

ELECTRIC and MAGNETIC FIELDS

**From Numerical Models
to Industrial Applications**

Edited by
**André Nicolet and
R. Beilmans**

Electric And Magnetic Fields From Numerical Models To Industrial Applications

Ying Liu



Electric And Magnetic Fields From Numerical Models To Industrial Applications:

Electric and Magnetic Fields R. Belmans,A. Nicolet,2012-12-06 This book contains the edited versions of the papers presented at the Second International Workshop on Electric and Magnetic Fields held at the Katholieke Universiteit van Leuven Belgium in May 1994 This Workshop deals with numerical solutions of electromagnetic problems in real life applications The topics include coupled problems thermal mechanical electric circuits CAD CAM applications 3D eddy current and high frequency problems optimisation and application oriented numerical problems This workshop was organised jointly by the AIM Association of Engineers graduated from de Montefiore Electrical Institute together with the Departments of Electrical Engineering of the Katholieke Universiteit van Leuven Prof R Belmans the University of Gent Prof J Melkebbek and the University of Liege Prof W Legros These laboratories are working together in the framework of the Pole d Attraction Interuniversitaire Inter University Attractie Pole 51 on electromagnetic systems led by the University of Liege and the research work they perform covers most of the topics of the Workshop One of the principal aims of this Workshop was to provide a bridge between the electromagnetic device designers mainly industrialists and the electromagnetic field computation developers Therefore this book contains a continuous spectrum of papers from application of electromagnetic models in industrial design to presentation of new theoretical developments

Electric And Magnetic Fields From Numerical Models To Industrial Applications A. Nicolet, *Electric and magnetic fields* International Workshop on Electric and Magnetic Fields,1996 Electric And Magnetic Fields From Numerical Models To Industrial Applications 3rd International Aim,

Scientific Computing in Electrical Engineering G. Ciuprina,D. Ioan,2007-05-30 This book is a collection of selected papers presented at the last Scientific Computing in Electrical Engineering SCEE Conference held in Sinaia Romania in 2006 The series of SCEE conferences aims at addressing mathematical problems which have a relevance to industry with an emphasis on modeling and numerical simulation of electronic circuits electromagnetic fields but also coupled problems and general mathematical and computational methods **International Workshop on Electric and Magnetic Fields** Association des Ingénieurs Electriciens Sortis de l'Institut d'Electricité Montefiore (Liège),1992

Electromagnetic Modeling by Finite Element Methods João Pedro A. Bastos,Nelson Sadowski,2003-04-01 Unlike any other source in the field this valuable reference clearly examines key aspects of the finite element method FEM for electromagnetic analysis of low frequency electrical devices The authors examine phenomena such as nonlinearity mechanical force electrical circuit coupling vibration heat and movement for applications in the electrical mechanical nuclear aeronautics and transportation industries Electromagnetic Modeling by Finite Element Methods offers a wide range of examples including torque vibration and iron loss calculation coupling of the FEM with mechanical equations circuits converters and thermal effects material modeling and proven methods for hysteresis implementation into FEM codes Providing experimental results and comparisons from the authors personal research Electromagnetic Modeling by Finite

Element Methods supplies techniques to implement FEM for solving Maxwell's equations analyze electrical and magnetic losses determine the behavior of electrical machines evaluate force distribution on a magnetic medium simulate movement in electrical machines and electromagnetic devices fed by external circuits or static converters and analyze the vibrational behavior of electrical machines

Industrial Application of Electromagnetic Computer Codes Yves R. Crutzen, Giorgio Molinari, Guglielmo Rubinacci, 2012-12-06 During the last decade a new generation of software tools has evolved in computational electromagnetics Both analytical methods and particularly numerical techniques have improved considerably leading to an extended range of capabilities and an increased applicability of both dedicated and general purpose computer codes It is the intention of this volume to review the state of the art in electromagnetic analysis and design and to describe the fundamentals and the advances in theoretical numerical approaches coupled with practical solutions for static and time dependent fields In this context the book illustrates the effectiveness of numerical techniques and associated computer codes in solving real electromagnetic field problems In addition it demonstrates the usefulness of modern codes for the analysis of many industrial practical cases In particular solutions of magnetostatic and magnetodynamic problems applied to electrical machines induction heating non destructive testing fusion reactor technology and other industrial are presented and discussed The present volume reflects and combines the lectures which are organized in the frame of the Eurocourse programme at JRC Ispra under the sponsorship of the Institute for Systems Engineering and Informatics ISEI It is hoped that in this context the Institute and particularly the Systems Engineering Reliability SER Division can play a stimulating role in sponsoring and promoting the diffusion of knowledge in novel areas of computer and information science

Optimal Design of the Electromagnetic Devices Using Numerical Methods Vasile Topa, 2000

Innovative Food Processing Technologies Kai Knoerzer, PhD, Pablo Juliano, PhD, Peter Roupas, PhD, Cornelis Versteeg, PhD, 2011-04-19 Part of the IFT Institute of Food Technologists series this book discusses multiphysics modeling and its application in the development optimization and scale up of emerging food processing technologies The book covers recent research outcomes to demonstrate process efficiency and the impact on scalability safety and quality and technologies including High Pressure Processing High Pressure Thermal Sterilization Radiofrequency Ultrasound Ultraviolet and Pulsed Electric Fields Processing Ideal for food and process engineers food technologists equipment designers microbiologists and research and development personnel this book covers the importance and the methods for applying multiphysics modeling for the design development and application of these technologies

Electromagnetic Theory and Computation Paul W. Gross, P. Robert Kotiuga, 2004-06-14 This book explores the connection between algebraic structures in topology and computational methods for 3 dimensional electric and magnetic field computation The connection between topology and electromagnetism has been known since the 19th century but there has been little exposition of its relevance to computational methods in modern topological language This book is an effort to close that gap It will be of interest to people working in finite element methods

for electromagnetic computation and those who have an interest in numerical and industrial applications of algebraic topology *Third International Workshop on Electric and Magnetic Fields*, 1996 Nonlinear Electromagnetic Systems A. J. Moses, A. Basak, 1996 The book covers classical and practical approaches to electromagnetic field solutions in magnetic devices The following topics are addressed Advanced computational techniques Intelligent computer aided design Magnetic materials Inverse problems Magnetic sensors and transducers Performance and optimisation of devices Applications to electronic systems Modelling of non linear systems and other related topics This volume presents 200 of the best articles presented at the International Symposium on Non Linear Electromagnetic Systems ISEM in Cardiff Wales The previous ISEM papers were published in the successful volume *Advanced Computational and Design Techniques in Applied Electromagnetic Systems* by Elsevier Main chapters in this book are Electromagnetic Devices Non linearities at contacts and interfaces in semiconductor structures by R H Williams as key note Optimisation Inverse and Biological Studies Power loss testing intelligent computation of optimization of metal cutting grid methods for CFD and CEM Magnetic Materials Materials for circuit simulator applications rotational magnetostriction Computational Techniques and Modelling Electromagnetic device design soft magnetic materials engineering application of artificial intelligence Sensors and Non destructive Testing Eddy current nondestructive evaluation nonlinear magnetoresistance micro magnetic sensor Electronic and Electrical Applications Non linear transistor parameters superconducting magnets *The Finite Element Method for Electromagnetic Modeling* Gérard Meunier, 2010-01-05 The Finite Element Method for Electromagnetic Modeling Written by specialists in the modeling of electromagnetism this book provides a comprehensive review of the finite element method for low frequency applications Fundamentals of the method as well as new advances in the field are described in detail Static magnetodynamic and fixed formulations are first covered before the discussion moves on to different macroscopic behavior laws of materials and their implementation in a finite element context and to more specific formulations the modeling of thin regions when finite elements become ill fitting the coupling of 2D and 3D formulations with circuit equations taking into account the presence of eddy currents and the treatment of geometric symmetries when the sources are not symmetric Coupled problems are then outlined before the book concludes with coverage of different meshing methods in the context of electromagnetism and optimization techniques *Electromagnetic Fields in Mechatronics, Electrical and Electronic Engineering* Andrzej Krawczyk, Sławomir Wiak, Xose M. Lopez-Fernandez, 2006 More and more researchers engage into investigation of electromagnetic applications especially these connected with mechatronics information technologies medicine biology and material sciences It is readily seen when looking at the content of the book that computational techniques which were under development during the last three decades and are still being developed serve as good tools for discovering new electromagnetic phenomena It means that the field of computational electromagnetics belongs to an application area rather than to a research area This publication aims at joining theory and practice thus the majority of papers are deeply rooted in

engineering problems being simultaneously of high theoretical level The editors hope to touch the heart of the matter in electromagnetism The book focuses on the following issues Computational Electromagnetics Electromagnetic Engineering Coupled Field and Special Applications Micro and Special Devices Bioelectromagnetics and Electromagnetic Hazard and Magnetic Material Modelling Abstracted in Inspec , *The Cell Method* Elena Ferretti, 2014-02-02 The Cell Method CM is a computational tool that maintains critical multidimensional attributes of physical phenomena in analysis This information is neglected in the differential formulations of the classical approaches of finite element boundary element finite volume and finite difference analysis often leading to numerical instabilities and spurious results This book highlights the central theoretical concepts of the CM that preserve a more accurate and precise representation of the geometric and topological features of variables for practical problem solving Important applications occur in fields such as electromagnetics electrodynamics solid mechanics and fluids CM addresses non locality in continuum mechanics an especially important circumstance in modeling heterogeneous materials Professional engineers and scientists as well as graduate students are offered A general overview of physics and its mathematical descriptions Guidance on how to build direct discrete formulations Coverage of the governing equations of the CM including nonlocality Explanations of the use of Tonti diagrams and References for further reading Mathematical Models for Eddy Currents and Magnetostatics Rachid Touzani, Jacques Rappaz, 2013-10-01 This monograph addresses fundamental aspects of mathematical modeling and numerical solution methods of electromagnetic problems involving low frequencies i e magnetostatic and eddy current problems which are rarely presented in the applied mathematics literature In the first part the authors introduce the mathematical models in a realistic context in view of their use for industrial applications Several geometric configurations of electric conductors leading to different mathematical models are carefully derived and analyzed and numerical methods for the solution of the obtained problems are given Related issues such as convergence of the approximations and error estimates are discussed The second part of the monograph presents various coupled problems that involve eddy current or magnetostatic problems in particular magneto hydrodynamic problems and magnetic shaping problems concerning the melt flow of electrically conducting metals induction heating processes inductively coupled plasmas and ferromagnetic screening modeling The presentation of each model comes with numerical illustration from industrial applications *Electromagnetic Fields in Electrical Engineering* Andrzej Krawczyk, S. Wiak, 2002 This volume includes contributions on field theory and advanced computational electromagnetics electrical machines and transformers optimization and interactive design electromagnetics in materials coupled field and electromagnetic components in mechatronics induction heating systems bioelectromagnetics and electromagnetics in education **Modeling and Application of Electromagnetic and Thermal Field in Electrical Engineering** Zhiguang Cheng, Norio Takahashi, Behzad Forghani, 2019-12-03 Co authored by an international research group with a long standing cooperation this book focuses on engineering oriented electromagnetic and thermal field modeling and

application It presents important contributions including advanced and efficient finite element analysis used in the solution of electromagnetic and thermal field problems for large and multi scale engineering applications involving application script development magnetic measurement of both magnetic materials and components under various even extreme conditions based on well established standard and non standard experimental systems and multi level validation based on both industrial test systems and extended TEAM P21 benchmarking platform Although these are challenging topics they are useful for readers from both academia and industry

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