



Numerical Modelling and Design of Electrical Machines and Devices (Advances in Electrical and Electronic Engineering)

By K. Hameyer, R. Belmans



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Designed for undergraduates, graduates and practicing engineers, this text provides an up-to-date overview of numerical field computational methods and, in particular, of the finite element method (FEM) in magnetics. Particular attention is paid to the practical use of the FEM in designing electromagnetic devices such as motors, transformers and actuators.

The book is based on the authors' extensive experience teaching numerical techniques to students and design engineers from industry and is ideal for use by anyone who wishes to learn fundamentals and immediately apply these to actual design problems.



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Editorial Review

From the Author

Preface (written by authors) This book provides an overview of numerical field computational method. Particular attention is paid to the finite element method (FEM) for the design of electrical machines and other magnetic devices.

It is based on the authors' experience in teaching numerical techniques to undergraduates, graduates and doctoral students in courses at their own and at various international universities, e.g. guest courses at COPPE Universidade Federal do Rio de Janeiro (Brazil), Universite de Batna (Algeria) and the RWTH Aachen (Germany). The numerical techniques are introduced to engineers from industry in an annual "Short Course in Magnetism" organised at the Katholieke Universiteit Leuven.

This book is intended to be the basic reading material for such courses on numerical field computations as given nowadays at the Electrical Energy division in the Electrical Engineering Department of the Katholieke Universiteit Leuven and as guest courses at other universities.

The book describes the theory and techniques of modelling and simulating electromagnetic devices. While its primary focus is on the techniques applicable to the modelling of electrical machines and the electromechanical energy transducers, it also illustrates the usefulness of knowing the physical background of the specific problems. Accordingly, the right problem definitions can be applied and computed results can be interpreted and verified in a proper way.

Particular attention is paid to the FEM in designing electromagnetic devices, such as motors, actuators and transformers. This means that only frequencies below 10 kHz are considered. Several aspects of coupled fields are discussed in sections where the physical problem urges coupled solutions. The book has been written as a text book for undergraduates, graduates and engineers in practice who want to learn how to apply the fundamentals to solve electromagnetic design problems. Selected examples to develop skills to define and solve a field problem accurately are given at the end of this book. In parallel with the text for this book, an in-house software package for two dimensional and axisymmetrical FEM problems is developed to investigate the various aspects of the numerical field computation and their usefulness.

Without the support of various people, this book would not appear in this shape. In the first instance we should like to thank especially Dr. U. Pahner for his contributions to the optimisation chapter. The texts from section 7.3.1 to 7.3.3 are slightly adapted parts of his excellent Ph.D. thesis.

The authors are grateful to all their Ph.D. students currently working in the area of field computations for their suggestions, criticism and active participation collecting this course material. Some topics introduced in this book are directly related to the current research work in the division ESAT/ELEN.

As a guest professor and regular visitor to our division, Prof. E. M. Freeman contributed to general ideas, which we have developed over the years as well.

Users Review

From reader reviews:

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