Numerical Simulation Of Optical Wave Propagation With Examples In Matlab

We have developed a website on Numerical Modeling of Optical Waveguides (http://optical-waveguides-modeling.net) that contains a Waveguide Tutorial, which summarizes basic concepts of light propagation in optical waveguides, dispersive, and nonlinear properties, and a broad collection of free and commercial software available for numerical simulations of waveguiding structures, supplied with a short summary of its capabilities and potential applications, a list of references to research papers that utilize a particular software package, and a link to the software provider's page. We provide the visitors of our website with an online file-sharing facility to be used to exchange simulation codes, documentation, and other relevant.

This book introduces optics through the use of simulations, namely, Python. Students, researchers, and engineers will be able to use Python simulations to better understand the basic concepts of optics and professors will be able to provide immediate visualizations of the complex ideas. Readers will learn programming in Python. Throughout this book, a simulated laboratory will be provided where students can learn by "hands on" exploration. The text will cover most of the standard topics of traditional optics.

This book provides a comprehensive overview of the photonic sensing field by covering plasmonics, photonic crystal, and SOI techniques from theory to real sensing applications. A literature review of ultra-sensitive photonic sensors, including their design and application in industry, makes this a self-contained and comprehensive resource for different types of sensors, with high value to the biosensor sector in particular. The book is organized into four parts: Part I covers the basic theory of wave propagation, basic principles of sensing, surface plasmon resonance, and silicon photonics; Part II details the computational modeling techniques for the analysis and prediction of photonic sensors; Part III and Part IV cover the various mechanisms and light matter interaction scenarios behind the design of photonic sensors including photonic crystal fiber sensors and SOI sensors. This book is appropriate for academics and researchers specializing in photonic sensors; graduate students in the early and intermediate stages working in the areas of photonics, sensors, biophysics, and biomedical engineering; and to biomedical, environmental, and chemical engineers.

The Boussinesq equation is the first model of surface waves in shallow water that considers the nonlinearity and the dispersion and their interaction as a reason for wave stability known as the Boussinesq paradigm. This balance bears solitary waves that behave like quasi-particles. At present, there are some Boussinesq-like equations. The prevalent part of the known analytical and numerical solutions, however, relates to the 1d case while for multidimensional cases, almost nothing is known so far. An exclusion is the solutions of the Kadomtsev-Petviashvili equation. The difficulties originate from the lack of known analytic initial conditions and the nonintegrability in the multidimensional case. Another problem is which kind of nonlinearity will keep the temporal stability of localized solutions. The system of coupled nonlinear Schroedinger equations known as well as the vector Schroedinger equation is a soliton supporting dynamical system. It is considered as a model of light propagation in Kerr isotropic media. Along with that, the phenomenology of the equation opens a prospect of investigating the quasi-particle behavior of the interacting solitons. The initial polarization of the vector Schroedinger equation and its evolution evolves from the vector nature of the model. The existence of exact (analytical) solutions usually is rendered to simpler models, while for the vector Schroedinger equation such solutions are not known. This determines the role of the numerical schemes and approaches. The vector Schroedinger equation is a spring-board for combining the reduced integrability and conservation laws in a discrete level. The experimental observation and measurement of ultrashort pulses in waveguides is a hard job and this is the reason and stimulus to create mathematical models for computer simulations, as well as reliable algorithms for treating the governing equations. Along with the nonintegrability, one more problem appears here - the multidimensionality and necessity to split and linearize the operators in the appropriate way.

Programming for Computations - MATLAB/Octave

Lasers, Modulators, Photodetectors, Solar Cells, and Numerical Methods, Vol. 2

Diffractive Nanophotonics

Computational Fourier Optics

Handbook of Optoelectronic Device Modeling and Simulation

Numerical Simulation of Optical Wave Propagation is solely dedicated to wave-optics simulations. The book discusses digital Fourier transforms (FT), FT-based operations, multiple methods of wave-optics simulations, sampling requirements, and simulations in atmospheric turbulence.

Nonlinear Optics probes in great depth quadratic and cubic nonlinearities, photorefractive nonlinear optics, the nonlinear optical properties of nematic liquid crystals, and photonic bandgap structures. This reference places core physical principles and theoretical concepts in dialogue with contemporary applications and research and presents

Authored by the internationally renowned Jos é M. Carcione, Wave Fields in Real Media: Wave Propagation in Anisotropic, Anelastic, Porous and Electromagnetic Media examines the differences between an ideal and a real description of wave propagation, starting with the introduction of relevant stress-strain relations. The combination of this relation and the equations of momentum conservation lead to the equation of motion. The differential formulation is written in terms of memory variables, and Biot's theory is used to describe wave propagation in porous media. For each rheology, a plane-wave analysis is performed in order to understand the physics of wave propagation. This book contains a review of the main direct numerical methods for solving the equation of motion in the time and space domains. The emphasis is on geophysical applications for seismic exploration, but researchers in the fields of earthquake seismology, rock acoustics, and material science - including many branches of acoustics of fluids and solids - may also find this text useful. New to this edition: This new edition presents the fundamentals of wave propagation in Anisotropic, Anelastic, Porous Media while also incorporating the latest research from the past 7 years, including that of the author. The author presents all the equations and concepts necessary to understand the physics of wave propagation. These equations form the basis for modeling and inversion of seismic and electromagnetic data. Additionally, demonstrations are given, so the book can be used to teach post-graduate courses. Addition of new and revised content is approximately 30%. Examines the fundamentals of wave propagation in anisotropic, anelastic and porous media Presents all equations and concepts necessary to understand the physics of wave propagation, with examples Emphasizes geophysics, particularly, seismic exploration for hydrocarbon reservoirs, which is essential for exploration and production of oil

This invaluable second edition provides more in-depth discussions and examples in various chapters. Based largely on the authors' own in-class lectures as well as research in the area, the comprehensive textbook serves two purposes. The first introduces some traditional topics such as matrix formalism of geometrical optics, wave propagation and diffraction, and some fundamental background on Fourier optics. The second presents the essentials of acousto-optics and electro-optics, and provides the students with experience in modeling the theory and applications using a commonly used software tool MATLAB®. Request Inspection Copy

Wave Propagation in Anisotropic, Anelastic, Porous and Electromagnetic Media

Numerical Methods for Stochastic Partial Differential Equations with White Noise

Phase-Space Optics: Fundamentals and Applications

Understanding Optics with Python

Optics Using MATLAB

Computational Fourier Optics is a text that shows the reader in a tutorial form how to implement Fourier optical theory and analytic methods on the computer. A primary objective is to give students of Fourier optics the capability of programming their own basic wave optic beam propagations and imaging simulations. The book will also be of interest to professional engineers and physicists learning Fourier optics simulation techniques-either as a self-study text or a text for a short course. For more advanced study, the latter chapters and appendices provide methods and examples for modeling beams and pupil functions with more complicated structure, aberrations, and partial coherence. For a student in a course on Fourier optics, this book is a concise, accessible, and practical companion to any of several excellent textbooks on Fourier optical theory.

Recently, the rapid development of radiofrequency (RF)/microwave and photonic/optical waveguide technologies has had a significant impact on the current electronic industrial, medical and information and communication technology (ICT) fields. This book is a self-contained collection of valuable scholarly papers related to waveguide design, modeling, and applications. This book contains 20 chapters that cover three main subtopics of waveguide technologies, namely RF and microwave waveguide, photonic and optical waveguide and waveguide analytical solutions. Hence, this book is particularly useful to the academics, scientists, practicing researchers and postgraduate students whose work relates to the latest waveguide technologies.

Diffractive Nanophotonics demonstrates the utility of the well-established methods of diffractive computer optics in solving nanophotonics tasks. It is concerned with peculiar properties of laser light diffraction by microoptics elements with nanoscale features and light confinement in subwavelength space regions. Written by recognized experts in this field, the book covers in detail a wide variety of advanced methods for the rigorous simulation of light diffraction. The authors apply their expertise to addressing cutting-edge problems in nanophotonics. Chapters consider the basic equations of diffractive nanophotonics and related transformations and numerical methods for solving diffraction problems under strict electromagnetic theory. They examine the diffraction of light on two-dimensional microscopic objects of arbitrary shape and present a numerical method for solving the problem of diffraction on periodic diffractive micro- and nanostructures. This method is used in modern trends in nanophotonics, such as plasmonics, metamaterials, and nanometrology. The book describes the simulation of electromagnetic waves in nanophotonic devices and discusses two methods of calculating the spatial modes of microstructured photonic crystal fibres—a relatively new class of optical fibres with the properties of photonic crystals. The book explains the theory of paraxial and non-paraxial laser beams with axial symmetry and an orbital angular momentum—called vortex beams—which are used for optical trapping and rotating micro- and nanoparticles in a ring in the cross-sectional plane of the beam. The final chapter discusses methods for calculating the force and torque exerted by the electromagnetic field focused onto the microparticle of arbitrary form, whose dimensions are comparable with the wavelength of light.

Most of the Earth''s surface is covered by water. Our everyday lives and activities are affected by water waves in oceans, such as the tsunami that occurred in the Indian Ocean on 26 December 2004. This indicates how important it is for us to fully understand water waves, in particular the very large ones. One way to do so is to perform numerical simulation based on the nonlinear theory. Considerable research advances have been made in this area over the past decade by developing various numerical methods and applying them to emerging problems; however, until now there has been no comprehensive book to reflect these advances. This unique volume aims to bridge this gap. This book contains 18 self-contained chapters written by more than 50 authors from 12 different countries, many of whom are world-leading experts in the field. Each chapter is based mainly on the pioneering work of the authors and their research teams over the past decades.The chapters altogether deal with almost all numerical methods that have so far been employed to simulate nonlinear water waves and cover many important and very interesting applications, such as overturning waves, breaking waves, waves generated by landslides, freak waves, solitary waves, tsunamis, sloshing waves, interaction of extreme waves with beaches, interaction with fixed structures, and interaction with free-response floating structures. Therefore, this book provides a comprehensive overview of the state-of-the-art research and key achievements in numerical modeling of nonlinear water waves, and serves as a unique reference for postgraduates, researchers and senior engineers working in industry.

Implementing Large Eddy Simulation to Numerical Simulation of Optical Wave Propagation

Orbital Angular Momentum States of Light

Theory and Applications

Summaries of Papers Presented at the Numerical Simulation and Analysis in Guided-Wave Optics and Optoelectronics Workshop, February 5, 1989, Houston Texas

Introduction to Computer Holography

Since publication of the first edition of this text in 1998, there have been several new, important developments in the theory of beam wave propagation through a random medium, which have been incorporated into this second edition. Also new to this edition are models for the scintillation index under moderate-to-strong irradiance fluctuations; models for aperture averaging based on ABCD ray matrices; beam wander and its effects on scintillation; theory of partial coherence of the source; models of rough targets for ladar applications; phase fluctuations; analysis of other beam shapes; plus expanded analysis of free-space optical communication systems and imaging systems.

The goal of this book is to discuss fundamentals of electromagnetic wave propagation, especially radiowave propagation, groundwave propagation, surface wave propagation, maritime communication, radar applications in terms of parabolic equation modeling and simulation approaches This is the first book on the guided wave propagation model in nearly two decades. This book will cover several new applications. The book also introduces several simple and sophisticated MATLAB scripts as well as virtual electromagnetic tools for several well-known electromagnetic propagation problems.

This book covers basic- to expert-level applications in computer holography, a strong candidate for the ultimate 3D display technology. The computer holography developed in the course of the past decade represents the basis of wave optics. Accordingly, the book presents the basic theory of wave optics and practical techniques for handling wave fields by means of the fast Fourier transform. Numerical techniques based on polygons, as well as mask-based techniques, are also presented for calculating the optical fields of virtual 3D models with occlusion processing. The book subsequently describes simulation techniques for very large-scale optical fields, and addresses the basics and concrete applications of simulation, offering a valuable resource for readers who need to employ it in the context of developing optical devices. To aid in comprehension, the main content is complemented by numerous examples of optical fields and photographs of reconstructed 3D images.

This book presents computer programming as a key method for solving mathematical problems. There are two versions of the book, one for MATLAB and one for Python. The book was inspired by the Springer book TCSE 6: A Primer on Scientific Programming with Python (by Langtangen), but the style is more accessible and concise, in keeping with the needs of engineering students. The book outlines the shortest possible path from no previous experience with programming to a set of skills that allows the students to write simple programs for solving common mathematical problems with numerical methods in engineering and science courses. The emphasis is on generic algorithms, clean design of programs, use of functions, and automatic tests for verification.

Numerical Simulation Methods for Wave Propagation Through Optical Waveguides

Numerical Methods in Photonics

Numerical Simulation of Water Waves

Numerical Simulation and Analysis in Guided-wave Optics and Optoelectronics

Nonlinear Optics

Optics Using MATLAB provides a functional overview of the development of MATLAB code that can be used to enhance and increase one's understanding of optics though the use of visualization tools. The book ties a variety of optical topics to MATLAB programming activities and can act as a supplement to other textbooks or can stand alone. Part I focuses on a wide range of basic programming fundamentals using MATLAB and includes such topics as curve fitting, image processing, and file storage. Part II provides a review of selected topics in optics and demonstrates how these can be explored using MATLAB scripts. Part III discusses how to use MATLAB to improve the usability of custom programs through graphical user interfaces and incorporation of other programming languages. Those who need flexibility and special calculations in their optical design or optical engineering work will find value in the book's explanations and examples of user-programmable software.

Fundamentals of Optical Waveguides is an essential resource for any researcher, professional or student involved in optics and communications engineering. Any reader interested in designing or actively working with optical devices must have a firm grasp of the principles of lightwave propagation. Katsunari Okamoto has presented this difficult technology clearly and concisely with several illustrations and equations. Optical theory encompassed in this reference includes coupled mode theory, nonlinear optical effects, finite element method, beam propagation method, staircase concatenation method, along with several central theorems and formulas. Since the publication of the well-received first edition of this book, planar lightwave circuits and photonic crystal fibers have fully matured. With this second edition the advances of these fibers along with other improvements on existing optical technologies are completely detailed. This comprehensive volume enables readers to fully analyze, design and simulate optical atmospheres. Exceptional new chapter on Arrayed-Waveguide Grating (AWG) In-depth discussion of Photonic Crystal Fibers (PCFs) Thorough explanation of Multimode Interference Devices (MMI) Full coverage of polarization Mode Dispersion (PMD)

Simulation and modeling using numerical methods is one of the key instruments in any scientific work. In the field of photonics, a wide range of numerical methods are used for studying both fundamental optics and applications such as design, development, and optimization of photonic components. Modeling is key for developing improved photonic devices and reducing development time and cost. Choosing the appropriate computational method for a photonics modeling problem requires a clear understanding of the pros and cons of the available numerical methods. Numerical Methods in Photonics presents six of the most frequently used methods: FDTD, FDFD, 1+1D nonlinear propagation, modal method, Green's function, and FEM. After an introductory chapter outlining the basics of Maxwell's equations, the book includes self-contained chapters that focus on each of the methods. Each method is accompanied by a review of the mathematical principles in which it is based, along with sample scripts, illustrative examples of characteristic problem solving, and exercises. MATLAB® is used throughout the text. This book provides a solid basis to practice writing your own codes. The theoretical formulation is complemented by sets of exercises, which allow you to grasp the essence of the modeling tools.

Orbital Angular Momentum States of Light provides an in-depth introduction to modelling of long-range propagation of orbital angular momentum (OAM) modes as well as more general structured light beams through atmospheric turbulence. Starting with angular spectrum method for diffraction and description of structured light states, the book discusses the technical details related to wave propagation through atmospheric turbulence. The review of historical as well as more recent ideas in this topical area, along with computer simulation codes, makes this book a useful reference to researchers and optical engineers interested in developing and testing of free-space applications of OAM states of light. ?Key Features Includes modelling of long-range propagation using the angular spectrum approach Presents basic description of turbulence propagation using single or multi-phase screen models Provides information on advanced topics such as propagation polarization of singularities through turbulence Provides discussion on the spiral phase quadrature transform and its application for robust beam engineering Includes accompanying open-source software code snippets for modelling the propagation of scalar and vector beams through turbulence

Numerical Simulation of Optical Wave Propagation Through Random Media

Nonlinear Waves

Advances in Numerical Simulation of Nonlinear Water Waves

Fundamentals and Applications

Theory, Computer Simulation, Experiment

A comprehensive cross section of phase-space optics This definitive volume highlights an elegant, unified approach to optical rays, waves, and system design using cutting-edge phase-space techniques. Phase-Space Optics: Fundamentals and Applications details theoretical concepts of phase space as well as novel engineering applications in specific disciplines. This authoritative guide includes full coverage of sampling, superresolution imaging, and the phase-space interpretation of ultrafast optics. Work with Wigner optics, analyze phase-space equations, develop wave propagation models, and gain a new understanding of optical sources and systems. Discover how to: Describe optical phenomena using Wigner and ambiguity functions Perform phase-space rotations using ray transformation matrices Influence the trade-off between pupil size and depth of field Analyze and design optical signals using the Radon-Wigner transform Accomplish superresolution by squeezing phase space Interpret the intimate relationship between radiometry and coherence Use basic algebra to discover self-imaging, Fresnel diffraction, and the Talbot effect Develop discrete models, sampling criteria, and interpolation formulae Work with ultrafast processes and complex space-time structures

Optoelectronic devices are now ubiquitous in our daily lives, from light emitting diodes (LEDs) in many household appliances to solar cells for energy. This handbook shows how we can probe the underlying and highly complex physical processes using modern mathematical models and numerical simulation for optoelectronic device design, analysis, and performance optimization. It reflects the wide availability of powerful computers and advanced commercial software, which have opened the door for non-specialists to perform sophisticated modeling and simulation tasks. The chapters comprise the know-how of more than a hundred experts from all over the world. The handbook is an ideal starting point for beginners but also gives experienced researchers the opportunity to renew and broaden their knowledge in this expanding field.

This book serves two purposes: first to introduce readers to the concepts of geometrical optics, physical optics and techniques of optical imaging and image processing, and secondly to provide them with experience in modeling the theory and applications using the commonly used software tool MATLAB®. A comprehensively revised version of the authors' earlier book

Principles of Applied Optics, Contemporary Optical Image Processing with MATLAB brings out the systems aspect of optics. This includes ray optics, Fourier Optics, Gaussian beam propagation, the split-step beam propagation method, holography and complex spatial filtering, ray theory of holograms, optical scanning holography, acousto-optic image processing, edge enhancement and correlation using photorefractive materials, holographic phase distortion correction, to name a few. MATLAB examples are given throughout the text. MATLAB is emphasized since it is now a widely accepted software tool very routinely used in signal processing. A sizeable portion of this book is based on the authors' own in-class presentations, as well as research in the area. Instructive problems and MATLAB assignments are included at the end of each Chapter to enhance even further the value of this book to its readers. MATLAB is a registered trademark of The MathWorks, Inc.

This tutorial introduces the theory and applications of MTF, used to specify the image quality achieved by an imaging system. It covers basic linear systems theory and the relationship between impulse response, resolution, MTF, OTF, PTF, and CTF. Practical measurement and testing issues are discussed.

Viscous Drag Reduction in Boundary Layers

A Gentle Introduction to Numerical Simulations with MATLAB/Octave

Numerical Simulation and Analysis in Guided-Wave Optics

Numerical Simulation in Guided-wave Optics and Optoelectronics

Emerging Waveguide Technology

This book discusses the numerical simulation of water waves, which combines mathematical theories and modern techniques of numerical simulation to solve the problems associated with waves in coastal, ocean, and environmental engineering. Bridging the gap between practical mathematics and engineering, the book describes wave mechanics, establishment of mathematical wave models, modern numerical simulation techniques, and applications of numerical models in engineering. It also explores environmental issues related to water waves in coastal regions, such as pollutant and sediment transport, and introduces numerical wave flumes and wave basins. The material is self-contained, with numerous illustrations and tables, and most of the mathematical and engineering concepts are presented or derived in the text. The book is intended for researchers, graduate students and engineers in the fields of hydraulic, coastal, ocean and environmental engineering with a background in fluid mechanics and numerical simulation methods.

This book covers numerical methods for stochastic partial differential equations with white noise using the framework of Wong-Zakai approximation. The book begins with some motivational and background material in the introductory chapters and is divided into three parts. Part I covers numerical stochastic ordinary differential equations. Here the authors start with numerical methods for SDEs with delay using the Wong-Zakai approximation and finite difference in time. Part II covers temporal white noise. Here the authors consider SPDEs as PDEs driven by white noise, where discretization of white noise (Brownian motion) leads to PDEs with smooth noise, which can then be treated by numerical methods for PDEs. In this part, recursive algorithms based on Wiener chaos expansion and stochastic collocation methods are presented for linear stochastic advection-diffusion-reaction equations. In addition, stochastic Euler equations are exploited as an application of stochastic collocation methods, where a numerical comparison with other integration methods in random space is made. Part III covers spatial white noise. Here the authors discuss numerical methods for nonlinear elliptic equations as well as other equations with additive noise. Numerical methods for SPDEs with multiplicative noise are also discussed using the Wiener chaos expansion method. In addition, some SPDEs driven by non-Gaussian white noise are discussed and some model reduction methods (based on Wick-Malliavin calculus) are presented for generalized polynomial chaos expansion methods. Powerful techniques are provided for solving stochastic partial differential equations. This book can be considered as self-contained. Necessary background knowledge is presented in the appendices. Basic knowledge of probability theory and stochastic calculus is presented in Appendix A. In Appendix B some semi-analytical methods for SPDEs are presented. In Appendix C an introduction to Gauss quadrature is provided. In Appendix D, all the conclusions which are needed for proofs are presented, and in Appendix E a method to compute the convergence rate empirically is included. In addition, the authors provide a thorough review of the topics, both theoretical and computational exercises in the book with practical discussion of the effectiveness of the methods. Supporting Matlab files are made available to help illustrate some of the concepts further. Bibliographic notes are included at the end of each chapter. This book serves as a reference for graduate students and researchers in the mathematical sciences who would like to understand state-of-the-art numerical methods for stochastic partial differential equations with white noise.

Explosion Hazards and Evaluation presents the principles and applications of explosion hazards evaluation. The text is organized into nine chapters. Chapters 1 and 2 discuss the energy release processes which generate accidental explosions, and the resulting development of pressure and shock waves in a surrounding atmosphere. The manner in which the "free-field" waves are modified in interacting with structures or other objects in their paths is discussed in Chapter 3. Structural response to blast loading and non-penetrating impact is covered in two chapters, with Chapter 4 including simplified analysis methods and Chapter 5 including numerical methods. Chapter 6 includes a rather comprehensive treatment of generation of fragments and missiles in explosions, and the flight and effects of impact of these objects. Chapter 7 considers thermal radiation of large chemical explosions. Explosions may or may not cause damage or casualty, and various damage criteria have been developed for structures, vehicles, and people. These criteria are presented in Chapter 8. General procedures for both the postmortem evaluation of accidental explosions and for design for blast and impact resistance are reviewed in Chapter 9. Engineers, scientists, and plant safety personnel will find the book very useful.

INDUSTRIAL MOTOR CONTROL 7E is an integral part of any electrician training. Comprehensive and up to date, this book provides crucial information on basic relay control systems, programmable logic controllers, and solid state devices commonly found in an industrial setting. Written by a highly qualified and respected author, you will find easy-to-follow instructions and essential information on controlling industrial motors and commonly used devices in contemporary industry. INDUSTRIAL MOTOR CONTROL 7E successfully bridges the gap between industrial maintenance and instrumentation, giving you a fundamental understanding of the operation of variable frequency drives, solid state relays, and other applications that employ electronic devices. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Fundamentals of Optical Waveguides

Explosion Hazards and Evaluation

Radio Wave Propagation and Parabolic Equation Modeling

Computational Photonic Sensors

Industrial Motor Control

Modern optical fabrication technologies enable the realization of optical components in between very nanoscopic- and macroscopic scales without symmetries and with extraordinary accuracies. This opens up novel possibilities in the design of modern optical system. Nevertheless, the ability to take direct advantage out of these developments is intrinsically linked to profound numerical simulation tools to analyze, model and design these systems. Consequently, these demands trigger the steady development and improvement of algorithms, which advances the optical design process and therewith the functionality of related devices. It is one aim of this thesis to introduce and to discuss improved numerical techniques to model micro-optical systems. Moreover, it is a second aim of this thesis to also investigate the potential of these improved simulation methodologies to design micro-optical systems. In particular, an illumination concept is introduced, which allows to realize tailored illumination distributions in a highly integrated approach. Finally, it is a third aim of this thesis to use the improved simulation methodologies to solve inverse problems for the characterization of micro-optical components. In particular, the ability to resolve the origin of glass matrix distortions during fiber Bragg grating inscriptions will be discussed. Moreover, a computational sensing concept to characterize optical fibers will be introduced.

Wave or weak turbulence is a branch of science concerned with the evolution of random wave fields of all kinds and on all scales, from waves in galaxies to capillary waves on water surface, from waves in nonlinear optics to quantum fluids. In spite of the enormous diversity of wave fields in nature, there is a common conceptual and mathematical core which allows to describe the processes of random wave interactions within the same conceptual paradigm, and in the same language. The development of this core and its links with the applications is the essence of wave turbulence science (WT) which is an established integral part of nonlinear science.The book comprising seven reviews aims at discussing new challenges in WT and perspectives of its development. A special emphasis is made upon the links between the theory and experiment. Each of the reviews is devoted to a particular field of application (there is no overlap), or a novel approach or idea. The reviews cover a variety of applications of WT, including water waves, optical fibers, WT experiments on a metal plate and observations of astrophysical WT.

This book discusses a new class of photonic devices, known as surface plasmon nanophotonic structures. The book highlights several exciting new discoveries, while providing a clear discussion of the underlying physics, the nanofabrication issues, and the materials considerations involved in designing plasmonic devices with new functionality. Chapters written by the leaders in the field of plasmonics provide a solid background to each topic.

This book provides a clear and accessible introduction to the essential mathematical foundations of linear canonical transforms from a signals and systems perspective. Substantial attention is devoted to how these transforms relate to optical systems and wave propagation. There is extensive coverage of sampling theory and fast algorithms for numerically approximating the family of transforms. Chapters on topics ranging from digital holography to speckle metrology provide a window on the wide range of applications. This volume will serve as a reference for researchers in the fields of image and signal processing, wave propagation, optical information processing and holography, optical system design and modeling, and quantum optics. It will be of use to graduate students in physics and engineering, as well as for scientists in other areas seeking to learn more about this important yet relatively unfamiliar class of integral transformations.

Engineering Optics with MATLAB

Laser Beam Propagation Through Random Media

Theory, Numerical Modeling, and Applications

Linear Canonical Transforms

Advances In Wave Turbulence