SEMINAR

COMPUTER AIDED TOPOLOGY SELECTION AND OPTIMIZATION OF SWITCHED MODE POWER SUPPLIES 9:00am - 6:00pm

ABOUT THE INSTRUCTORS

Dr. Norbert Fröhleke, Dipl.-Ing. Dietmar Hahm, Dipl.-Ing.Hugues Douglas Njiende,Institute for Power Electronics and Electrical Drives, University of Paderborn, Germany.

The research interests of Dr. Fröhleke include switched-mode power converter analysis, modeling and control, high-frequency magnetics, and computer-aided development of power electronic circuits and magnetic components, piezoelectric drives, and new actuators.

Dipl.-Ing. Hahm works as a research assistant on the development of CAE-software and expert-systems. The special interests of Dipl.-Ing. Njiende are modelling and optimization of magnetic components.

Dr. Lutz Zacharias, SIMEC GmbH & Co. KG, Chemnitz, Germany (see seminar 21)

TOPICAL OUTLINE

Designers of switched mode power supplies (SMPS) have to find the optimal solution for supplying most different loads in almost no time. Shortening time-to-market, short-term cost savings and experience gained from former projects lead to using well-tested solutions, thus putting aside innovative concepts and potential benefits at an early stage.

- In the seminar will be introduced an innovative design methodology supporting the following functions:
- A computer aided selection (CAS) of the best matching power supply topologies using a knowledge base.
- A computer aided DC and AC analysis (CAA) of power circuitry developed with a computer algebra program generating input for improved model libraries.
- Design of power electronic, control circuitry and magnetic components, taking care of high-frequency effects, using a computer aided design program (CAD) supported by the CAA-model libraries, libraries for the selection of components, materials, and circuit and system simulation using the commercial multi domain simulator SIMPLORER.
- Thermal design using approximate thermal modeling of power semiconductors and magnetic components, while total assemblies are characterized by thermal simulations and measurements to generate models under SIMPLORER.
- Automated Computer aided optimization (CAO) of magnetic components with respect to selected cost functions which might be efficiency, weight etc. by applying enhanced models and state-of-the-art numerical optimization algorithms.
- Overview and theoretical background on common switched mode power supply topologies Power electronics, Control circuitry, Magnetic components
- Introduction in time saving modeling/simulation of Integrated Power Electronic Systems Handling of multi domain systems with multi domain simulation Methods of behavioral modeling and their practical implementation Introduction of Power Electronic Systems Model Library
- Selection and Parameterization of Power Circuits Following topologies will be discussed: Buck converter with different rectifier configurations like M1, M2, B2 and current doubler and their isolated circuit variants like half bridge, full bridge, one and two switch forward converter, passive-Resonant-Commutated-Pole (PRCP) Full bridge and other resonant switching topologies.
- Thermal Modeling Parameterization of thermal models Goal: Optimum electro-thermal system design
- Magnetic Component Design and Optimization Dimensioning of core and winding parameters like e.g. the air gap width, the layer thickness in gapped inductors and in transformers with respect to design objectives such as minimum size, minimum temperature rise, costs, etc.

WHO SHOULD ATTEND

All engineers, managers and academics, who have to deal with the design of switched mode power supplies and want to use simulation and automated transformer and inductor optimization.