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**Industry 4.0 and
Advanced Manufacturing -**

Amaresh Chakrabarti
2020-10-28

This book presents selected papers from the 1st International Conference on Industry 4.0 and Advanced Manufacturing held at the Indian Institute of Science, Bangalore and includes deliberations from stakeholders in manufacturing and Industry 4.0 on the nature, needs, challenges, opportunities, problems, and solutions in these transformational areas. Special emphasis is placed on exploring avenues for creating a vision of, and enablers for, sustainable, affordable, and human-centric Industry 4.0. The book showcases cutting edge practice, research, and educational innovation in this crucial and rapidly evolving area.

This book will be useful to researchers in academia and industry, and will also be useful to policymakers involved in creating ecosystems for implementation of Industry 4.0.

Magnetism: A Very Short Introduction -

Stephen J. Blundell 2012-06-28

Magnetism is a strange force, mysteriously attracting one object to another apparently through empty space. It has been claimed as a great healer, with magnetic therapies being proposed over the centuries and still popular today. Why are its mysterious important to solve? In this Very Short Introduction, Stephen J. Blundell explains why. For centuries magnetism has been used for various exploits; through compasses it gave us navigation and through motors, generators, and turbines it has given us

power. Blundell explores our understanding of electricity and magnetism, from the work of Galvani, Ampere, Faraday, and Tesla, and goes on to explore how Maxwell and Faraday's work led to the unification of electricity and magnetism, thought of as one of the most imaginative developments in theoretical physics. With a discussion of the relationship between magnetism and relativity, quantum magnetism, and its impact on computers and information storage, Blundell shows how magnetism has changed our fundamental understanding of the Universe. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books

are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

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.

Magnetic Materials and

3D Finite Element Modeling - João Pedro A. Bastos 2017-04-28

Magnetic Materials and 3D Finite Element Modeling explores material characterization and finite element modeling (FEM) applications. This book relates to electromagnetic analysis based on Maxwell's equations and application of the finite element (FE) method to low frequency devices. A great source for senior undergraduate and graduate students in electromagnetics, it also supports industry professionals working in magnetics, electromagnetics, ferromagnetic materials science and electrical engineering. The authors present current concepts on ferromagnetic material characterizations and losses. They provide introductory material;

highlight basic electromagnetics, present experimental and numerical modeling related to losses and focus on FEM applied to 3D applications. They also explain various formulations, and discuss numerical codes.

- Furnishes algorithms in computational language
- Summarizes concepts related to the FE method
- Uses classical algebra to present the method, making it easily accessible to engineers

Written in an easy-to-understand tutorial format, the text begins with a short presentation of Maxwell's equations, discusses the generation mechanism of iron losses, and introduces their static and dynamic components. It then demonstrates simplified models for the hysteresis phenomena under alternating

magnetic fields. The book also focuses on the Preisach and Jiles–Atherton models, discusses vector hysteresis modeling, introduces the FE technique, and presents nodal and edge elements applied to 3D FE formulation connected to the hysteretic phenomena. The book discusses the concept of source-field for magnetostatic cases, magnetodynamic fields, eddy currents, and anisotropy. It also explores the need for more sophisticated coding, and presents techniques for solving linear systems generated by the FE cases while considering advantages and drawbacks.

Electromagnetic Theory and Computation - Paul W. Gross 2011-04-28

Although topology was recognized by Gauss and Maxwell to play a pivotal role in the

formulation of electromagnetic boundary value problems, it is a largely unexploited tool for field computation. The development of algebraic topology since Maxwell provides a framework for linking data structures, algorithms, and computation to topological aspects of three-dimensional electromagnetic boundary value problems. This book attempts to expose the link between Maxwell and a modern approach to algorithms. The first chapters lay out the relevant facts about homology and cohomology, stressing their interpretations in electromagnetism. These topological structures are subsequently tied to variational formulations in electromagnetics, the finite element method, algorithms, and certain aspects of numerical linear algebra. A

recurring theme is the formulation of and algorithms for the problem of making branch cuts for computing magnetic scalar potentials and eddy currents. Appendices bridge the gap between the material presented and standard expositions of differential forms, Hodge decompositions, and tools for realizing representatives of homology classes as embedded manifolds. *A History of Electricity and Magnetism* - Herbert W. Meyer 1971
Written so as to be understood by the non-technical reader who is curious about the origin of all the electrical and electromagnetic devices that surround him, this history also provides a convenient compendium of information for those familiar with the electrical and magnetic fields. The book moves

along at a rapid pace, as it must if it is to cover the enormous proliferation of developments that have occurred during the last hundred years or so. The author has struck a workable balance between the human side of his story, introducing those biographical details that help advance it, and its technical side, explaining theories and "how things work" where this seems appropriate. He also achieves a balance in recounting the discovery of basic scientific principles and their technological applications--the myriad of devices and inventions that utilize energy and information in electromagnetic form. Indeed, one of the important themes of the book is the close and reciprocal relationship between science and technology, between theory and practice.

Before approximately 1840, the purely scientific investigations of electrical and magnetic phenomena were largely "ad hoc" and observational, and essentially no technology based on them existed. Afterwards, the scientific explorations became more programmatic and mathematical, and technical applications and inventions began to be produced in great abundance. In return, this technology paid its debt to pure science by providing it with a series of measuring instruments and other research devices that allowed it to advance in parallel. Although this book reviews the early discoveries, from the magnetic lodestone and electrostatic amber of antiquity to Galvani's frog's legs and Franklin's kite-and-key of the 1700s, its major

emphasis is on the post-1840 developments, as the following chapter titles will confirm: Early Discoveries-- Electrical Machines and Experiments with Static Electricity--Voltaic Electricity, Electrochemistry, Electromagnetism, Galvanometers, Ampere, Biot and Savart, Ohm-- Faraday and Henry-- Direct Current Dynamos and Motors--Improvements in Batteries, Electrostatic Machines, and Other Older Devices-- Electrical Instruments, Laws, and Definitions of Units--The Electric Telegraph--The Atlantic Cable--The Telephone-- Electric Lighting-- Alternating Currents-- Electric Traction-- Electromagnetic Waves, Radio, Facsimile, and Television--Microwaves, Radar, Radio Relay, Coaxial Cable, Computers--Plasmas, Masers, Lasers, Fuel

Cells, Piezoelectric Crystals, Transistors-- X-Rays, Radioactivity, Photoelectric Effect, Structure of the Atom, Spectra.

Introduction to

Electrodynamics - David J. Griffiths 2017-06-29
This is a re-issued and affordable printing of the widely used undergraduate electrodynamics textbook.

Trends in

Electromagnetism - Victor Barsan 2012-03-23
Among the branches of classical physics, electromagnetism is the domain which experiences the most spectacular development, both in its fundamental and practical aspects. The quantum corrections which generate non-linear terms of the standard Maxwell equations, their specific form in curved spaces, whose predictions can be

confronted with the cosmic polarization rotation, or the topological model of electromagnetism, constructed with electromagnetic knots, are significant examples of recent theoretical developments. The similarities of the Sturm-Liouville problems in electromagnetism and quantum mechanics make possible deep analogies between the wave propagation in waveguides, ballistic electron movement in mesoscopic conductors and light propagation on optical fibers, facilitating a better understanding of these topics and fostering the transfer of techniques and results from one domain to another. Industrial applications, like magnetic refrigeration at room temperature or use of metamaterials for antenna couplers and

covers, are of utmost practical interest. So, this book offers an interesting and useful reading for a broad category of specialists.

Mechanics of Electromagnetic Materials and Structures

- J. S. Yang 2000

This volume contains papers presented at the Symposium on the Mechanics of Electromagnetic Materials and Structures of the 1999 ASME Summer Meeting in Blacksburg, Virginia, USA. Topics covered include continuum modelling of deformable electromagnetic materials, magnetoelasticity and electroelasticity. Experimental, computational, and theoretical results are presented. The Symposium and the book are enriched by the participation of contributors from

industries and presentations related to device applications.

Photocatalysis - Suresh C. Pillai 2021-08-23

This book is a concise and up-to-date introduction to the topic of photocatalysis.

It covers the fundamentals of photocatalysis, design of photoreactors and modelling and simulations for photoreaction. Also, industrial applications such as hydrogen production, water disinfection, degradation of air pollutants, pesticides and pharmaceuticals are described.

Information Sources in Physics - Dennis F. Shaw 1994

This third edition includes two new chapters on quantum optics and physics of materials, and eight of the other chapters have been completely

rewritten by new authors. All chapters have been revised and updated. Patent coverage now includes European and international patents. Theoretical materials a

Review of Radio Science

- W. Ross Stone
2002-08-12

A triennial summation of the state of the art in radio science This book is the fourth in the modern series of triennial reviews prepared by the International Union of Radio Science to further communication and understanding of the status and future of radio science, both for those working in the field, and for those who want to know what is of current importance in this area. The International Union of Radio Science, URSI (Union Radio-Scientifique Internationale), has

divided the subject of "Radio Science" according to the ten topics of the Scientific Commissions that make up URSI. This volume consists of thirty-eight original, peer-reviewed papers. Each paper provides a critical, in-depth review of—and, in many cases, tutorial on—advances and research that have been of significant importance within the area of interest of the Commissions during the past three to four years. Among the topics covered are:

- Electromagnetic metrology
- Fields and waves
- Signals and systems
- Electronics and photonics
- Electromagnetic noise and interference
- Wave propagation and remote sensing
- Ionospheric radio and propagation
- Waves in plasmas
- Radio astronomy
- Electromagnetics in

biology and medicine

With an included CD-ROM of the full book text, allowing the user to do full-text searching of all the papers, the Review of Radio Science: 1999–2002 is a resource of vital importance to anyone working in, or with an interest in, radio science.

Electromagnetics and Calculation of Fields - Nathan Ida 2013-03-07

This introduction to electromagnetic fields emphasizes the computation of fields and the development of theoretical relations. It presents the electromagnetic field and Maxwell's equations with a view toward connecting the disparate applications to the underlying relations, along with computational methods of solving the equations.

Advanced Engineering Electromagnetics - Constantine A. Balanis

2012-01-24

Balanis' second edition of Advanced Engineering Electromagnetics – a global best-seller for over 20 years – covers the advanced knowledge engineers involved in electromagnetic need to know, particularly as the topic relates to the fast-moving, continually evolving, and rapidly expanding field of wireless communications. The immense interest in wireless communications and the expected increase in wireless communications systems projects (antenna, microwave and wireless communication) points to an increase in the number of engineers needed to specialize in this field. In addition, the Instructor Book Companion Site contains a rich collection of multimedia resources for use with this text. Resources include: Ready-made lecture notes

in Power Point format for all the chapters. Forty-nine MATLAB® programs to compute, plot and animate some of the wave phenomena. Nearly 600 end-of-chapter problems, that's an average of 40 problems per chapter (200 new problems; 50% more than in the first edition) A thoroughly updated Solutions Manual 2500 slides for Instructors are included.

Contributions to Electricity and Magnetism - Joseph Henry 1839

Computational Methods for Nanoscale

Applications - Igor Tsukerman 2020-08-21 Positioning itself at the common boundaries of several disciplines, this work provides new perspectives on modern nanoscale problems where fundamental science meets technology and

computer modeling. In addition to well-known computational techniques such as finite-difference schemes and Ewald summation, the book presents a new finite-difference calculus of Flexible Local Approximation Methods (FLAME) that qualitatively improves the numerical accuracy in a variety of problems.

Magnetism and Magnetic Materials - J. M. D.

Coey 2010-03-25

An essential textbook for graduate courses on magnetism and an important source of practical reference data.

High Magnetic Field Science and Its Application in the United States - National

Research Council

2013-12-25

The Committee to Assess the Current Status and Future Direction of High Magnetic Field Science

in the United States was convened by the National Research Council in response to a request by the National Science Foundation. This report answers three questions: (1) What is the current state of high-field magnet science, engineering, and technology in the United States, and are there any conspicuous needs to be addressed? (2) What are the current science drivers and which scientific opportunities and challenges can be anticipated over the next ten years? (3) What are the principal existing and planned high magnetic field facilities outside of the United States, what roles have U.S. high field magnet development efforts played in developing those facilities, and what potentials exist for further international collaboration in this

area? A magnetic field is produced by an electrical current in a metal coil. This current exerts an expansive force on the coil, and a magnetic field is "high" if it challenges the strength and current-carrying capacity of the materials that create the field. Although lower magnetic fields can be achieved using commercially available magnets, research in the highest achievable fields has been, and will continue to be, most often performed in large research centers that possess the materials and systems know-how for forefront research. Only a few high field centers exist around the world; in the United States, the principal center is the National High Magnetic Field Laboratory (NHMFL). High Magnetic Field Science and Its Application in the

United States considers continued support for a centralized high-field facility such as NHFML to be the highest priority. This report contains a recommendation for the funding and siting of several new high field nuclear magnetic resonance magnets at user facilities in different regions of the United States. Continued advancement in high-magnetic field science requires substantial investments in magnets with enhanced capabilities. High Magnetic Field Science and Its Application in the United States contains recommendations for the further development of all-superconducting, hybrid, and higher field pulsed magnets that meet ambitious but achievable goals.

Engineering Optimization 2014 - Hélder Rodrigues

2014-09-26

Modern engineering processes and tasks are highly complex, multi- and interdisciplinary, requiring the cooperative effort of different specialists from engineering, mathematics, computer science and even social sciences. Optimization methodologies are fundamental instruments to tackle this complexity, giving the possibility to unite synergistically team members' inputs and thus decisively contribute to solving new engineering technological challenges. With this context in mind, the main goal of Engineering Optimization 2014 is to unite engineers, applied mathematicians, computer and other applied scientists working on research, development and practical application of optimization methods

applied to all engineering disciplines, in a common scientific forum to present, analyze and discuss the latest developments in this area. Engineering Optimization 2014 contains the edited papers presented at the 4th International Conference on Engineering Optimization (ENGOPT2014, Lisbon, Portugal, 8-11 September 2014). ENGOPT2014 is the fourth edition of the biennial "International Conference on Engineering Optimization". The first conference took place in 2008 in Rio de Janeiro, the second in Lisbon in 2010 and the third in Rio de Janeiro in 2012. The contributing papers are organized around the following major themes:

- Numerical Optimization Techniques
- Design Optimization and Inverse Problems
- Efficient Analysis and Reanalysis

Techniques - Sensitivity Analysis - Industrial Applications - Topology Optimization For Structural Static and Dynamic Failures - Optimization in Oil and Gas Industries - New Advances in Derivative-Free Optimization Methods for Engineering Optimization - Optimization Methods in Biomechanics and Biomedical Engineering - Optimization of Laminated Composite Materials - Inverse Problems in Engineering Optimization 2014 will be of great interest to engineers and academics in engineering, mathematics and computer science.

Proceedings of the Tenth International Symposium on Applied

Electromagnetic and Mechanics - T. Takagi
2003

This publication covers topics in the area of applied electromagnetics

and mechanics. Since starting in Japan in 1988, the ISEM has become a well-known international forum on applied electromagnetics.

Computer Engineering in Applied Electromagnetism

- Slawomir Wiak
2006-06-07

Computer Engineering in Applied Electromagnetism contains papers which were presented at the International Symposium on Electromagnetic Fields in Electrical Engineering, held in Maribor, Slovenia, 18-20 September 2003. It consists of three parts, Computational Techniques, Electromagnetic Engineering, and Special Applications. The contributions selected for the book cover a wide spectrum of theory and practice, being simultaneously of high theoretical level and deeply rooted in

engineering problems.
Thus, this volume touches on what is of key importance in electromagnetism.
Electromagnetic Fields in Electrical Engineering - Andrzej Krawczyk 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.

Journal of Technical Physics - 2000

New Frontiers for Metrology: From Biology and Chemistry to Quantum and Data Science -

M.J.T. Milton 2021-12-22
The use of standard and reliable measurements is essential in many areas of life, but nowhere is it of more crucial importance than in the world of science, and physics in particular. This book contains 20 contributions presented as part of Course 206 of the International School of Physics Enrico Fermi on New Frontiers for Metrology: From Biology and Chemistry to Quantum and Data Science, held in Varenna, Italy, from 4 -13 July 2019. The Course was the 7th in the Enrico Fermi series devoted to metrology, and followed a milestone in the history of measurement: the adoption of new definitions for the base units of the SI. During the Course, participants reviewed the decision and discussed how the new foundation for metrology is opening new

possibilities for physics, with several of the lecturers reflecting on the implications for an easier exploration of the unification of quantum mechanics and gravity. A wide range of other topics were covered, from measuring color and appearance to atomic weights and radiation, and including the application of metrological principles to the management and interpretation of very large sets of scientific data and the application of metrology to biology. The book also contains a selection of posters from the best of those presented by students at the Course. Offering a fascinating exploration of the latest thinking on the subject of metrology, this book will be of interest to researchers and practitioners from many fields.

IEEE Translation Journal

on Magnetics in Japan - 1989

Electromagnetic Simulation Using the FDTD Method with Python

- Jennifer E. Houle

2020-01-15

Provides an introduction to the Finite Difference Time Domain method and shows how Python code can be used to implement various simulations This book allows engineering students and practicing engineers to learn the finite-difference time-domain (FDTD) method and properly apply it toward their electromagnetic simulation projects.

Each chapter contains a concise explanation of an essential concept and instruction on its implementation into computer code. Included projects increase in complexity, ranging from simulations in free space to propagation in dispersive media. This third edition utilizes

the Python programming language, which is becoming the preferred computer language for the engineering and scientific community. Electromagnetic Simulation Using the FDTD Method with Python, Third Edition is written with the goal of enabling readers to learn the FDTD method in a manageable amount of time. Some basic applications of signal processing theory are explained to enhance the effectiveness of FDTD simulation. Topics covered in include one-dimensional simulation with the FDTD method, two-dimensional simulation, and three-dimensional simulation. The book also covers advanced Python features and deep regional hyperthermia treatment planning. Electromagnetic Simulation Using the FDTD Method with Python:

Guides the reader from basic programs to complex, three-dimensional programs in a tutorial fashion Includes a rewritten fifth chapter that illustrates the most interesting applications in FDTD and the advanced graphics techniques of Python Covers peripheral topics pertinent to time-domain simulation, such as Z-transforms and the discrete Fourier transform Provides Python simulation programs on an accompanying website An ideal book for senior undergraduate engineering students studying FDTD, Electromagnetic Simulation Using the FDTD Method with Python will also benefit scientists and engineers interested in the subject. Surface Impedance Boundary Conditions - Sergey V. Yuferev

2018-09-03

Surface Impedance Boundary Conditions is perhaps the first effort to formalize the concept of SIBC or to extend it to higher orders by providing a comprehensive, consistent, and thorough approach to the subject. The product of nearly 12 years of research on surface impedance, this book takes the mystery out of the largely overlooked SIBC. It provides an understanding that will help practitioners select, use, and develop these efficient modeling tools for their own applications. Use of SIBC has often been viewed as an esoteric issue, and they have been applied in a very limited way, incorporated in computation as an ad hoc means of simplifying the treatment for specific problems. Apply a

Surface Impedance "Toolbox" to Develop SIBCs for Any Application The book not only outlines the need for SIBC but also offers a simple, systematic method for constructing SIBC of any order based on a perturbation approach. The formulation of the SIBC within common numerical techniques—such as the boundary integral equations method, the finite element method, and the finite difference method—is discussed in detail and elucidated with specific examples. Since SIBC are often shunned because their implementation usually requires extensive modification of existing software, the authors have mitigated this problem by developing SIBCs, which can be incorporated within existing software without system

modification. The authors also present: Conditions of applicability, and errors to be expected from SIBC inclusion Analysis of theoretical arguments and mathematical relationships Well-known numerical techniques and formulations of SIBC A practical set of guidelines for evaluating SIBC feasibility and maximum errors their use will produce A careful mix of theory and practical aspects, this is an excellent tool to help anyone acquire a solid grasp of SIBC and maximize their implementation potential.

Electromagnetic Fields in Mechatronics, Electrical and Electronic Engineering - A. Krawczyk 2006-08-15
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 Modeling.

The Cell Method for Electrical Engineering and Multiphysics Problems

- Piergiorgio Alotto 2013-01-24
This book presents a numerical scheme for the solution of field problems governed by partial differential equations: the cell method. The technique lends itself naturally to the solution of multiphysics problems with several interacting phenomena. The Cell Method, based on a

space-time tessellation, is intimately related to the work of Tonti and to his ideas of classification diagrams or, as they are nowadays called, Tonti diagrams: a graphical representation of the problem's equations made possible by a suitable selection of a space-time framework relating physical variables to each other. The main features of the cell method are presented and links with many other discrete numerical methods (finite integration techniques, finite difference time domain, finite volumes, mimetic finite differences, etc.) are discussed. After outlining the theoretical basis of the method, a set of physical problems which have been solved with the cell method is described. These single and multiphysics

problems stem from the authors' research experience in the fields of electromagnetism, elasticity, thermo-elasticity and others. Finally, the implementation of the numerical technique is described in all its main components: space-time discretization, problem formulation, solution and representation of the resulting physical fields.

Multiobjective Shape Design in Electricity and Magnetism - Paolo Di

Barba 2009-12-03

Multiobjective Shape Design in Electricity and Magnetism is entirely focused on electric and magnetic field synthesis, with special emphasis on the optimal shape design of devices when conflicting objectives are to be fulfilled. Direct problems are solved by means of finite-element

analysis, while evolutionary computing is used to solve multiobjective inverse problems. This approach, which is original, is coherently developed throughout the whole manuscript. The use of game theory, dynamic optimisation, and Bayesian imaging strengthens the originality of the book. Covering the development of multiobjective optimisation in the past ten years, Multiobjective Shape Design in Electricity and Magnetism is a concise, comprehensive and up-to-date introduction to this research field, which is growing in the community of electricity and magnetism. Theoretical issues are illustrated by practical examples. In particular, a test problem is solved by different methods so that, by comparison of

results, advantages and limitations of the various methods are made clear.

Optimization and Inverse Problems in

Electromagnetism - Marek Rudnicki 2013-04-17

From 12 to 14 September 2002, the Academy of Humanities and Economics (AHE) hosted the workshop "Optimization and Inverse Problems in Electromagnetism". After this bi-annual event, a large number of papers were assembled and combined in this book. During the workshop recent developments and applications in optimization and inverse methodologies for electromagnetic fields were discussed. The contributions selected for the present volume cover a wide spectrum of inverse and optimal electromagnetic methodologies, ranging from theoretical to practical applications.

A number of new optimal and inverse methodologies were proposed. There are contributions related to dedicated software.

Optimization and Inverse Problems in

Electromagnetism consists of three thematic chapters, covering: -General papers (survey of specific aspects of optimization and inverse problems in electromagnetism), - Methodologies, - Industrial Applications. The book can be useful to students of electrical and electronics engineering, computer science, applied mathematics (PhD level) and to researchers interested in the topic.

Numerical Methods in Electromagnetism - M. V.K. Chari 2000

Electromagnetics is the foundation of our electric technology. It

describes the fundamental principles upon which electricity is generated and used. This includes electric machines, high voltage transmission, telecommunication, radar, and recording and digital computing. Numerical Methods in Electromagnetism will serve both as an introductory text for graduate students and as a reference book for professional engineers and researchers. This book leads the uninitiated into the realm of numerical methods for solving electromagnetic field problems by examples and illustrations. Detailed descriptions of advanced techniques are also included for the benefit of working engineers and research students. Comprehensive descriptions of numerical methods In-depth introduction to

finite differences, finite elements, and integral equations Illustrations and applications of linear and nonlinear solutions for multi-dimensional analysis Numerical examples to facilitate understanding of the methods Appendices for quick reference of mathematical and numerical methods employed

Optimal Design of the Electromagnetic Devices Using Numerical Methods

- Vasile Topa 2000

Advanced Computer Techniques in Applied Electromagnetics -

Andrzej Krawczyk 2008 Includes contributions on electromagnetic fields in electrical engineering which intends at joining theory and practice. This book helps the world-wide electromagnetic community, both academic

and engineering, in understanding electromagnetism itself and its application to technical problems.

Electromagnetic Wave Propagation for Industry and Biomedical

Applications - Lulu Wang
2022-03-16

This book highlights original research and high-quality technical briefs on electromagnetic wave propagation, radiation, and scattering, and their applications in industry and biomedical engineering. It also presents recent research achievements in the theoretical, computational, and experimental aspects of electromagnetic wave propagation, radiation, and scattering. The book is divided into three sections. Section 1 consists of chapters with general mathematical methods and approaches to the

forward and inverse problems of wave propagation. Section 2 presents the problems of wave propagation in superconducting materials and porous media. Finally, Section 3 discusses various industry and biomedical applications of electromagnetic wave propagation, radiation, and scattering.

Computational Electromagnetics - Carsten Carstensen
2012-12-06

The dimmed outlines of phenomenal things all into one another unless we put on the merge focusing-glass of theory, and screw it up some times to one pitch of definition and sometimes to another, so as to see down into different depths through the great millstone of the world James Clerk Maxwell (1831 - 1879) For a long time after the foundation of the

modern theory of electromagnetism by James Clerk Maxwell in the 19th century, the mathematical approach to electromagnetic field problems was for a long time dominated by the analytical investigation of Maxwell's equations. The rapid development of computing facilities during the last century has then necessitated appropriate numerical methods and algorithmic tools for the simulation of electromagnetic phenomena. During the last few decades, a new research area "Computational Electromagnetics" has emerged comprising the mathematical analysis, design, implementation, and application of numerical schemes to simulate all kinds of relevant electromagnetic processes. This area is still rapidly evolving with a wide spectrum of challenging issues

featuring, among others, such problems as the proper choice of spatial discretizations (finite differences, finite elements, finite volumes, boundary elements), fast solvers for the discretized equations (multilevel techniques, domain decomposition methods, multipole, panel clustering), and multiscale aspects in microelectronics and micromagnetics.

Magnetic Excitations and Geometric Confinement - Gary Matthew Wysin 2015

In this book, author Gary Wysin provides an overview of model systems and their behaviour and effects, and is intended for advanced students and researchers in physics, chemistry and engineering interested in confined magnetism. It is also suitable as an auxiliary text in a class on magnetism or

solid state physics. Previous physics knowledge is expected, along with some basic knowledge of classical electromagnetism and electromagnetic waves for the latter chapters.

Characterisation of Soft Magnetic Materials Under Rotational Magnetisation

- Stanislaw Zurek
2017-11-22

The book presents practical aspects related to the measurement of rotational power loss in soft magnetic materials. The book furthermore focuses on practical aspects of performing such measurements, the associated difficulties as well as solutions to the most common problems. Numerous practical aspects, hands-on experience, and most commonly encountered pitfalls are heavily discussed in the book. The text begins with introduction to

magnetism, then follows with definitions of measurement methods of rotational power loss from physical viewpoint. Two chapters describe and detail the various sensors which can be employed for such measurements as well as all the aspects of designing, making, and using a magnetising apparatus. A synthesis of the likely optimal design of a magnetising apparatus is also given, preceded with the full reasoning based on all the research carried out to date.

Characterisation of Soft Magnetic Materials Under Rotational Magnetisation serves as an excellent starting point for any student having to perform magnetic measurements under rotational magnetisation, but also under 1D, 2D or 3D excitation. Because the methods, sensors, and

apparatus are extensively discussed it will also be a great reference for more senior researchers and experts in the field.

There is a whole chapter devoted to analysis of measurement uncertainty. This subject is rarely published for magnetic measurements, which makes it more difficult for all researchers to understand the concepts and methodology used in uncertainty estimation. This chapter not only introduces the whole subject, but also provides multiple step-by-step examples which can be easily followed, from very simple cases to much more complex ones. All equations are presented with full SI units which greatly helps in practical application of the presented methodology. Each chapter is written in such a way that it can be studied on its

own, so that the reader can focus only on the specific aspects, as required.

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Antennas and Wave Propagation - Pedro Pinho 2018-09-26
Antennas and radio propagation are continuously and rapidly evolving and new challenges arise every day. As a result of these rapid changes the need for up-to-date texts that address this growing field from an interdisciplinary perspective persists. This book, organized into nine chapters, presents new antenna designs and materials that will be used in the future, due to the trend for higher frequencies, as well as a bird's eye view of some aspects related to radio propagation channel modeling. The book covers the theory but

also the practical aspects of technology implementation in a way that is suitable for

undergraduate and graduate-level students, as well as researchers and professional engineers.