Methods For Electromagnetic Field Analysis By Ismo V Lindell

This text examines a variety of spectral computational techniques— including k-space theory, Floquet theory and beam propagation— that are used to analyze electromagnetic and optical problems. The authors tie together different applications in EM and optics in which the state variable method is used. Emphasizing the analysis of planar diffraction gratings using rigorous coupled wave analysis, the book presents many cases that are analyzed using a full-field vector approach to solve Maxwell's equations in anisotropic media where a standard wave equation approach is intractable.

Professor Joan Van Bladel, an eminent researcher and educator in fundamental electromagnetic theory and its application in electrical engineering, has updated and expanded his definitive text and reference on electromagnetic fields to twice its original content. This new edition incorporates the latest methods, theory, formulations, and applications that relate to today's technologies. With an emphasis on basic principles and a focus on electromagnetic formulation and analysis, Electromagnetic Fields, Second Edition includes detailed discussions of electrostatic fields, potential theory, propagation in waveguides and unbounded space, scattering by obstacles, penetration through apertures, and field behavior at high and low frequencies.

Electrical Engineering/Electromagnetics Methods for Electromagnetic Field Analysis A volume in the IEEE Series on Electromagnetic Wave Theory Donald G. Dudley, Series Editor . a gigantic platter of formulae of the dyadic kind.'--Akhlesh Lakhtaki, Professor, The Pennsylvania State University This monograph discusses mathematical and conceptual methods applicable in the analysis of electromagnetic fields and waves. Dyadic algebra is reviewed and armed with new identities it is applied throughout the book. The power of dyadic operations is seen when working with boundary, sheet and interface conditions, medium equations, field transformations, Greens functions, plane wave problems, vector circuit theory, multipole and image sources. Dyadic algebra offers convenience in handling problems involving chiral and bianisotropic media, of recent interest because of their wide range of potential applications. The final chapter gives, for the first time in book form, a unified presentation of EIT, the exact image theory, introduced by this author and colleagues. EIT is a general method for solving problems involving layered media by replacing them through image sources located in complex space. The main emphasis of the monograph is not on specific results but methods of analysis. The contents should be of interest to scientists doing research work in various fields of electromagnetics, as well as to graduate students. The addition of problems and answers in this reprint will enhance the teaching value of this work. Also in the series. Mathematical Foundations for Electromagnetic Theory Donald D. Dudley, University of Arizona, Tucson 1994 Hardcover 256 pp Methods for Electromagnetic Wave Propagation D. S. Jones, University of Dundee 1995 Hardcover 672 pp The Transmission Line Modeling Method: TLM Christos Christopoulos, University of Nottingham 1995 Hardcover 232 pp

Unlike any other source in the field, this valuable reference clearly examines key aspects of the finite element method (FEM) for electromagnetic analysis of low-frequency electrical devices. The authors examine phenomena such as nonlinearity, mechanical force, electrical circuit coupling, vibration, heat, and movement for applications in the electrical, mechanical, nuclear, aeronautics, and transportation industries. Electromagnetic Modeling by Finite Element Methods offers a wide range of examples, including torque, vibration, and iron loss calculation; coupling of the FEM with mechanical equations, circuits, converters, and thermal effects; material modeling; and proven methods for hysteresis implementation into FEM codes. Providing experimental results and comparisons from the authors' personal research, Electromagnetic Modeling by Finite Element Methods supplies techniques to implement FEM for solving Maxwell's equations, analyze electrical and magnetic losses, determine the behavior of electrical machines, evaluate force distribution on a magnetic medium, simulate movement in electrical machines and electromagnetic devices fed by external circuits or static converters, and analyze the vibrational behavior of electrical machines.

Finite Elements in Electrical and Magnetic Field Problems

Electric Field Analysis

Electric and Magnetic Fields

Numerical Analysis of Electromagnetic Fields

Optimization Methods in Electromagnetic Radiation

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.

This book addresses the most advanced to-date mathematical approach and numerical methods in electromagnetic field theory and wave propagation. It presents the application of developed methods and techniques to the analysis of waves in various guiding structures —shielded and open metal-dielectric waveguides of arbitrary cross-section, planar and circular waveguides filled with inhomogeneous dielectrics, metamaterials, chiral media, anisotropic media and layered media with absorption. It also looks into spectral properties of wave propagation for the waveguide families being considered, and the relevant mathematical techniques such as spectral theory of non-self-adjoint operator-valued functions are described, including rigorous proofs of the existence of various types of waves. Further, numerical methods constructed on the basis of the presented mathematical approach and the results of numerical modeling for various structures are also described in depth. The book is beneficial to a broad spectrum of readers ranging from pure and applied mathematicians in electromagnetic field theory to researchers and engineers who are familiar with mathematics. Further, it is also useful as a supplementary text for upper-level undergraduate students interested in learning more advanced topics of mathematical methods in electromagnetics.

Electrical Engineering/Electromagnetics Singular Electromagnetic Fields and Sources A volume in the IEEE Series on Electromagnetic Wave Theory Donald D. Dudley, Series Editor 'I will cherish my copy of this gem.'--James R. Wait This is a companion volume to the many available graduate textbooks on electromagnetic theory. It is devoted to a study of the infinities in electromagnetic fields and in their sources. Three types of singularities are investigated: (1) Those associated with strongly concentrated sources of charge and current, the relevant densities are expressed in terms of delta-functions and derivatives. (2) Those associated with the fields resulting from strongly concentrated sources. (3) Those which occur at sharp edges and vertices of cones and sectors. The approach is both theoretical and numerical. The information presented, far from being purely formal, is of importance for practical work. It can be used, for example, to accelerate significantly the convergence of a numerical algorithm. The book is written for electrical engineers and applied physicists who have an interest in the general topic of 'Maxwell's equations' and more particularly for those who are engaged in the actual solution of electromagnetic problems. The mathematical level of the text is that of the 'applied' mathematician. An introductory chapter on 'Distribution Theory' has been written in that spirit. Also in the series. Mathematical Foundations for Electromagnetic Theory Donald D. Dudley, University of Arizona, Tucson 1994 Hardcover 256 pp Methods for Electromagnetic Field Analysis Ismo V. Lindell, Helsinki University of Technology 1992 Hardcover 320 pp The Transmission Line Modeling Method: TLM Christos Christopoulos, University of Nottingham 1995 Hardcover 232 pp

Here are the newest methods for using computers to design linear antennas and microwave printed circuits. Learn how to use supercomputers to apply the FD-TD and the FE methods, and how to develop computation programs. Includes the methods of antenna analysis with integral equation, physical optics approximation, electromagnetic wave scattering due to random surface, eigen function expansion, and rectangular boundary division. Features practice problems and answers, plus examples of actual calculation programs. With 132 diagrams and 1121 equations.

The Method of Lines

Electromagnetic Fields in Electrical Engineering

Colloquium : Papers

Electromagnetic Fields

Numerical Methods in Electromagnetism

This book presents a comprehensive treatment of electromagnetic analysis and design of three critical devices for an MRI system - the magnet, gradient coils, and radiofrequency (RF) coils. Electromagnetic Analysis and Design in Magnetic Resonance Imaging is unique in its detailed examination of the analysis and design of the hardware for an MRI system. It takes an engineering perspective to serve the many scientists and engineers in this rapidly expanding field. Chapters present: an introduction to MRI basic concepts of electromagnetics, including Helmholtz and Maxwell coils, inductance calculation, and magnetic fields produced by special cylindrical and spherical surface currents principles for the analysis and design of gradient coils, including discrete wires and the target field method analysis of RF coils based on the equivalent lumped-circuit model as well as an analysis based on the integral equation formulation survey of special purpose RF coils analytical and numerical methods for the analysis of electromagnetic fields in biological objects With the continued, active development of MRI instrumentation, Electromagnetic Analysis and Design in Magnetic Resonance Imaging presents an excellent, logically organized text - an indispensable resource for engineers, physicists, and graduate students working in the field of MRI.

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

This is the first comprehensive monograph that featuresstate-of-the-art multigrid methods for enhancing the modelingversatility, numerical robustness, and computational efficiency ofone of the most popular classes of numerical electromagnetic fieldmodeling methods: the method of finite elements. The focus of thepublication is the development of robust preconditioners for theiterative solution of electromagnetic field boundary value problems(BVPs) discretized by means of finite methods. Specifically, the authors set forth their own successful attempstto utilize concepts from multigrid and multilevel methods for theeffective preconditioning of matrices resulting from theapproximation of electromagnetic BVPs using finite methods.Following the authors' careful explanations and step-by-stepinstruction, readers can duplicate the authors' results and takeadvantage of today's state-of-the-art multigrid/multilevelpreconditioners for finite element-based iterative electromagneticfield solvers. Among the highlights of coverage are: * Application of multigrid, multilevel, and hybridmultigrid/multilevel preconditioners to electromagnetic scatteringand radiation problems * Broadband, robust numerical modeling of passive microwavecomponents and circuits * Robust, finite element-based modal analysis of electromagneticwaveguides and cavities * Application of Krylov subspace-based methodologies forreduced-order macromodeling of electromagnetic devices andsystems * Finite element modeling of electromagnetic waves in periodicstructures The authors provide more than thirty detailed algorithms alongsidepseudo-codes to assist readers with practical computerimplementation. In addition, each chapter includes an applicationssection with helpful numerical examples that validate the authors'methodologies and demonstrate their computational efficiency androbustness. This groundbreaking book, with its coverage of an exciting newenabling computer-aided design technology, is an essentialreference for computer programmers, designers, and engineers, aswell as graduate students in engineering and applied physics.

Finite elements - the basic concepts and an application to 3-D magnetostatic problems. The fundamental equations of eletric and magnetic fields. Shape functions. Software engineering aspects of finite elements. Finite element solution of magnetic and electric field problems in electrical machines and devices. Numerical analysis of Eddy-Current problems. The high-order polynomial finite element method in electromagnetic field computation. Transient solution of the diffusion equation by discrete Fourier transformation. Mutually constrained partial differential and integral equation field formulations. Applications of integral equation methods to the numerical solution of magnetostatic and Eddy-Current problems.

Theory and Computation of Electromagnetic Fields

Monday, 16 May 1983

Deterministic and Statistical Theories

Electromagnetic Field Analysis of Induction Motors by Finite Element Method and Its Application to Phantom Loading

Analysis, Methods, and Tools for Electromagnetic Field Exposure Assessment and Control

Bragg gratings, meander lines, clystron resonators, photonic crystals), antennas (e.g. circular and conformal); and enables the reader to solve partial differential equations in other physical areas by using the described principles."--BOOK JACKET.

Instructs advanced and important analysis methods which are frequently used for researchers, engineers and students who work on applications of electromagnetic waves to microwave devices and antennas. The book also includes various numerical techniques.

This textbook is intended for a course in electromagnetism for upper undergraduate and graduate students. The main concepts and laws of classical macroscopic electrodynamics and initial information about generalized laws of modern electromagnetics are discussed, explaining some paradoxes of the modern theory. The reader then gets acquainted with electrodynamics methods of field analysis on the basis of wave equation solution. Emission physics are considered using an example of the Huygens-Fresnel-Kirchhoff canonic principle. The representation about strict electrodynamics task statement on the base of Maxwell equations, boundary conditions, emission conditions and the condition on the edge is given. Different classes of approximate boundary conditions are presented, which essentially simplify understanding of process physics. The canonic Fresnel functions are given and their generalization on the case of anisotropic impedance. The free waves in closed waveguides and in strip-slotted and edge-dielectric transmission lines are described. A large number of Mathcad programs for illustration of field patterns and its properties in different guiding structures are provided. The material is organized for self-study as well as classroom use.

X, 153 leaves : ill. ; 30 cm.

Acoustic and Electromagnetic Scattering Analysis Using Discrete Sources

Analysis Methods for Electromagnetic Wave Problems

A Time-domain Haar-wavelet-based Multiresolution Technique for Electromagnetic Field Analysis

Colloquium on "Recent Developments in High Frequency Electromagnetic Field Analysis by Finite Element Methods"

GPU-Based Acceleration on ACEnet for FDTD Method of Electromagnetic Field Analysis

A thorough and rigorous analysis of electromagnetic fields in cavities This book offers a comprehensive analysis of electromagnetic fields in cavities of general shapes and properties. Part One covers classical deterministic methods to conclude resonant frequencies, modal fields, and cavity losses; quality factor; mode bandwidth; and the excitation of cavity fields from arbitrary current distributions for metal-wall cavities of simple shape. Part Two covers modern statistical methods to analyze electrically large cavities of complex shapes and properties. Electromagnetic Fields in Cavities combines rigorous solutions to Maxwell's equations with conservation of energy to solve for the statistics of many quantities of interest: penetration into cavities (and shielding effectiveness), field strengths far from and close to cavity walls, and power received by antennas within cavities. It includes all modes and shows you how to utilize fairly simple statistical formulae to apply to your particular problem, whether it's interference calculations, electromagnetic compatibility testing in reverberation chambers, measurement of shielding materials using multiple cavities, or efficiency of test antennas. Electromagnetic Fields in Cavities is a valuable resource for researchers, engineers, professors, and graduate students in electrical engineering.

A new edition of the leading textbook on the finite element method, incorporating major advancements and further applications in the field of electromagnetics The finite element method (FEM) is a powerful simulation technique used to solve boundary-value problems in a variety of engineering circumstances. It has been widely used for analysis of electromagnetic fields in antennas, radar scattering, RF and microwave engineering, high-speed/high-frequency circuits, wireless communication, electromagnetic compatibility, photonics, remote sensing, biomedical engineering, and space exploration. The Finite Element Method in Electromagnetics, Third Edition explains the method's processes and techniques in careful, meticulous prose and covers not only essential finite element method theory, but also its latest developments and applications—giving engineers a methodical way to quickly master this very powerful numerical technique for solving practical, often complicated, electromagnetic problems. Featuring over thirty percent new material, the third edition of this essential and comprehensive text now includes: A wider range of applications, including antennas, phased arrays, electric machines, high-frequency circuits, and crystal photonics The finite element analysis of wave propagation, scattering, and radiation in periodic structures The time-domain finite element method for analysis of wideband antennas and transient electromagnetic phenomena Novel domain decomposition techniques for parallel computation and efficient simulation of large-scale problems, such as phased-array antennas and photonic crystals Along with a great many examples, The Finite Element Method in Electromagnetics is an ideal book for engineering students as well as for professionals in the field.

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.

Electric Field Analysis is both a student-friendly textbook and a valuable tool for engineers and physicists engaged in the design work of high-voltage insulation systems. The text begins by introducing the physical and mathematical fundamentals of electric fields, presenting problems from power and dielectric engineering to show how the theories are put into practice. The book then describes various techniques for electric field analysis and their significance in the validation of numerically computed results, as well as: Discusses finite difference, finite element, charge simulation, and surface charge simulation methods for the numerical computation of electric fields Provides case studies for electric field distribution in a cable termination, around a post insulator, in a condenser bushing, and around a gas-insulated substation (GIS) spacer Explores numerical field calculation for electric field optimization, demonstrating contour correction and examining the application of artificial neural networks Explains how high-voltage field optimization studies are carried out to meet the desired engineering needs Electric Field Analysis is accompanied by an easy-to-use yet comprehensive software for electric field computation. The software, along with a wealth of supporting content, is available for download with qualifying course adoption.

Computational Methods for Electromagnetic and Optical Systems, Second Edition

Mathematical Models, Spectral Theory and Numerical Analysis

Electromagnetic Modeling by Finite Element Methods

Colloquium, 1983, London: Proceedings

Methods in Electromagnetic Wave Propagation

Co-published with Oxford University Press. This new edition takes account of the most recent analytical progress that has been made in the field of electromagnetic wave propagation and the impact of the wider availability of powerful computers. The aim of this book is to develop a suitable framework of theory and numerical analysis with applications to various aspects of the propagation of electromagnetic waves. The conjugate gradient method and CGFFT are given extensive treatment.

The coverage of finite methods has been expanded and conforming finite elements particularly appropriate to electromagnetic applications are described. New topics have been added to this edition including Sobolev spaces, vector optimization, absorbing boundary conditions, and surface radiation conditions.

This book is the collection of the contributions offered at the International Symposium on Electromagnetic Fields in Electrical Engineering, ISEF '87, held in Pavia, Italy, in September 1987. The Symposium was attended by specialists engaged in both theoretical and applied research in low-frequency electromagnetism. The charming atmosphere of Pavia and its ancient university provided a very effective environment to discuss the latest results in the field and, at the same time, to enjoy the company or colleagues and friends coming from over 15 countries. The contributions have been grouped into 7 chapters devoted to fundamental problems, computer programs, transformers, rotating electrical machines, mechanical and thermal effects, various applications and synthesis, respectively. Such a classification is merely to help the reader because a few papers could be put in several chapters. Over the past two decades electromagnetic field computations have received a big impulse by the large availability of digital computers with better and better performances in speed and capacity. Many various methods have been developed but not all of them appear convenient enough for practical engineering use. In fact, the technical and industrial challenges set some principal attributes and criteria for good computation methods. They should be relatively easy to use, fit into moderately sized computers, yield useful design data, maintain flexibility with m1n1mum cost in time and effort.

Numerical methods for solving boundary value problems have developed rapidly. Knowledge of these methods is important both for engineers and scientists. There are many books published that deal with various approximate methods such as the finite element method, the boundary element method and so on. However, there is no textbook that includes all of these methods. This book is intended to fill this gap. The book is designed to be suitable for graduate students in engineering science, for senior undergraduate students as well as for scientists and engineers who are interested in electromagnetic fields. Objective Numerical calculation is the combination of mathematical methods and field theory. A great number of mathematical concepts, principles and techniques are discussed and many computational techniques are considered in dealing with practical problems. The purpose of this book is to provide students with a solid background in numerical analysis of the field problems. The book emphasizes the basic theories and universal principles of different numerical methods and describes why and how different methods work. Readers will then understand any methods which have not been introduced and will be able to develop their own new methods. Organization Many of the most important numerical methods are covered in this book. All of these are discussed and compared with each other so that the reader has a clear picture of their particular advantage, disadvantage and the relation between each of them. The book is divided into four parts and twelve chapters.

The Method of Lines (MOL) is a versatile approach to obtaining numerical solutions to partial differential equations (PDEs) as they appear in dynamic and static problems. This method, popular in science and engineering, essentially reduces PDEs to a set of ordinary differential equations that can be integrated using standard numerical integration methods. Its significant advantage is that the analysis algorithms follow the physical wave propagation and are therefore efficient. This is because the fields on the discretisation lines are described by generalised transmission line (GTL) equations. With this formulation we have a connection to the well known transmission line theory and resulting in an easy understanding. The method of lines is a very accurate and powerful way to analyze electromagnetic waves, enabling a full-wave solution without the computational burden of pure finite element or finite difference methods. With Analysis of Electromagnetic Fields and Waves, Reinhold Pregla describes an important and powerful method for analyzing electromagnetic waves. This book: Describes the general analysis principles for electromagnetic fields. Includes applications in microwave, millimetre wave and optical frequency regions. Unifies the analysis by introducing generalised transmission line (GTL) equations for all orthogonal coordinate systems and with materials of arbitrary anisotropy as a common start point. Demonstrates a unique analysis principle with the numerical stable impedance/admittance transformation and a physical adapted field transformation concept that is also useful for other modelling algorithms. Includes chapters on Eigenmode calculations for various waveguides, concatenations and junctions of arbitrary number of different waveguide sections in complex devices, periodic structures (e.g. Bragg gratings, meander lines, clystron resonators, photonic crystals), antennas (e.g. circular and conformal). Enables the reader to solve partial differential equations in other physical areas by using the described principles. Features an accompanying website with program codes in Matlab© for special problems. Analysis of Electromagnetic Fields and Waves will appeal to electromagnetic field practitioners in primary and applied research as well as postgraduate students in the areas of photonics, micro- and millimetre waves, general electromagnetics, e.g. microwave integrated circuits, antennas, integrated and fibre optics, optoelectronics, nanophotonics, microstructures, artificial materials.

Methods for Electromagnetic Field Analysis

Methodologies for Electromagnetic Field Modeling for Computer Aided Analysis of Multi-domain Physical Interactions

Microwave and mmWave Engineering with Generalized Macroscopic Electrodynamics

Electromagnetic Field Analysis Guide

From Numerical Models to Industrial Applications

The analysis of scattering of electromagnetic waves in inhomogeneous three-dimensional bounded media is extremely important from both theoretical and practical viewpoints, and constitutes the core family of problems in electromagnetics.

Methods for Electromagnetic Field AnalysisMethods for Electromagnetic Field AnalysisMethods for Electromagnetic Field AnalysisWiley-IEEE Press

Several methodologies are presented in this work to facilitate the modeling of electromagnetic fields in the context of multi-domain physical interactions. Among the challenges for computer aided analysis of electromagnetic problems in interaction with other physical phenomena are the largely different temporal and spatial scales that may occur and the task of maintaining accuracy and computational efficiency in the implementation of boundary conditions for time-varying media. First, we present a methodology for the phenomenological modeling of passive intermodulation generation in metallic contacts due to electron tunneling. The methodology provides for the development of passive intermodulation source models that are compatible with general-purpose electromagnetic and non-linear network analysis-oriented circuit simulators. The derived model allows for an investigation of the impact of surface roughness and skin effect on the levels and frequency dependence of passive intermodulation interference. Thus, the model is intended to enhance the understanding of the passive intermodulation source due to electron tunneling in metallic contacts. The second methodology presented is a Lagrangian approach for increasing the accuracy of the finite difference time domain method for modeling wave propagation in geometries involving curved and moving boundaries. This methodology provides for the definition of an equivalent electromagnetic boundary value problem over a domain with fixed boundaries. A modified time-dependent operator is derived for the Lagrangian formulation, operating on a modified set of Maxwell's equations on a reference domain. This method relaxes spatial oversampling requirement and achieves high accuracy and computational efficiency. The third methodology provides for an efficient analysis of problems with widely separated time scales. We propose the application of the method of multi-time partial differential equations to the numerical solution of one-dimensional electromagnetic wave interactions involving highly disparate temporal variations in both excitation and time-varying media properties and boundary conditions. The temporal oversampling requirement is relaxed by introducing multiple time scales for quasi-periodic functions and, upon solution of the multivariate partial differential equation, we recover a solution to the univariate problem.

This book considers problems of optimization arising in the design of electromagnetic radiators and receivers, presenting a systematic general theory applicable to a wide class of structures. The theory is illustrated with examples, and indications of how the results can be applied to more complicated structures. The final chapter introduces techniques from multicriteria optimization in antenna design. References to mathematics and engineering literature guide readers through the necessary mathematical background.

Recent Developments in High Frequency Electromagnetic Field Analysis by Finite Element Methods

The Finite Element Method in Electromagnetics

Advanced Computational Electromagnetic Methods

Antenna Theory Approach Versus Transmission Line Models

Electromagnetic Fields in Cavities

The discrete sources method is an efficient and powerful tool for solving a large class of boundary-value problems in scattering theory. A variety of numerical methods for discrete sources now exist. In this book, the authors unify these formulations in the context of the so-called discrete sources method. Comprehensive presentation of the discrete sources method Original theory - an extension of the conventional null-field method using discrete sources Practical examples that demonstrate the efficiency and flexibility of elaborated methods (scattering by particles with high aspect ratio, rough particles, nonaxisymmetric particles, multiple scattering) List of discrete sources programmes available via the Internet

Offers a comprehensive overview of the recent advances in the area of computational electromagnetics Computational Method in Electromagnetic Compatibility offers a review of the most recent advances in computational electromagnetics. The authors—noted experts in the field—examine similar problems by taking different approaches related to antenna theory models and transmission line methods. They discuss various solution methods related to boundary integral equation techniques and finite difference techniques. The topics covered are related to realistic antenna systems including antennas for air traffic control or ground penetrating radar antennas; grounding systems (such as grounding systems for wind turbines); biomedical applications of electromagnetic fields (such as transcranial magnetic stimulation); and much more. The text features a number of illustrative computational examples and a reference list at the end of each chapter. The book is grounded in a rigorous theoretical approach and offers mathematical details of the formulations and solution methods. This important text: Provides a trade-off between a highly efficient transmission line approach and antenna theory models providing analysis of high frequency and transient phenomena Contains the newest information on EMC analysis and design principles Discusses electromagnetic field coupling to thin wire configurations and modeling in bioelectromagnetics Written for engineering students, senior researchers and practicing electrical engineers, Computational Method in Electromagnetic Compatibility provides a valuable resource in the design of equipment working in a common electromagnetic environment.

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

Singular Electromagnetic Fields and Sources

Release 5.5

Computational Methods in Electromagnetic Compatibility

Integral Equations and Iteration Methods in Electromagnetic Scattering

Analysis of Electromagnetic Fields and Waves