Electromagnetic Theory And Computation A Topological Approach Mathematical Sciences Research Institute Publications

The Elements of Nonlinear Optics
Complex Computing-Networks
Variational Formulations, Complementarity, Edge Elements
New Trends in Computational Electromagnetics
Mathematical and Computational Methods in Photonics and Phononics
Monte Carlo Methods for Electromagnetics
Low-Frequency Electromagnetic Modeling for Electrical and Biological Systems Using MATLAB
A Topological Approach
Electromagnetic Waves in Stratified Media

Quantum Computation and Quantum Information
Computational Methods in Geophysical Electromagnetics
Theory of Electromagnetic Wave Propagation
Computational Electrodynamics
Higher Order FDTD Schemes for Waveguide and Antenna Structures
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Electromagnetics for Electrical Machines
Theory and Computation of Electromagnetic Fields
Electromagnetic Theory and Applications for Photonic Crystals
Electromagnetic Theory
Electromagnetic Field Theory Fundamentals
A Gauge Approach with Applications in Microelectronics
Computer Field Models of Electromagnetic Devices
A Topological Approach

Theory and Computation of Electromagnetic Fields in Layered Media
Brain-like and Wave-oriented Electrodynamic Algorithms
Electromagnetic Theory and Computation
Theory and Computation of Electromagnetic Fields
Computational Electromagnetism
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Electromagnetism for Signal Processing, Spectroscopy and Contemporary Computing
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Theory of Electromagnetic Well Logging
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GROSS JOSHUA

The Elements of Nonlinear Optics

Courier Corporation

Reviews the fundamental concepts behind the theory and computation of electromagnetic fields The book is divided in two parts. The first part covers both fundamental theories (such as vector analysis, Maxwell’s equations, boundary condition, and transmission line theory) and advanced topics (such as wave transformation, addition

theorems, and fields in layered media) in order to benefit students at all levels. The second part of the book covers the major computational methods for numerical analysis of electromagnetic fields for engineering applications. These methods include the three fundamental approaches for numerical analysis of electromagnetic fields: the finite difference method (the finite difference time-domain method in particular), the finite element method, and the integral equation-based moment method. The second part also examines fast algorithms for solving integral equations and hybrid techniques that combine different numerical methods to seek more efficient solutions of complicated electromagnetic problems. Theory and Computation of Electromagnetic Fields, Second Edition: Provides the foundation necessary for graduate students to learn and understand more advanced topics Discusses electromagnetic analysis in rectangular, cylindrical and spherical coordinates Covers computational electromagnetics in both frequency and time domains Includes new and updated homework problems and examples Theory and Computation of Electromagnetic Fields, Second Edition is written for advanced undergraduate and graduate level electrical engineering students. This book can also be used as a reference for professional engineers interested in learning

about analysis and computation skills.
Complex Computing-Networks John Wiley & Sons
This book contains the ceremonials and the proceedings pertaining to the Int- national Symposium CCN2005 on "Complex Computing-Networks: A Link between Brain-like and Wave-Oriented Electrodynamics Algorithms," convened at Do ?u ? University of Istanbul, Turkey, on 13–14 June 2005, in connection with the bestowal of the honorary doctorate degrees on Professors Leopold B. Felsen and Leon O. Chua, for their extraordinary achievements in electromagnetics, and n-linear systems, respectively. The symposium was co-organized by Cem Göknar and Levent Sevgi, in consultation with Leopold B. Felsen and Leon O. Chua. Istanbul is a city with wonderful natural and historical surroundings, a city not only interconnecting Asia and Europe but also Eastern and Western cultures. Therefore, CCN2005 was a memorable event not only in the lifetime of Drs. Felsen, Chua, and their families, but also for all the other participants who were there to congratulate the recipients and participate in the symposium.
Variational Formulations, Complementarity, Edge Elements SciTech Publishing
This monograph provides a framework for students and practitioners who are working on the solution of electromagnetic imaging

in geophysics. Bridging the gap between theory and practical applied material (for example, inverse and forward problems), it provides a simple explanation of finite volume discretization, basic concepts in solving inverse problems through optimization, a summary of applied electromagnetics methods, and MATLAB?÷code for efficient computation.

New Trends in Computational Electromagnetics Cambridge University Press

Computer Field Models of Electromagnetic Devices, volume 34 in the book series Studies in Applied Electromagnetics and Mechanics is devoted to modeling and simulation, control systems, testing, measurements, monitoring, diagnostics and advanced software

Mathematical and Computational Methods in Photonics and Phononics John Wiley & Sons

This book presents an in-depth treatment of various mathematical aspects of electromagnetism and Maxwell's equations: from modeling issues to well-posedness results and the coupled models of plasma physics (Vlasov-Maxwell and Vlasov-Poisson systems) and magnetohydrodynamics (MHD). These equations and boundary conditions are discussed, including a brief review of absorbing boundary conditions. The focus then moves to well-posedness results. The relevant function spaces are introduced, with an

emphasis on boundary and topological conditions. General variational frameworks are defined for static and quasi-static problems, time-harmonic problems (including fixed frequency or Helmholtz-like problems and unknown frequency or eigenvalue problems), and time-dependent problems, with or without constraints. They are then applied to prove the well-posedness of Maxwell's equations and their simplified models, in the various settings described above. The book is completed with a discussion of dimensionally reduced models in prismatic and axisymmetric geometries, and a survey of existence and uniqueness results for the Vlasov-Poisson, Vlasov-Maxwell and MHD equations. The book addresses mainly researchers in applied mathematics who work on Maxwell's equations. However, it can be used for master or doctorate-level courses on mathematical electromagnetism as it requires only a bachelor-level knowledge of analysis.

Monte Carlo Methods for Electromagnetics John Wiley & Sons

Covering the development of field computation in the past forty years, this book is a concise, comprehensive and up-to-date introduction to methods for the analysis and synthesis of electric and magnetic fields. A broad view of the subject of field models in electricity and magnetism, ranging from basic theory to numerical applications, is offered.

The approach throughout is to solve field problems directly from partial differential equations in terms of vector quantities. Low-Frequency Electromagnetic Modeling for Electrical and Biological Systems Using MATLAB Morgan & Claypool Publishers First-ever comprehensive introduction to the major new subject of quantum computing and quantum information. A Topological Approach Electromagnetic Theory and ComputationA Topological Approach

In this monograph, the authors propose a systematic and rigorous treatment of electromagnetic field representations in complex structures. The architecture suggested in this book accommodates use of different numerical methods as well as alternative Green's function representations in each of the subdomains resulting from a partitioning of the overall problem. The subdomains are regions of space where electromagnetic energy is stored and are

described in terms of equivalent circuit representations based either on lumped element circuits or on transmission lines. Connection networks connect the subcircuits representing the subdomains. The connection networks are lossless, don't store energy and represent the overall problem topology. This is similar to what is done in circuit theory and permits a phrasing of the solution of EM field problems in complex structures by Network-oriented methods.

Electromagnetic Waves in Stratified Media IEEE Press Series on Electromagnetic Wave Theory

Computational electrodynamics is a vast research field with a wide variety of tools. In physics, the principle of gauge invariance plays a pivotal role as a guide towards a sensible formulation of the laws of nature as well as for computing the properties of elementary particles using the lattice formulation of gauge theories. However, the gauge principle has played a much less pronounced role in performing computation in classical electrodynamics. In this work, the author demonstrates that starting from the gauge formulation of electrodynamics using the electromagnetic potentials leads to computational tools that can very well compete with the conventional electromagnetic field-based tools. Once accepting the formulation based on gauge fields, the computational code is very transparent due to the mimetic mapping of the electrodynamic variables on the computational grid. Although the illustrations and applications originate from microelectronic engineering, the method has a much larger range of applicability. Therefore this book will be useful to everyone having interest in computational electrodynamics. The volume is organized as follows: In part 1, a detailed introduction and overview is presented of

the Maxwell equations as well as the derivation of the current and charge densities in different materials. Semiconductors are responding to electromagnetic fields in a non-linear way, and the induced complications are discussed in detail. Part 2, using the gauge potentials, presents the transition of electrodynamics theory to a formulation that can serve as the gateway to computational code. In part 3, a collection of microelectronic device designs demonstrate the feasibility and success of the methods in Part 2. Part 4 focuses on a set of topical themes that brings the reader to the frontier of research in building the simulation tools, using the gauge principle in computational electrodynamics. Technical topics discussed in the book include: - Electromagnetic Field Equations - Constitutive Relations - Discretization and Numerical Analysis - Finite Element and Finite Volume Methods - Design of Integrated Passive Components

Quantum Computation and Quantum Information
Elsevier

This classic 1968 edition of Field Computation by Moment Methods is the first book to explore the computation of electromagnetic fields by the method of moments--the most popular method for the numerical solution of electromagnetic field problems. It presents a unified approach to moment methods by employing the concepts of linear spaces and functional analysis.

Written especially for those who have a minimal amount of experience in electromagnetic theory, theoretical and mathematical are illustrated by examples that prepare all readers with the skills they need to apply the method of moments to new, engineering-related problems. *Computational Methods in Geophysical Electromagnetics* Springer Science & Business Media Electromagnetics for Electrical Machines offers a comprehensive yet accessible treatment of the linear theory of electromagnetics and its application to the design of electrical machines. Leveraging valuable classroom insight gained by the authors during their impressive and ongoing teaching careers, this text emphasizes concepts rather than numerical methods, providing presentation/project problems at the end of each chapter to enhance subject knowledge. Highlighting the essence of electromagnetic field (EMF) theory and its correlation with electrical machines, this book: Reviews Maxwell's equations and scalar and vector potentials Describes the special cases leading to the Laplace, Poisson's, eddy current, and wave equations Explores the utility of the uniqueness, generalized Poynting, Helmholtz, and approximation theorems Discusses the Schwarz–Christoffel transformation, as well as the determination of airgap permeance

Addresses the skin effects in circular conductors and eddy currents in solid and laminated iron cores Contains examples relating to the slot leakage inductance of rotating electrical machines, transformer leakage inductance, and theory of hysteresis machines Presents analyses of EMFs in laminated-rotor induction machines, three-dimensional field analyses for three-phase solid rotor induction machines, and more Electromagnetics for Electrical Machines makes an ideal text for postgraduate-level students of electrical engineering, as well as of physics and electronics and communication engineering. It is also a useful reference for research scholars concerned with problems involving electromagnetics.

Theory of Electromagnetic Wave Propagation CRC Press

Photonic technology promises much faster computing, massive parallel processing, and an evolutionary step in the digital age. The search continues for devices that will enable this paradigm, and these devices will be based on photonic crystals. Modeling is a key process in developing crystals with the desired characteristics and performance, and Electromagnetic Theory and Applications for Photonic Crystals provides the electromagnetic-theoretical models that can be effectively applied to modeling photonic crystals and related optical devices. The book

supplies eight self-contained chapters that detail various analytical, numerical, and computational approaches to the modeling of scattering and guiding problems. For each model, the chapter begins with a brief introduction, detailed formulations of periodic structures and photonic crystals, and practical applications to photonic crystal devices. Expert contributors discuss the scattering matrix method, multipole theory of scattering and propagation, model of layered periodic arrays for photonic crystals, the multiple multipole program, the mode-matching method for periodic metallic structures, the method of lines, the finite-difference frequency-domain technique, and the finite-difference time-domain technique. Based on original research and application efforts, Electromagnetic Theory and Applications for Photonic Crystals supplies a broad array of practical tools for analyzing and designing devices that will form the basis for a new age in computing.

Computational Electrodynamics CRC Press

This book is a self-contained account of the most important principles of nonlinear optics. Assuming a familiarity with basic mathematics, the fundamentals of nonlinear optics are developed from the basic concepts, introducing and explaining the essential quantum mechanical apparatus as it arises. Later chapters deal with

the materials used and the constructions that are necessary to induce the effects.

Higher Order FDTD Schemes for Waveguide and Antenna Structures

Wiley-IEEE Press

Reviews the fundamental concepts behind the theory and computation of electromagnetic fields The book is divided in two parts. The first part covers both fundamental theories (such as vector analysis, Maxwell's equations, boundary condition, and transmission line theory) and advanced topics (such as wave transformation, addition theorems, and fields in layered media) in order to benefit students at all levels. The second part of the book covers the major computational methods for numerical analysis of electromagnetic fields for engineering applications. These methods include the three fundamental approaches for numerical analysis of electromagnetic fields: the finite difference method (the finite difference time-domain method in particular), the finite element method, and the integral equation-based moment method. The second part also examines fast algorithms for solving integral equations and hybrid techniques that combine different numerical methods to seek more efficient solutions of complicated electromagnetic problems. Theory and Computation of Electromagnetic Fields, Second Edition: Provides the foundation necessary for graduate students to learn and understand

more advanced topics Discusses electromagnetic analysis in rectangular, cylindrical and spherical coordinates Covers computational electromagnetics in both frequency and time domains Includes new and updated homework problems and examples Theory and Computation of Electromagnetic Fields, Second Edition is written for advanced undergraduate and graduate level electrical engineering students. This book can also be used as a reference for professional engineers interested in learning about analysis and computation skills.

Field Models in Electricity and Magnetism Academic Press

Describes most popular computational methods used to solve problems in electromagnetics Matlab code is included throughout, so that the reader can implement the various techniques discussed Exercises included

Field Computation by Moment Methods Cambridge University Press

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.

Plasma Scattering of Electromagnetic Radiation John Wiley & Sons

The Multilevel Fast Multipole Algorithm (MLFMA) for Solving Large-Scale Computational Electromagnetic Problems provides a detailed and instructional overview of implementing MLFMA. The book: Presents a comprehensive treatment of the MLFMA algorithm, including basic linear algebra concepts, recent developments on the parallel computation, and a number of application examples Covers solutions of electromagnetic problems involving dielectric objects and perfectly-conducting objects Discusses applications including scattering from airborne targets, scattering from red blood cells, radiation from antennas and arrays, metamaterials etc. Is written by authors who have more than 25 years experience on the development and implementation of MLFMA The book will be useful for post-graduate students, researchers, and academics, studying in the areas of computational electromagnetics, numerical analysis, and computer science, and who would like to implement and develop rigorous simulation

environments based on MLFMA.

The Multilevel Fast Multipole Algorithm (MLFMA) for Solving Large-Scale Computational Electromagnetics Problems Cambridge University Press

International Series of Monographs in Electromagnetic Waves, Volume 3: Electromagnetic Waves in Stratified Media provides information pertinent to the electromagnetic waves in media whose properties differ in one particular direction. This book discusses the important feature of the waves that enables communications at global distances. Organized into 13 chapters, this volume begins with an overview of the general analysis for the electromagnetic response of a plane stratified medium comprising of any number of parallel homogeneous layers. This text then explains the reflection of electromagnetic waves from planar stratified media. Other chapters consider the oblique reflection of plane electromagnetic waves from a continuously stratified medium. This book discusses as well the fundamental theory of wave propagation around a sphere. The final chapter deals with the theory of propagation in a spherically stratified medium. This book is a valuable resource for electrical engineers, scientists, and research workers.

Electromagnetic Field Computation by Network Methods Stylus Publishing, LLC

Recently, several applications, primarily driven by microtechnology, have emerged where the use of materials with tailored electromagnetic (dielectric) properties are necessary for a successful overall design. The ``tailored'' aggregate properties are achieved by combining an easily moldable base matrix with particles having dielectric properties that are chosen to deliver (desired) effective properties. In many cases, the analysis of such materials requires the simulation of the macroscopic and microscopic electromagnetic response, as well as its resulting coupled thermal response, which can be important to determine possible failures in ``hot spots.'' This necessitates a stress analysis. Furthermore, because, oftentimes, such processes initiate degratory chemical processes, it can be necessary to also include models for these processes as well. A central objective of this work is to provide basic models and numerical solution strategies to analyze the coupled response of such materials by direct simulation using standard laptop/desktop equipment. Accordingly, this monograph covers: (1) The foundations of Maxwell's equations, (2) Basic homogenization theory, (3) Coupled systems (electromagnetic, thermal, mechanical and chemical), (4) Numerical methods and (5) An introduction to select biological problems. The

text can be viewed as a research monograph suitable for use in an upper-division undergraduate or first year graduate course geared towards students in the applied sciences, mechanics and mathematics that have an interest in the analysis of particulate materials.

Electromagnetic Waves, Materials, and Computation with MATLAB Elsevier

The authors present a broad overview of the recent efforts in computational electromagnetics to develop and implement more robust, accurate and efficient algorithms. With the recent improvement in available computing power, this is a timely overview of a rapidly developing subject.

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