Seminar 2 Sunday and Monday June 17/18

– Booking for 2 days only –

SOFT-SWITCHING POWER ELECTRONICS CIRCUITS AND SWITCHED-CAPACITOR CONVERTERS 9:00am – 6:00pm

Instructor: Prof. Adrian Ioinovici, Holon Academic Institute of Technology, Israel

ABOUT THE INSTRUCTOR

Adrian Ioinovici is a Professor of Power electronics at the Holon Academic Institute of Technology,Israel.He published more than 100 papers in the field.He was one of the pioneers in development of switched-based-capacitors electronic converters , presented original soft-switching DC-DC converters and published new methods for the analysis and large-signal simulation of power electronics circuits. He has served as an Associate Editor in Power Electronics for IEEE CAS Transactions,chair of the Techn Committee on Power Electronics of IEEE CAS Society.

I REVIEW OF BASIC CONVERTERS

Basic structures of DC-DC converters; Voltage-mode control and current- mode control. parallel operation of current-mode controlled regulators; Push-pull, half-bridge, full-bridge converters; Resonant converters: series, parallel, series parallel of type LCC, LLC, LLCC, with leading and with lagging PF. super-resonant multiple-switch converters; Quasi-resonant converters: half-wave and full-wave mode operation, zero-current-switching, zero-voltage-switching, stresses, frequency-controlled QRC and fixed-switching frequency PWM QRC.

II SWITCHED-CAPACITOR-BASED ELECTRONIC CONVERTERS

Basic principle of use of a SC circuit for power processing; Step-down, step-up and inverting basic SC DC-DC converters, commercially-available SC DC-DC converters, Fibonacci type, canonical structures, SC DC-AC basic structure; DC voltage ratio, efficiency, ripple and regulation of SC -based converters; Control methods: duty-cycle, current source and on-resistance control; Buck and boost SC DC-DC converters. Multi-stage DC-DC and DC-AC converters; Switched-capacitor QRC with digital control; Continuous-input current SC circuits; Bi-directional SC regulators; Cascaded SC with soft-switching buck/boost converters for very high DC ratio; Very low output-voltage converters for IC applications and converters for the automotive industry

III MODERN SOFT-SWITCHING PWM-CONTROLLED DC-DC CONVERTERS

Zero-voltage transition (ZVT) and zero-current transition (ZCT) converters. Topological stages, Stresses, Efficiency, Design Conditions, Results; ZCZVT converter, operation, waveforms, design example; Buck ZVT converter with a resonant CLC bridge, topological stages, analysis, design example, results; Buck and boost converters with ZVT and zero-capacitive turn-on losses for all the switches, stages, design, results; ZVS converter with recuperation of the resonant circuit energy; Lossless passive snubber for boost-type converters; Capacitor-voltage clamped resonant converter; Soft-switching PWM full -bridge converter; Quadratic soft-switching converter with no auxiliary transistor; Buck converter in discontinuous-capacitor-voltage mode

IV AC-DC CONVERTERS,POWER FACTOR CORRECTION

Two-stage versus single-stage single-switch PFC; S4 PFC with additional windings; Charge-pump cell for PFC with passive snubber; Power factor correction with three-phase diodes and soft-switching active snubber

V DC-AC INVERTERS

Class D inverter (VSI) with capacitive snubber, RC snubber and stray-inductance snubber; Boost DC-AC voltage source inverter; QRC for soft-switching inverter - practical challenges; Series-resonant power inverter

WHO SHOULD ATTEND

The seminar is intended for engineers working in research or in design of power electronics circuits.The participants will get an overview of the main developments of the last decade:switched-capacitor-based and soft-switching converters.Theoretical analysis and practical designs of different topologies will give the participant the understanding of the evolution of the field and the capability to choose available structures and to develop new ones.