions of voltages and currents at all points in the circuit. In this way peak values, RMS values, THD and power factors can be derived.

## **Course Outline**

1. Introduction to the Switching Function Technique (through an example)
2. Switching Function Algebra: Ohms Law, Kirchoff's laws, Superposition
3. TYPE A Power Electronic circuits: The switching configuration is connected directly to the voltage source. The General Matrix, single and three phase AC/DC, DC/AC and the matrix converter
4. TYPE B Power Electronic circuits: An Impedance exists between the voltage source and the switching configuration.
5. PSPICE & MATLAB modeling
6. Extended Analysis

A good reference for the course is the book: "The switching Function: Analysis of Power Electronic Circuits", IEE ,London,2006 , ISBN-10 086341351X, ISBN-13:978-086341 -351-3 It is Marouchos, CC. I recommend that the tutorial fee covers the cost of the book as well. It is available from IET for 55 pounds. I can investigate for a special reduced price for the course.

## **The Presenter of the course:**

Dr CC Marouchos. See Short attached CV

**Name:** Christos Charalambous Marouchos

**Date and place of birth:** 25/3/52 Nicosia Cyprus

**ID** 453339

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**Present Position:** Lecturer (ent) at the Cyprus University of Technology, Department of Electrical Engineers and Information Technology. I was transferred from the Higher Technical Institute in January 2008.

## Education

### Academic Qualifications

Higher Technical Institute, Nicosia:	Diploma of Technician Engineer,	1973
Middlessex Polytechnic, London:	Engineering Council Examinations: CEI Part 2,	1976
Brunel University, London:	MSc Power Electronics	1977
Brunel University, London:	PhD Power Electronics,	1981

## Publications:

### Journals Papers:

1. **Marouchos, C.**; Darwish, MK; El-Habrouk 'A NEW MATHEMATICAL MODEL FOR ANALYSING 3-PHASE CONTROLLED RECTIFIER USING SWITCHING FUNCTIONS'. Accepted for publication at IET Power Electronics 2009.
2. **Marouchos, C.**; Darwish, MK; El-Habrouk: 'Variable var compensator circuits" IEE proc. Electric Power Applications, Vol 153, No 5 Sept 2006.

### Conference Papers

3. Marouchos, CC: "A New Switched Inductor VAR Compensator EPE 2009 Barcelona
4. Marouchos, CC: "Active Line Shaping of a Single Phase Rectifier using the Switching Function Technique". EPE PEMC 2008
4. **C. Marouchos** and M. K. Darwish "A New Mathematical Model for Analysing 3-Phase Controlled Rectifier using Switching Functions" 11<sup>th</sup> International Power Electronics and Motion Control Conference (EPE-PEMC 2004), September 2004. (accepted for presentation).
5. P.Mehta.T.Thomson.**C.Marouchos** "Generation of reactive power using switched capacitors" Proc. 15<sup>th</sup> Universities Power Engineering conference, Leicester University, England March 1980
6. P.Mehta.T.Thomson.**C.Marouchos** "A Technique for control of mains pollution by high power converters" 1980

## Book:

*Marouchos, CC : "The switching Function: Analysis of Power Electronic Circuits", IEE, London, 2006, ISBN-10 086341351X, ISBN-13: 978-086341351-3*

This research book presents a new technique for the analysis and simulation of existing and new power electronic circuits. This is the Switching function Technique. The book was written over the long period of four years and it covers a research period of 1998 -2006. It contains many research ideas which are now developed into journal papers.

## Patents

Two patents: App.No 8525288 and App.No 8008439