Electromagnetic Waves Materials And Computation With Matlab

Theory of Waveguides and Transmission Lines
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Principles of Electromagnetic Waves and Materials
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Principles of Electromagnetic Waves and Materials

MCCARTHY MAYRA

Theory of Waveguides and Transmission Lines John Wiley & Sons
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.
Field Computation by Moment Methods 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 ®. 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 Electromagnetic-Aerodynamics CRC Press
Readily available commercial software enables engineers and students to perform routine calculations and design without necessarily having a sufficient conceptual understanding of the anticipated solution. The software is so user-friendly that it usually produces a beautiful colored visualization of that solution, often camouflaging the fact that t
Theory and Computation of Electromagnetic Fields 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.
Principles of Electromagnetic Waves and Materials CRC Press
Electromagnetic Boundary Problems introduces the formulation and solution of Maxwell's equations describing electromagnetism. Based on a one-semester graduate-level course taught by the authors, the text covers material parameters, equivalence principles, field and source (stream) potentials, and uniqueness, as well as:Provides analytical solutions
Advanced Electromagnetic Computation Createspace Independent Publishing Platform
This book focuses primarily on senior undergraduates and graduates in Electromagnetics Waves and Materials courses. The book takes an integrative approach to the subject of electromagnetics by supplementing quintessential "old school" information and methods with instruction in the use of new commercial software such as MATLAB. Homework problems, PowerPoint slides, an instructor’s manual, a solutions manual, MATLAB downloads, quizzes, and suggested examination problems are included. Revised throughout, this new edition includes two key new chapters on artificial electromagnetic materials and electromagnetics of moving media.
Electromagnetic Waves Springer
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.
Numerical Calculations for Reflection of Electromagnetic Waves from a Lossy Magnetoplasma 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.
Engineering Electromagnetics CRC Press
This fourth edition of the text reflects the continuing increase in awareness and use of computational electromagnetics and incorporates advances and refinements made in recent years. Most notable among these are the improvements made to the standard algorithm for the finite-difference time-domain (FDTD) method and treatment of absorbing boundary conditions in FDTD, finite element, and transmission-line-matrix methods. It teaches the readers how to pose, numerically analyze, and solve EM problems, to give them the ability to expand their problem-solving skills using a variety of methods, and to prepare them for research in electromagnetism. Includes new homework problems in each chapter. Each chapter is updated with the current trends in CEM. Adds a new appendix on CEM codes, which covers commercial and free codes. Provides updated MATLAB code.
Basic Electromagnetism and Materials CRC Press
This book covers the principles of operation of electromagnetic waveguides and transmission lines. The approach is divided between mathematical descriptions of basic behaviors and

treatment of specific types of waveguide structures. Classical (distributed-network) transmission lines, their basic properties, their connection to lumped-element networks, and the distortion of pulses are discussed followed by a full field analysis of waveguide modes. Modes of specific kinds of waveguides - traditional hollow metallic waveguides, dielectric (including optical) waveguides, etc. are discussed. Problems of excitation and scattering of waveguide modes are addressed, followed by discussion of real systems and performance.

Field Computation by Moment Methods CRC Press

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.

Computational Electromagnetics with MATLAB, Fourth Edition CRC Press

Method of multiple scales is used to calculate the electromagnetic fields for first and second harmonics, in first two orders of small parameter expansion, which satisfy the nonlinear coupled wave equations in a chi(2) medium. The results contain no secular terms nor ill-behaved terms. The fields obtained in lowest order calculations are the same as those in slowly varying amplitude approximation. The secular terms and ill-behaved terms resulted in the previous calculations are carefully removed in consistent with this method. We have shown that the first order correction to the electromagnetic field in each harmonic in slowly varying amplitude approximation is down by a factor of 10(exp -5) compared with the leading term. In other words, slowly varying amplitude approximation itself is proven to be a very good approximation. We have estimated the angular deviation of light propagation direction from a straight line in a chi(2) medium which is roughly in a range of 0.2 - 0.6 for an incident laser of intensity 6kW/sq cm. We have obtained the exact coupled differential equations for the amplitudes of the lth confined TE and TM modes for both first and second harmonics in a nonlinear slab waveguide. They become slightly simplified in slowly varying amplitude approximation but still too complicated to be tractable. For a special case of a nonlinear slab waveguide made of material with bar-42m crystalline symmetry, these equations are further simplified. For the case of perfect phase matching or very small phase mismatch and of other specific conditions being met, the equations are reduced to the well-known coupled differential equations which have the solutions given by Jacobian elliptic functions.

Computational Wave Propagation CRC Press

This book provides students with a thorough theoretical understanding of electromagnetic field equations and it also treats a large number of applications. The text is a comprehensive two-semester textbook. The work treats most topics in two steps – a short, introductory chapter followed by a second chapter with in-depth extensive treatment; between 10 to 30 applications per topic; examples and exercises throughout the book; experiments, problems and summaries. The new edition includes: modifications to about 30-40% of the end of chapter problems; a new introduction to electromagnetics based on behavior of charges; a new section on units; MATLAB tools for solution of problems and demonstration of subjects; most chapters include a summary. The book is an undergraduate textbook at the Junior level, intended for required classes in electromagnetics. It is written in simple terms with all details of derivations included and all steps in solutions listed. It requires little beyond basic calculus and can be used for self-study. The wealth of examples and alternative explanations makes it very approachable by students. More than 400 examples and exercises, exercising every topic in the book Includes 600 end-of-chapter problems, many of them applications or simplified applications Discusses the finite element, finite difference and method of moments in a dedicated chapter

New Trends in Computational Electromagnetics World Scientific

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.

Principles of Electromagnetic Waves and Materials Wiley-IEEE Press

This book describes the state-of-the-art research topics in theoretical materials science. It encompasses the computational methods and techniques which can advance more realistic calculations for understanding the physical principles in new growth methods of optoelectronic materials and related surface problems. These principles also govern the photonic, electronic, and structural properties of materials which are essential for device applications. They will also provide the crucial ingredients for the growth of future novel materials.

Principles of Electromagnetic Waves and Materials Createspace Independent Publishing Platform

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

Electromagnetic Waves, Materials, and Computation with MATLAB John Wiley & Sons

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.

Analysis of Electromagnetic Fields and Waves SciTech Publishing Introducing computational wave propagation methods developed over 40 years of research, this comprehensive book offers a computational approach to NDE of isotropic, anisotropic, and functionally graded materials. It discusses recent methods to enable enhanced computational efficiency for anisotropic materials. It offers an overview of the need for and uses of NDE simulation. The content provides a basic understanding of ultrasonic wave propagation through continuum mechanics and detailed discussions on the mathematical techniques of six computational methods to simulate NDE experiments. In this book, the pros and cons of each individual method are discussed and guidelines for selecting specific simulation methods for specific NDE scenarios are offered. Covers ultrasonic CNDE fundamentals to provide understanding of NDE simulation methods Offers a catalog of effective CNDE methods to evaluate and compare Provides exercises on real-life NDE problems with mathematical steps Discusses CNDE for common material types, including isotropic, anisotropic, and functionally graded materials Presents readers with practical knowledge on ultrasonic CNDE methods This work is an invaluable resource for researchers, advanced students, and industry professionals across materials, mechanical, civil, and aerospace engineering, and anyone seeking to enhance their understanding of computational approaches for advanced material evaluation methods.

Computational Electromagnetics Springer Science & Business Media

Because future microwave, magnetic resonance, and wave propagation systems will involve miniature devices, nanosize structures, multifunctional applications, and composites of various types of materials, their development requires distinctly multidisciplinary collaborations. That means specialized approaches will not be sufficient to satisfy requirements. Anticipating that many students lack specialized training in magnetism and magnetics, Magnetics, Dielectrics, and Wave Propagation with MATLAB® Codes avoids application-specific descriptions.Instead, it connects phenomenological approaches with comprehensive microscopic formulations to provide a new and sufficiently broad physical perspective on modern trends in microwave technology. Reducing complex calculation approaches to their simplest form, this book’s strength is in its step-by-step explanation of the procedure for unifying Maxwell’s equations with the free energy via the equation of motion. With clear and simple coverage of everything from first principles to calculation tools, it revisits the fundamentals that govern the phenomenon of magnetic resonance and wave propagation in magneto-dielectric materials. Introduces constitutive equations via the free energy, paving the way to consider wave propagation in any media This text helps students develop an essential understanding of the origin of magnetic parameters from first principles, as well as how these parameters are to be included in the large-scale free energy. More importantly, it facilitates successful calculation of said parameters, which is required as the dimensionality of materials is reduced toward the microscopic scale. The author presents a systematic way of deriving the permeability tensor of the most practical magnetic materials, cubic and hexagonal crystal structures. Using this simple and very general approach, he effectively bridges the gap between microscopic and macroscopic principles as applied to wave propagation.

The World of Applied Electromagnetics Electromagnetic Waves, Materials, and Computation with MATLAB Commonplace use of non-metallic materials and composites in vehicles and other environments has led to a need to compute scattering and other electromagnetic phenonema in their presence. This book provides the first comprehensive treatment of a variety of approximate boundary conditions in electromagnetics. The genesis and properties of impedance, resistive sheet, conductive sheet, generalised and absorbing boundary conditions are discussed. Applications to diffraction by numerous canonical geometries and impedance structures are presented. Accuracy and uniqueness issues are addressed and high frequency techniques such as physical and geometrical theory of diffraction are introduced. Many of the results presented are previously unpublished.

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