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Crystal Nonlinear Optics
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Wave Motion in Elastic Solids
MATLAB® Recipes for Earth Sciences
Photonic Crystals

Electromagnetic Wave Propagation, Radiation, and Scattering

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 the program is executing the wrong simulation of the physical problem. *Electromagnetic Waves, Materials, and Computation with MATLAB®* takes an integrative modern approach to the subject of electromagnetic analysis by supplementing quintessential "old school" information and methods with instruction in the use of newer commercial software such as MATLAB and methods including FDTD. Delving into the electromagnetics of bounded simple media, equations of complex media, and computation, this text includes: Appendices that cover a wide range of associated issues and techniques A concluding section containing an array of problems, quizzes, and examinations A downloadable component for instructors including PowerPoint™ slides, solutions to problems, and more Striking a balance between theoretical and practical aspects, internationally recognized expert Dikshitulu Kalluri clearly illustrates how intuitive approximate solutions are derived. Providing case studies and practical examples throughout, he examines the role of commercial software in this process, also covering interpretation of findings. Kalluri's extensive experience teaching this subject enables him to streamline and convey material in a way that helps readers master conceptual mathematical aspects. This gives them confidence in their

ability to use high-level software to write code, but it also ensures that they will never be solely dependent on such programs.

Computational Electromagnetics for RF and Microwave Engineering

This work addresses integrated optics from both the theory and practical modelling standpoints, describing recent work on beam propagation, planar spectrographs, four-wave coupled mode array, CAD for integrated optics and component cost modelling.

Advanced Engineering Electromagnetics

One of the most methodical treatments of electromagnetic wave propagation, radiation, and scattering—including new applications and ideas Presented in two parts, this book takes an analytical approach on the subject and emphasizes new ideas and applications used today. Part one covers fundamentals of electromagnetic wave propagation, radiation, and scattering. It provides ample end-of-chapter problems and offers a 90-page solution manual to help readers check and comprehend their work. The second part of the book explores up-to-date applications of electromagnetic waves—including radiometry, geophysical remote sensing and imaging, and biomedical and signal processing applications. Written by a world renowned authority in the field of electromagnetic research, this new edition of *Electromagnetic Wave Propagation, Radiation, and Scattering: From Fundamentals to Applications* presents detailed applications with useful appendices, including mathematical formulas, Airy function, Abel's equation, Hilbert transform, and Riemann surfaces. The book also features newly revised material that focuses on the following topics: Statistical wave theories—which have been extensively applied to topics such as geophysical remote sensing, bio-electromagnetics, bio-optics, and bio-ultrasound imaging Integration of several distinct yet related disciplines, such as statistical wave theories, communications, signal processing, and time reversal imaging New phenomena of multiple scattering, such as coherent scattering and memory effects Multiphysics applications that combine theories for different physical phenomena, such as seismic coda waves, stochastic wave theory, heat diffusion, and temperature rise in biological and other media Metamaterials and solitons in optical fibers, nonlinear phenomena, and porous media Primarily a textbook for graduate courses in electrical engineering, *Electromagnetic Wave Propagation, Radiation, and Scattering* is also ideal for graduate students in bioengineering, geophysics, ocean engineering, and geophysical remote sensing. The book is also a useful reference for engineers and scientists working in fields such as geophysical remote sensing, bio-medical engineering in optics and ultrasound, and new materials and integration with signal processing.

Optical Waves in Layered Media

Advanced textbook on crystal nonlinear optics.

Quick Finite Elements for Electromagnetic Waves

This book demonstrates the implementation of an automated measuring system for very efficient measurement of chromatic dispersion, which uses a modulation phase shift method over long haul of optical single mode fiber. The authors show how a new scheme for measuring chromatic dispersion is adopted in conjunction with a tunable laser (TLS), providing the optical power at required wavelength and digital oscilloscope (DOSC) for measuring the phase difference between microwave signals from transmitter and microwave signals at the receiver. This is a novel approach for real-time chromatic dispersion in optical systems such as optical fibers. The setup used is very simple, accurate and cost effective, compared to other methods such as direct measurement, differential mode delay, polarization mode dispersion measurement and phase delay method.

Ultra-Fast Fiber Lasers

Balanis' second edition of Advanced Engineering Electromagnetics – a global best-seller for over 20 years – covers the advanced knowledge engineers involved in electromagnetic need to know, particularly as the topic relates to the fast-moving, continually evolving, and rapidly expanding field of wireless communications. The immense interest in wireless communications and the expected increase in wireless communications systems projects (antenna, microwave and wireless communication) points to an increase in the number of engineers needed to specialize in this field. In addition, the Instructor Book Companion Site contains a rich collection of multimedia resources for use with this text. Resources include: Ready-made lecture notes in Power Point format for all the chapters. Forty-nine MATLAB® programs to compute, plot and animate some of the wave phenomena Nearly 600 end-of-chapter problems, that's an average of 40 problems per chapter (200 new problems; 50% more than in the first edition) A thoroughly updated Solutions Manual 2500 slides for Instructors are included.

Inverse Synthetic Aperture Radar Imaging With MATLAB Algorithms

This book provides a full representation of Inverse Synthetic Aperture Radar (ISAR) imagery, which is a popular and important radar signal processing tool. The book covers all possible aspects of ISAR imaging. The book offers a fair amount of signal processing techniques and radar basics before introducing the inverse problem of ISAR and the forward problem of Synthetic Aperture Radar (SAR). Important concepts of SAR such as resolution, pulse compression and image formation are given together with associated MATLAB codes. After providing the fundamentals for ISAR imaging, the book gives the detailed imaging procedures for ISAR imaging with associated MATLAB functions and codes. To enhance the image quality in ISAR imaging, several imaging tricks and fine-tuning procedures such as zero-padding and windowing are also presented. Finally, various real applications of ISAR imagery, like imaging the antenna-platform scattering, are given in a separate chapter. For all these algorithms, MATLAB codes and figures are included. The final chapter considers advanced concepts and trends in ISAR imaging.

Photonics Modelling and Design

An informative look at the theory, computer implementation, and application of the scaled boundary finite element method This reliable resource, complete with MATLAB, is an easy-to-understand introduction to the fundamental principles of the scaled boundary finite element method. It establishes the theory of the scaled boundary finite element method systematically as a general numerical procedure, providing the reader with a sound knowledge to expand the applications of this method to a broader scope. The book also presents the applications of the scaled boundary finite element to illustrate its salient features and potentials. The Scaled Boundary Finite Element Method: Introduction to Theory and Implementation covers the static and dynamic stress analysis of solids in two and three dimensions. The relevant concepts, theory and modelling issues of the scaled boundary finite element method are discussed and the unique features of the method are highlighted. The applications in computational fracture mechanics are detailed with numerical examples. A unified mesh generation procedure based on quadtree/octree algorithm is described. It also presents examples of fully automatic stress analysis of geometric models in NURBS, STL and digital images. Written in lucid and easy to understand language by the co-inventor of the scaled boundary element method Provides MATLAB as an integral part of the book with the code cross-referenced in the text and the use of the code illustrated by examples Presents new developments in the scaled boundary finite element method with illustrative examples so that readers can appreciate the significant features and potentials of this novel method—especially in emerging technologies such as 3D printing, virtual reality, and digital image-based analysis The Scaled Boundary Finite Element Method: Introduction to Theory and Implementation is an ideal book for researchers, software developers, numerical analysts, and postgraduate students in many fields of engineering and science.

Applications of Nonlinear Fiber Optics

Introduces methods of data analysis in geosciences using MATLAB such as basic statistics for univariate, bivariate and multivariate datasets, jackknife and bootstrap resampling schemes, processing of digital elevation models, gridding and contouring, geostatistics and kriging, processing and georeferencing of satellite images, digitizing from the screen, linear and nonlinear time-series analysis and the application of linear time-invariant and adaptive filters. Includes a brief description of each method and numerous examples demonstrating how MATLAB can be used on data sets from earth sciences.

Electromagnetic Waves, Materials, and Computation with MATLAB®

This second edition comes from your suggestions for a more lively format, self-learning aids for students, and the need for applications and projects without being distracted from EM Principles. Flexibility Choose the order, depth, and method of reinforcing EM Principles—the PDF files on CD provide Optional Topics, Applications, and Projects. Affordability Not only is this text priced below competing texts, but also the topics on CD (and downloadable to registered users) provide material sufficient for a second term of study with no additional book for students to buy. MATLAB This book takes full advantage of MATLAB's power to motivate and

reinforce EM Principles. No other EM books is better integrated with MATLAB. The second edition is even richer and easier to incorporate into course use with the new, self-paced MATLAB tutorials on the CD and available to registered users.

Fourier Modal Method and Its Applications in Computational Nanophotonics

Metamaterials is a young subject born in the 21st century. It is concerned with artificial materials which can have electrical and magnetic properties difficult or impossible to find in nature. The building blocks in most cases are resonant elements much smaller than the wavelength of the electromagnetic wave. The book offers a comprehensive treatment of all aspects of research in this field at a level that should appeal to final year undergraduates in physics or in electrical and electronic engineering. The mathematics is kept at a minimum; the aim is to explain the physics in simple terms and enumerate the major advances. It can be profitably read by graduate and post-graduate students in order to find out what has been done in the field outside their speciality, and by experts who may gain new insight about the inter-relationship of the physical phenomena involved.

Guided Wave Photonics

The book provides a survey of numerical methods for acoustics, namely the finite element method (FEM) and the boundary element method (BEM). It is the first book summarizing FEM and BEM (and optimization) for acoustics. The book shows that both methods can be effectively used for many other cases, FEM even for open domains and BEM for closed ones. Emphasis of the book is put on numerical aspects and on treatment of the exterior problem in acoustics, i.e. noise radiation.

Computational Photonics

Ultrashort pulses in mode-locked lasers are receiving focused attention from researchers looking to apply them in a variety of fields, from optical clock technology to measurements of the fundamental constants of nature and ultrahigh-speed optical communications. Ultrashort pulses are especially important for the next generation of ultrahigh-speed optical systems and networks operating at 100 Gbps per carrier. *Ultra Fast Fiber Lasers: Principles and Applications with MATLAB® Models* is a self-contained reference for engineers and others in the fields of applied photonics and optical communications. Covering both fundamentals and advanced research, this book includes both theoretical and experimental results. MATLAB files are included to provide a basic grounding in the simulation of the generation of short pulses and the propagation or circulation around nonlinear fiber rings. With its unique and extensive content, this volume— Covers fundamental principles involved in the generation of ultrashort pulses employing fiber ring lasers, particularly those that incorporate active optical modulators of amplitude or phase types Presents experimental techniques for the generation, detection, and characterization of ultrashort pulse sequences derived from several current schemes Describes the multiplication of ultrashort pulse sequences using the Talbot diffraction effects in the time domain via the use of highly dispersive media Discusses developments of multiple short pulses in the form of solitons

binding together by phase states Elucidates the generation of short pulse sequences and multiple wavelength channels from a single fiber laser The most practical short pulse sources are always found in the form of guided wave photonic structures. This minimizes problems with alignment and eases coupling into fiber transmission systems. In meeting these requirements, fiber ring lasers operating in active mode serve well as suitable ultrashort pulse sources. It is only a matter of time before scientists building on this research develop the practical and easy-to-use applications that will make ultrahigh-speed optical systems universally available.

Wireless and Guided Wave Electromagnetics

The book Optical Fiber and Wireless Communications provides a platform for practicing researchers, academics, PhD students, and other scientists to review, plan, design, analyze, evaluate, intend, process, and implement diversiform issues of optical fiber and wireless systems and networks, optical technology components, optical signal processing, and security. The 17 chapters of the book demonstrate capabilities and potentialities of optical communication to solve scientific and engineering problems with varied degrees of complexity.

Integrated Photonics

This book is a collection of contributions by renowned scientists in the optical fiber technology field, covering a wide range of recent progress pertaining to various topics such as special optical fibers, non-linear effects in optical fiber, components and devices for communication systems as well as optical fiber sensors. Inevitably, many aspects are omitted but each chapter is a representative example of the latest trends and results in a rapidly evolving research scenario. This collection is enriched by a few expert commentaries on selected topics, highlighting recent innovative developments and a future outlook in optical fiber technology.

Silicon Photonics Design

Optical Fiber and Wireless Communications

This book presents selected papers from 1st International Conference on Optical and Wireless Technologies, providing insights into the analytical, experimental, and developmental aspects of systems, techniques, and devices in these spheres. It explores the combined use of various optical and wireless technologies in next-generation networking applications, and discusses the latest developments in applications such as photonics, high-speed communication systems and networks, visible light communication, nanophotonics, and wireless and multiple-input-multiple-output (MIMO) systems. The book will serve as a valuable reference resource for academics and researchers across the globe.

Electromagnetics

A comprehensive manual on the efficient modeling and analysis of photonic

devices through building numerical codes, this book provides graduate students and researchers with the theoretical background and MATLAB programs necessary for them to start their own numerical experiments. Beginning by summarizing topics in optics and electromagnetism, the book discusses optical planar waveguides, linear optical fiber, the propagation of linear pulses, laser diodes, optical amplifiers, optical receivers, finite-difference time-domain method, beam propagation method and some wavelength division devices, solitons, solar cells and metamaterials. Assuming only a basic knowledge of physics and numerical methods, the book is ideal for engineers, physicists and practising scientists. It concentrates on the operating principles of optical devices, as well as the models and numerical methods used to describe them.

Introduction to Optical Waveguide Analysis

Carefully structured to instill practical knowledge of fundamental issues, *Optical Fiber Communication Systems with MATLAB® and Simulink® Models* describes the modeling of optically amplified fiber communications systems using MATLAB® and Simulink®. This lecture-based book focuses on concepts and interpretation, mathematical procedures, and engineering applications, shedding light on device behavior and dynamics through computer modeling. Supplying a deeper understanding of the current and future state of optical systems and networks, this Second Edition: Reflects the latest developments in optical fiber communications technology Includes new and updated case studies, examples, end-of-chapter problems, and MATLAB® and Simulink® models Emphasizes DSP-based coherent reception techniques essential to advancement in short- and long-term optical transmission networks *Optical Fiber Communication Systems with MATLAB® and Simulink® Models, Second Edition* is intended for use in university and professional training courses in the specialized field of optical communications. This text should also appeal to students of engineering and science who have already taken courses in electromagnetic theory, signal processing, and digital communications, as well as to optical engineers, designers, and practitioners in industry.

Artificially Birefringent Aluminum Gallium Arsenide/aluminum Oxide-based Submicron Waveguides and Resonant Cavities for Nonlinear Optics

From the beginning *Integrated Photonics* introduces numerical techniques for studying non-analytic structures. Most chapters have numerical problems designed for solution using a computational program such as Matlab or Mathematica. An entire chapter is devoted to one of the numeric simulation techniques being used in optoelectronic design (the Beam Propagation Method), and provides opportunity for students to explore some novel optical structures without too much effort. Small pieces of code are supplied where appropriate to get the reader started on the numeric work. *Integrated Photonics* is designed for the senior/first year graduate student, and requires a basic familiarity with electromagnetic waves, and the ability to solve differential equations with boundary conditions.

Photonic Crystal Fibers

This text continues the exploration of the use of MATLAB tools and features in visualizing physical processes. The symbolic math packages are important in solving those problems which are amenable to closed form solution, while the numerical packages are used for the remaining problems. The results for the solutions use the MATLAB graphics packages to help visualize the properties of the solutions. User dialogues are designed to allow users to change the input parameters in order to see how the dynamics of the solutions depends on the parameters of the specific problem. In particular movies are used to display the dynamical evolution of solutions in time.

Physics of Oscillations and Waves

Optical Waves in Layered Media bridges the gap between theory and practice by means of numerical examples based on real-life situations. Only classical electrodynamics is used in dealing with the interaction of light with matter, except in the last chapter on quantum wells.

Fiber Optics Handbook: Fiber, Devices, and Systems for Optical Communications

"Electromagnetics" is a thorough text that enables readers to readily grasp EM fundamentals, develop true problem-solving skills, and really understand and like the material. It is meant as an "ultimate resource" for undergraduate electromagnetics."

MATLAB-Based Electromagnetics

In this textbook a combination of standard mathematics and modern numerical methods is used to describe a wide range of natural wave phenomena, such as sound, light and water waves, particularly in specific popular contexts, e.g. colors or the acoustics of musical instruments. It introduces the reader to the basic physical principles that allow the description of the oscillatory motion of matter and classical fields, as well as resulting concepts including interference, diffraction, and coherence. Numerical methods offer new scientific insights and make it possible to handle interesting cases that can't readily be addressed using analytical mathematics; this holds true not only for problem solving but also for the description of phenomena. Essential physical parameters are brought more into focus, rather than concentrating on the details of which mathematical trick should be used to obtain a certain solution. Readers will learn how time-resolved frequency analysis offers a deeper understanding of the interplay between frequency and time, which is relevant to many phenomena involving oscillations and waves. Attention is also drawn to common misconceptions resulting from uncritical use of the Fourier transform. The book offers an ideal guide for upper-level undergraduate physics students and will also benefit physics instructors. Program codes in Matlab and Python, together with interesting files for use in the problems, are provided as free supplementary material.

Photonic Devices

This title can be used to either complement another electromagnetics text, or as an independent resource. Designed primarily for undergraduate electromagnetics, it can also be used in follow-up courses on antennas, propagation, microwaves, advanced electromagnetic theory, computational electromagnetics, electrical machines, signal integrity, etc. This title also provides practical content to current and aspiring industry professionals. MATLAB-Based Electromagnetics provides engineering and physics students and other users with an operational knowledge and firm grasp of electromagnetic fundamentals aimed toward practical engineering applications, by teaching them “hands on” electromagnetics through a unique and comprehensive collection of MATLAB computer exercises and projects. Essentially, the book unifies two themes: it presents and explains electromagnetics using MATLAB on one side, and develops and discusses MATLAB for electromagnetics on the other. MATLAB codes described (and listed) in TUTORIALS or proposed in other exercises provide prolonged benefits of learning. By running codes; generating results, figures, and diagrams; playing movies and animations; and solving a large variety of problems in MATLAB, in class, with peers in study groups, or individually, readers gain a deep understanding of electromagnetics.

Computational Acoustics of Noise Propagation in Fluids - Finite and Boundary Element Methods

This hands-on introduction to silicon photonics engineering equips students with everything they need to begin creating foundry-ready designs.

Waves in Metamaterials

This hands-on introduction to computational electromagnetics (CEM) links theoretical coverage of the three key methods - the FDTD, MoM and FEM - to open source MATLAB codes (freely available online) in 1D, 2D and 3D, together with many practical hints and tips gleaned from the author's 25 years of experience in the field. Updated and extensively revised, this second edition includes a new chapter on 1D FEM analysis, and extended 3D treatments of the FDTD, MoM and FEM, with entirely new 3D MATLAB codes. Coverage of higher-order finite elements in 1D, 2D and 3D is also provided, with supporting code, in addition to a detailed 1D example of the FDTD from a FEM perspective. With running examples through the book and end-of-chapter problems to aid understanding, this is ideal for professional engineers and senior undergraduate/graduate students who need to master CEM and avoid common pitfalls in writing code and using existing software.

Optical Fiber Communication Systems with MATLAB® and Simulink® Models, Second Edition

A comprehensive presentation of the theory and simulation of optical waveguides and wave propagations in a guided environment, Guided Wave Photonics: Fundamentals and Applications with MATLAB® supplies fundamental and advanced understanding of integrated optical devices that are currently employed in modern optical fiber communications systems and photonic signal processing systems. While there are many texts available in this area, none provide the breadth and depth of coverage and computational rigor found in this one. The

author has distilled the information into a very practical, usable format. In a logical progression of theory and application, he starts with Maxwell's equations and progresses directly to optical waveguides (integrated optic and fiber optic), couplers, modulators, nonlinear effects and interactions, and system applications. With up-to-date coverage of applicable algorithms, design guides, material systems, and the latest device and system applications, the book addresses:

- Fundamentals of guiding optical waves, including theoretical and simplified techniques
- Linear and nonlinear aspects of optical waveguiding
- Manipulating lightwaves by coupling and splitting
- Interactions of lightwaves and ultra-fast electrical travelling waves in modern optical modulators
- Applications of guided wave devices in optical communication systems and optical signal processing

Providing fundamental understanding of lightwave guiding and manipulating techniques, the text covers the field of integrated photonics by giving the principles, theoretical and applications. It explains how to solve the optical modes and their coupling as well as how to manipulate lightwaves for applications in communications and signal processing.

Fundamentals of Electromagnetics with MATLAB

Wireless communications allow high-speed mobile access to a global Internet based on ultra-wideband backbone intercontinental and terrestrial networks. Both of these environments support the carrying of information via electromagnetic waves that are wireless (in free air) or guided through optical fibers. *Wireless and Guided Wave Electromagnetics: Fundamentals and Applications* explores the fundamental aspects of electromagnetic waves in wireless media and wired guided media. This is an essential subject for engineers and physicists working with communication technologies, mobile networks, and optical communications. This comprehensive book:

- Builds from the basics to modern topics in electromagnetics for wireless and optical fiber communication
- Examines wireless radiation and the guiding of optical waves, which are crucial for carrying high-speed information in long-reach optical networking scenarios
- Explains the physical phenomena and practical aspects of guiding optical waves that may not require detailed electromagnetic solutions
- Explores applications of electromagnetic waves in optical communication systems and networks based on frequency domain transfer functions in the linear regions, which simplifies the physical complexity of the waves but still allows them to be examined from a system engineering perspective
- Uses MATLAB® and Simulink® models to simulate and illustrate the electromagnetic fields
- Includes worked examples, laboratory exercises, and problem sets to test understanding

The book's modular structure makes it suitable for a variety of courses, for self-study, or as a resource for research and development. Throughout, the author emphasizes issues commonly faced by engineers. Going a step beyond traditional electromagnetics textbooks, this book highlights specific uses of electromagnetic waves with a focus on the wireless and optical technologies that are increasingly important for high-speed transmission over very long distances.

Numerical Sound Synthesis

The development of new highly nonlinear fibers - referred to as microstructured fibers, holey fibers and photonic crystal fibers - is the next generation technology

for all-optical signal processing and biomedical applications. This new edition has been thoroughly updated to incorporate these key technology developments. The book presents sound coverage of the fundamentals of lightwave technology, along with material on pulse compression techniques and rare-earth-doped fiber amplifiers and lasers. The extensively revised chapters include information on fiber-optic communication systems and the ultrafast signal processing techniques that make use of nonlinear phenomena in optical fibers. New material focuses on the applications of highly nonlinear fibers in areas ranging from wavelength laser tuning and nonlinear spectroscopy to biomedical imaging and frequency metrology. Technologies such as quantum cryptography, quantum computing, and quantum communications are also covered in a new chapter. This book will be an ideal reference for: R&D engineers working on developing next generation optical components; scientists involved with research on fiber amplifiers and lasers; graduate students and researchers working in the fields of optical communications and quantum information. The only book on how to develop nonlinear fiber optic applications Two new chapters on the latest developments; Highly Nonlinear Fibers and Quantum Applications Coverage of biomedical applications

Integrated Optics

Photonic devices lie at the heart of the communications revolution, and have become a large and important part of the electronic engineering field, so much so that many colleges now treat this as a subject in its own right. With this in mind, the author has put together a unique textbook covering every major photonic device, and striking a careful balance between theoretical and practical concepts. The book assumes a basic knowledge of optics, semiconductors and electromagnetic waves. Many of the key background concepts are reviewed in the first chapter. Devices covered include optical fibers, couplers, electro-optic devices, magneto-optic devices, lasers and photodetectors. Problems are included at the end of each chapter and a solutions set is available. The book is ideal for senior undergraduate and graduate courses, but being device driven it is also an excellent engineers' reference.

Design and Development of Optical Dispersion Characterization Systems

Self-contained coverage of topics ranging from elementary theory of waves and vibrations in strings to three-dimensional theory of waves in thick plates. Over 100 problems.

The Scaled Boundary Finite Element Method

This book is intended to provide expert guidance through the properties of photonic crystal fibers, with a specific focus on the telecommunication aspects. This is the first book to report a complete overview of photonic crystal fiber analysis and design for telecom applications. The authors believe that photonic crystal fibers can revolutionize the field of guided optics and its applications.

Optical Fibers

A complete survey of modern design and analysis techniques for optical waveguides. This volume thoroughly details modern and widely accepted methods for designing the optical waveguides used in telecommunications systems. It offers a straightforward presentation of the sophisticated techniques used in waveguide analysis and enables a quick grasp of modern numerical methods with easy mathematics. The book is intended to guide the reader to a comprehensive understanding of optical waveguide analysis through self-study. This comprehensive presentation includes:

- * An extensive and exhaustive list of mathematical manipulations
- * Detailed explanations of common design methods: finite element method (FEM), finite difference method (FDM), beam propagation method (BPM), and finite difference time-domain method (FD-TDM)
- * Explanations for numerical solutions of optical waveguide problems with sophisticated techniques used in modern computer-aided design (CAD) software
- * Solutions to Maxwell's equations and the Schrodinger equation

The authors provide excellent self-study material for practitioners, researchers, and students, while also presenting detailed mathematical manipulations that can be easily understood by readers who are unfamiliar with them. *Introduction to Optical Waveguide Analysis* presents modern design methods in a comprehensive and easy-to-understand format.

Crystal Nonlinear Optics

Most available books on computational electrodynamics are focused on FDTD, FEM, or other specific technique developed in microwave engineering. In contrast, *Fourier Modal Method and Its Applications in Computational Nanophotonics* is a complete guide to the principles and detailed mathematics of the up-to-date Fourier modal method of optical analysis. It takes readers through the implementation of MATLAB® codes for practical modeling of well-known and promising nanophotonic structures. The authors also address the limitations of the Fourier modal method. Features:

- Provides a comprehensive guide to the principles, methods, and mathematics of the Fourier modal method
- Explores the emerging field of computational nanophotonics
- Presents clear, step-by-step, practical explanations on how to use the Fourier modal method for photonics and nanophotonics applications
- Includes the necessary MATLAB codes, enabling readers to construct their own code

Using this book, graduate students and researchers can learn about nanophotonics simulations through a comprehensive treatment of the mathematics underlying the Fourier modal method and examples of practical problems solved with MATLAB codes.

More Physics with MATLAB

The great interest in photonic crystals and their applications in the last 15 years is being expressed in the publishing of a large number of monographs, collections, textbooks and tutorials, where existing knowledge concerning - eration principles of photonic crystal devices and microstructured ?bers, their mathematical description, well-known and novel applications of such technologies in photonics and optical communications are presented. They challenge authors of new books to cover the gaps still existing in the literature and highlight and popularize of already known material in a new and original manner.

Authors of this book believe that the next step towards wide application of photonic crystals is the solution of many practical problems of design and computation of the specific photonic crystal-based devices aimed at the specific technical application. In order to make this step, it is necessary to increase the number of practitioners who can solve such problems independently. The aim of this book is to extend the group of researchers, developers and students, who could practically use the knowledge on the physics of photonic crystals together with the knowledge and skills of independent calculation of basic characteristics of photonic crystals and modeling of various elements of integrated circuits and optical communication systems created on the basis of photonic crystals. The book is intended for qualified readers, specialists in the field of optics and photonics, students of higher courses, master degree students and PhD students. As an introduction to the subject, the book contains the basics of wave optics and radiation propagation in simple guiding media such as planar waveguides and step-index fibers.

Optical and Wireless Technologies

Fiber optics is the hottest topic in communications and this book from the world's leading experts clearly lays out all the details of optical communications engineering * Essential technical guide and solutions kit for the super-fast, super-broad fiber systems and devices powering the fastest-growing communications infrastructure * Methods for generating above peak performance * Clear explanations and answers to tough challenges for WDM, DWDM, amplifiers, solitons, and other key technologies

Wave Motion in Elastic Solids

Photonics Modeling and Design delivers a concise introduction to the modeling and design of photonic devices. Assuming a general knowledge of photonics and the operating principles of fibre and semiconductor lasers, this book: Describes the analysis of the light propagation in dielectric media Discusses heat diffusion and carrier transport Applies the presented theory to develop fibre and semiconductor laser models Addresses the propagation of short optical pulses in optical fibres Puts all modeling into practical context with examples of devices currently in development or on the market Providing hands-on guidance in the form of MATLAB® scripts, tips, and other downloadable content, Photonics Modeling and Design is written for students and professionals interested in modeling photonic devices either for gaining a deeper understanding of the operation or to optimize the design.

MATLAB® Recipes for Earth Sciences

This practical book and accompanying software enables you to quickly and easily work out challenging microwave engineering and high-frequency electromagnetic problems using the finite element method (FEM) Using clear, concise text and dozens of real-world application examples, the book provides a detailed description of FEM implementation, while the software provides the code and tools needed to solve the three major types of EM problems: guided propagation, scattering, and radiation.

Photonic Crystals

Digital sound synthesis has long been approached using standard digital filtering techniques. Newer synthesis strategies, however, make use of physical descriptions of musical instruments, and allow for much more realistic and complex sound production and thereby synthesis becomes a problem of simulation. This book has a special focus on time domain finite difference methods presented within an audio framework. It covers time series and difference operators, and basic tools for the construction and analysis of finite difference schemes, including frequency-domain and energy-based methods, with special attention paid to problems inherent to sound synthesis. Various basic lumped systems and excitation mechanisms are covered, followed by a look at the 1D wave equation, linear bar and string vibration, acoustic tube modelling, and linear membrane and plate vibration. Various advanced topics, such as the nonlinear vibration of strings and plates, are given an elaborate treatment. Key features: Includes a historical overview of digital sound synthesis techniques, highlighting the links between the various physical modelling methodologies. A pedagogical presentation containing over 150 problems and programming exercises, and numerous figures and diagrams, and code fragments in the MATLAB® programming language helps the reader with limited experience of numerical methods reach an understanding of this subject. Offers a complete treatment of all of the major families of musical instruments, including certain audio effects. Numerical Sound Synthesis is suitable for audio and software engineers, and researchers in digital audio, sound synthesis and more general musical acoustics. Graduate students in electrical engineering, mechanical engineering or computer science, working on the more technical side of digital audio and sound synthesis, will also find this book of interest.

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