Electromagnetic Waves Materials And Computation With Matlab

Advanced Computational Electromagnetic Methods
Wave Propagation
Proceedings of the International Conference on Paradigms of Computing, Communication and Data Sciences
Electromagnetic and Optical Pulse Propagation 2
The Wave Concept in Electromagnetism and Circuits
Computational Electromagnetics
Wave Propagation in Materials for Modern Applications
Theory of Electromagnetic Waves Propagating in Nonlinear Anisotropic Optical Materials
Modeling and Computations in Electromagnetics
Basic Electromagnetism and Materials
Computational Methods for Electromagnetic and Optical Systems, Second Edition
Wave Propagation, Scattering And Emission In Complex Media
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Metamaterial Electromagnetic Wave Absorbers
Field Computation by Moment Methods
Electromagnetic and Optical Pulse Propagation
Advanced Electromagnetic Computation
Behaviour of Electromagnetic Waves in Different Media and Structures
Supercomputing
Computing Science, Communication and Security
Electromagnetic Waves, Materials, and Computation with MATLAB
Mechanics of Electromagnetic Materials and Structures
Applications and Metrology at Nanometer Scale 1
Applied Electromagnetism and Materials
Electromagnetics and Calculation of Fields
Electromagnetic Waves, Materials, and Computation with MATLAB®, Second Edition, Two Volume Set
Electromagnetic Mixing Formulas and Applications
Principles of Electromagnetic Waves and Materials

POLLARD BRAYLON

Advanced Computational Electromagnetic Methods CRC Press
This book presents practical and relevant technological information about electromagnetic properties of materials and their applications. It is aimed at senior undergraduate and graduate students in materials science and is the product of many years of teaching basic and applied electromagnetism. Topics range from the spectroscopy and characterization of dielectrics, to non-linear effects, to ion-beam applications in materials.

Wave Propagation Cuvillier Verlag
In the recent decades, there has been a growing interest in micro- and nanotechnology. The advances in nanotechnology give rise to new applications and new types of materials with unique electromagnetic and mechanical properties. This book is devoted to the modern methods in electrodynamics and acoustics, which have been developed to describe wave propagation in these modern materials and nanodevices. The book consists of original works of leading scientists in the field of wave propagation who produced new theoretical and experimental methods in the research field and obtained new and important results. The first part of the book consists of chapters with general mathematical methods and approaches to the problem of wave propagation. A special attention is attracted to the advanced numerical methods fruitfully applied in the field of wave propagation. The second part of the book is devoted to the problems of wave propagation in newly developed metamaterials, micro- and nanostructures and porous media. In this part the interested reader will find important and fundamental results on electromagnetic wave propagation in media with negative refraction index and electromagnetic imaging in devices based on the materials. The third part of the book is devoted to the problems of wave propagation in elastic and piezoelectric media. In the fourth part, the works on the

problems of wave propagation in plasma are collected. The fifth, sixth and seventh parts are devoted to the problems of wave propagation in media with chemical reactions, in nonlinear and disperse media, respectively. And finally, in the eighth part of the book some experimental methods in wave propagations are considered. It is necessary to emphasize that this book is not a textbook. It is important that the results combined in it are taken “from the desks of researchers“. Therefore, I am sure that in this book the interested and actively working readers (scientists, engineers and students) will find many interesting results and new ideas.

Proceedings of the International Conference on Paradigms of Computing, Communication and Data Sciences Springer Science & Business Media

The present text is intended as an introduction to electromagnetics and computation of electromagnetic fields. While many texts on electromagnetics exist, the subject of computation of electromagnetic fields is nonnally not treated or is treated in a number of idealized examples, with the main emphasis on development of theoretical relations. "Why another book on Electromagnetics?" This is perhaps the first question the reader may ask when opening this book. It is a valid question, because among the many books on Electromagnetics some are excellent. We have two answers to this question, answers that have motivated the writing of this book. The first concerns the method of presentation of Electromagnetism. Generally, in classical books the material is presented in the following sequence: electrostatics, magnetostatics, magnetodynamics, and wave propagation, using integral fonns of the field equations. As a primary effect of this presentation, the reader is led to think that the knowledge of this science is synonymous to memorizing dozens offonnulas. Additionally, an impression that there is no finn connection between these equations lingers in the reader's mind since at each step new postulates are added, seemingly unrelated to previous material. Our opinion is, and we shall try to convey this to the reader, that the Electromagnetic formalism is extremely simple and based on very few equations. They are the four "Maxwell equations" which include practically all the existent relationships between the electromagnetic quantities. The only additional relationships that need be considered is the Lorentz force and the material constitutive relations.

Electromagnetic and Optical Pulse Propagation 2 CRC Press

"This two-volume set consists of "Principles of Electromagnetic Waves and Materials, Second Edition" and "Advanced Electromagnetic Computation, Second Edition". Volume I takes an integrative approach to the subject of electromagnetics by supplementing quintessential "old school" information and methods with MATLAB® software. Volume II consists of advanced electromagnetic computation which focuses on Algorithms of Finite Differences, Moment Method, Finite Element method and Finite Difference Time Domain method. Hand-computed simple examples and MATLAB-coded simple examples with only a few elements are used to explain the concepts behind the algorithms. Four new chapters are included. "--Provided by publisher.

The Wave Concept in Electromagnetism and Circuits IET

Principles of Electromagnetic Waves and Materials is a condensed version of the author’s previously published textbook, Electromagnetic Waves, Materials, and Computation with MATLAB®. This book focuses on lower-level courses, primarily senior undergraduate and graduate students in electromagnetic waves and materials courses. It takes an integrative approach to the subject of electromagnetics by supplementing quintessential "old-school" information and methods with the appropriate amount of material on plasmas for exposing the students to the broad area of Plasmonics and by striking a balance between theoretical and practical aspects. Ancillary materials are available upon qualifying course adoption.

Computational Electromagnetics Artech House

The current rapid and complex advancement applications of electromagnetic (EM) and optical systems calls for a much needed update on the computational methods currently in use. Completely revised and reflecting ten years of develoments, this second edition of the bestselling Computational Methods for Electromagnetic and Optical Systems provides the update so desperately needed in this field. Offering a wealth of new material, this second edition begins with scalar wave propagation and analysis techniques, chiral and metamaterials, and photonic band gap structures. It examines Pontying vector and stored energy, as well as energy, group, and phase velocities; reviews k-space state variable formation with applications to anistropic planar systems; and presents full-field rigorous coupled wave analysis of planar diffraction gratings with applications to H-mode, E-mode, crossed gratings, single and multilayered diffraction grating analysis, and diffraction from anistropic gratings. Later chapters highlight spectral techniques and RCWA as applied to the analysis of dynamic wave-mixing in PR materials with induced transmission and reflection gratings and demonstrate the RCWA algorithm to analyze cylindrical and spherical systems using circular, bipolar cylindrical, and spherical coordinates. The book concludes with several RCWA computational case studies involving scattering from spatially inhomogeneous eccentric circular cylinders, solved in bipolar coordinates. Many of these examples apply the complex Poynting theorem or the forwardscattering (optical) theorem to validate numerical solutions by verifying power conservation. Using common computational tools such as Fortran, MATLAB, COMSOL, and RSOFT, the text offers numerous examples to illuminate the material, many of which employ a full-field vector approach to analyze and solve Maxwell’s equations in anisotropic media where a standard wave equation approach is intractable. Designed to introduce novel spectral computational techniques, the book demonstrates the application of these methods to analyze a variety of EM and optical systems.

Wave Propagation in Materials for Modern Applications CRC Press

Advanced Electromagnetic Computation with MATLAB® discusses commercial electromagnetic software, widely used in the industry. Algorithms of Finite Differences, Moment method, Finite Element method and Finite Difference Time Domain method are illustrated. Hand-computed simple examples and MATLAB-coded examples are used to explain the concepts behind the algorithms. Case studies of practical examples from transmission lines, waveguides, and electrostatic problems are given so students are able to develop the code and solve the problems. Two new chapters including advanced methods based on perturbation techniques and three dimensional finite element examples from radiation scattering are included.

Theory of Electromagnetic Waves Propagating in Nonlinear Anisotropic Optical Materials BoD – Books on Demand

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.

Modeling and Computations in Electromagnetics World Scientific

Contemporary High Performance Computing: From Petascale

toward Exascale focuses on the ecosystems surrounding the world's leading centers for high performance computing (HPC). It covers many of the important factors involved in each ecosystem: computer architectures, software, applications, facilities, and sponsors. The first part of the book examines significant trends in HPC systems, including computer architectures, applications, performance, and software. It discusses the growth from terascale to petascale computing and the influence of the TOP500 and Green500 lists. The second part of the book provides a comprehensive overview of 18 HPC ecosystems from around the world. Each chapter in this section describes programmatic motivation for HPC and their important applications; a flagship HPC system overview covering computer architecture, system software, programming systems, storage, visualization, and analytics support; and an overview of their data center/facility. The last part of the book addresses the role of clouds and grids in HPC, including chapters on the Magellan, FutureGrid, and LLGrid projects. With contributions from top researchers directly involved in designing, deploying, and using these supercomputing systems, this book captures a global picture of the state of the art in HPC.

Basic Electromagnetism and Materials John Wiley & Sons

This book gathers selected high-quality research papers presented at International Conference on Paradigms of Communication, Computing and Data Sciences (PCCDS 2022), held at Malaviya National Institute of Technology Jaipur, India, during 05 – 07 July 2022. It discusses high-quality and cutting-edge research in the areas of advanced computing, communications and data science techniques. The book is a collection of latest research articles in computation algorithm, communication and data sciences, intertwined with each other for efficiency.

Computational Methods for Electromagnetic and Optical Systems, Second Edition John Wiley & Sons

Conformal components are used nowadays at higher rate than ever before. They can be found in curved mobile phones, communication, navigation, and imaging systems in land, water, air, and space vehicles. The integration of those components within the external structure became of significant importance for aerodynamic, electromagnetic, aesthetic, or physical reasons. As a result, many mathematical models were previously developed to analyze and optimize such conformed devices. In this thesis, we contributed to this field by developing various models for full wave analysis of spheroidal components. As a starting point, mathematical formulas for conforming antennas on oblate and prolate spheroids were obtained. Those conformation methods were validated by conforming many antennas on spheroidal surfaces. They were then used to formulate Method of Moments equations with spheroidally curved current functions for analyzing wire antennas of random shape conformed to spheroids in the frequency domain. The complete model was applied to a conformal Archimedean spiral antenna on an oblate spheroid and showed that the conformed spiral has similar current distribution as its planar counterpart but produces an unsymmetrical radiation pattern. The obtained model was then extended to spheroidal multi-layer structures by integrating the spheroidal dyadic Green's Function within its mathematical derivation. However, due to a detected divergence in that function, the model couldn't be implemented. On the side of time based analysis methods, a Finite Difference Time Domain method was developed for closed oblate and prolate spheroidal structures. Alternative formulas for the structure's singularities and the condition of numerical stability were derived as well. The obtained model was then validated and used to characterize spheroidal cavities in the time and frequency domains. The method was extended later to unbounded spheroidal domain by deriving the Absorbing Boundary Conditions using the One Way Wave method. The whole model was then applied to characterize a patch antenna conformed to a prolate spheroid. Finally, an analytical solution for the transient fields in spherical multilayer media energized by spherical harmonics source and an algorithm for tracing back the path of all the reflected waves were obtained. The model was applied to different multilayer structures where the transient response was obtained and validated against a numerical solution.

Wave Propagation, Scattering And Emission In Complex Media CRC Press

This textbook offers the first unified treatment of wave propagation in electronic and electromagnetic systems and introduces readers to the essentials of the transfer matrix method, a powerful analytical tool that can be used to model and study an array of problems pertaining to wave propagation in electrons and photons. It is aimed at graduate and advanced undergraduate students in physics, materials science, electrical and computer engineering, and mathematics, and is ideal for researchers in photonic crystals, negative index materials, left-handed materials, plasmonics, nonlinear effects, and optics. Peter Markos and Costas Soukoulis begin by establishing the analogy between wave propagation in electronic systems and electromagnetic media and then show how the transfer matrix can be easily applied to any type of wave propagation, such as electromagnetic, acoustic, and elastic waves. The transfer matrix approach of the tight-binding model allows readers to understand its implementation quickly and all the concepts of solid-state physics are clearly introduced. Markos and Soukoulis then build the discussion of such topics as random systems and localized and delocalized modes around the transfer matrix, bringing remarkable clarity to the subject. Total internal reflection, Brewster angles, evanescent waves, surface waves, and resonant tunneling in left-handed materials are introduced and treated in detail, as are important new developments like photonic crystals, negative index materials, and surface plasmons. Problem sets aid students working through the subject for the first time.

Sol Man - Electromagnetic Waves Materials and Computation with Matlab® CRC Press

"An IEEE reprinting of this classic 1968 edition, FIELD COMPUTATION BY MOMENT METHODS is the first book to explore the computation of electromagnetic fields by the most popular method for the numerical solution to 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, this book illustrates theoretical and mathematical concepts to prepare all readers with the skills they need to apply the method of moments to new, engineering-related problems. Written especially for those who have a minimal amount of experience in electromagnetic theory, theoretical and mathematical concepts are illustrated by examples that prepare all readers with the skills they need to apply the method of moments to new, engineering-related problems."

Principles of Electromagnetic Waves and Materials CRC Press

This IMA Volume in Mathematics and its Applications COMPUTATIONAL WAVE PROPAGATION is based on the workshop with the same title and was an integral part of the 1994-1995 IMA program on "Waves and Scattering." We would like to thank Bjorn Engquist and Gregory A. Kriegsmann for their hard work in organizing this meeting and in editing the proceedings. We also take this opportunity to thank the National Science Foundation, the Army Research Office, and the Office of Naval Research,

whose financial support made this workshop possible. A vner Friedman Robert Gulliver v PREFACE Although the field of wave propagation and scattering has its classical roots in the last century, it has enjoyed a rich and vibrant life over the past 50 odd years. Scientists, engineers, and mathematicians have devel oped sophisticated asymptotic and numerical tools to solve problems of ever increasing complexity. Their work has been spurred on by emerging and maturing technologies, primarily concerned with the propagation and reception of information, and the efficient transmission of energy. The vitality of this scientific field is not waning. Increased demands to precisely quantify, measure, and control the propagation and scattering of waves in increasingly complex settings pose challenging scientific and mathematical problems. These push the envelope of analysis and comput ing, just as their forerunners did 50 years ago. These modern technological problems range from using underwater sound to monitor and predict global warming, to periodically embedding phase-sensitive amplifiers in optical fibers to insure long range digital communication.

Computational Electromagnetics—Retrospective and Outlook BoD – Books on Demand

This volume presents a detailed, rigorous treatment of the fundamental theory of electromagnetic pulse propagation in causally dispersive media that is applicable to dielectric, conducting, and semiconducting media. Asymptotic methods of approximation based upon saddle point methods are presented in detail.

Principles of Electromagnetic Waves and Materials Springer

This is nothing less than an essential text in what is a new and growing discipline. Electromagnetic modeling and computations is expanding as a result of the steadily increasing demand for designing electrical devices, modeling electromagnetic materials, and simulating electromagnetic fields in nanoscale structures. The aim of this volume is to bring together prominent worldwide experts to review state-of-the-art developments and future trends of modeling and computations in electromagnetics.

Mathematical Models and Numerical Methods for Full Wave Analysis of Prolate and Oblate Spheroidal Conformal Microwave Components Princeton University Press

This new resource covers the latest developments in computational electromagnetic methods, with emphasis on cutting-edge applications. This book is designed to extend existing literature to the latest development in computational electromagnetic methods, which are of interest to readers in both academic and industrial areas. The topics include advanced techniques in MoM, FEM and FDTD, spectral domain method, GPU and Phi hardware acceleration, metamaterials, frequency and time domain integral equations, and statistics methods in bio-electromagnetics.

Principles of Electromagnetic Waves and Materials Springer Science & Business Media

Principles of Electromagnetic Waves and Materials is a condensed version of the author's previously published textbook, Electromagnetic Waves, Materials, and Computation with MATLAB(R). This book focuses on lower-level courses, primarily senior undergraduate and graduate students in electromagnetic waves and materials courses. It takes an integrative approach to the subject of electromagnetics by supplementing quintessential "old-school" information and methods with the appropriate amount of material on plasmas for exposing the students to the broad area of Plasmonics and by striking a balance between theoretical and practical aspects.

The World of Applied Electromagnetics Createspace Independent Publishing Platform

This comprehensive volume thoroughly covers wave propagation behaviors and computational techniques for electromagnetic waves in different complex media. The chapter authors describe powerful and sophisticated analytic and numerical methods to solve their specific electromagnetic problems for complex media and geometries as well. This book will be of interest to electromagnetics and microwave engineers, physicists and scientists.

Contemporary High Performance Computing Springer

This book commemorates four decades of research by Professor Magdy F. Iskander (Life Fellow IEEE) on materials and devices for the radiation, propagation, scattering, and applications of electromagnetic waves, chiefly in the MHz-THz frequency range as well on electromagnetics education. This synopsis of applied electromagnetics, stemming from the life and times of just one person, is meant to inspire junior researchers and reinvigorate mid-level researchers in the electromagnetics community. The authors of this book are internationally known researchers, including 14 IEEE fellows, who highlight interesting research and new directions in theoretical, experimental, and applied electromagnetics.