

## Optoelectronics And Photonics Principles Practices Solution Manual

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

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allow you to grasp the essence of the modeling tools.

For one-semester, undergraduate-level courses in Optoelectronics and Photonics, in the departments of electrical engineering, engineering physics, and materials science and engineering. This text takes a fresh look at the enormous developments in electro-optic devices and associated materials.

Optoelectronics and Photonics Principles and Practices Prentice Hall

The Handbook of Photonics for Biomedical Science analyzes achievements, new trends, and perspectives of photonics in its application to biomedicine. With contributions from world-renowned experts in the field, the handbook describes advanced biophotonics methods and techniques intensively developed in recent years. Addressing the latest problems in biomedical optics and biophotonics, the book discusses optical and terahertz spectroscopy and imaging methods for biomedical diagnostics based on the interaction of coherent, polarized, and acoustically modulated radiation with tissues and cells. It covers modalities of nonlinear spectroscopic microscopies, photonic technologies for therapy and surgery, and nanoparticle photonic technologies for cancer treatment and UV radiation protection. The text also elucidates the advanced spectroscopy and imaging of normal and pathological tissues. This comprehensive handbook represents the next step in contemporary biophotonics advances. By collecting

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recently published information scattered in the literature, the book enables researchers, engineers, and medical doctors to become familiar with major, state-of-the-art results in biophotonics science and technology.

With emphasis on the physical and engineering principles, this book provides a comprehensive and highly accessible treatment of modern lasers and optoelectronics. Divided into four parts, it explains laser fundamentals, types of lasers, laser electronics & optoelectronics, and laser applications, covering each of the topics in their entirety, from basic fundamentals to advanced concepts. Key features include: exploration of technological and application-related aspects of lasers and optoelectronics, detailing both existing and emerging applications in industry, medical diagnostics and therapeutics, scientific studies and Defence. simple explanation of the concepts and essential information on electronics and circuitry related to laser systems illustration of numerous solved and unsolved problems, practical examples, chapter summaries, self-evaluation exercises, and a comprehensive list of references for further reading This volume is a valuable design guide for R&D engineers and scientists engaged in design and development of lasers and optoelectronics systems, and technicians in their operation and maintenance. The tutorial approach serves as a useful reference for under-graduate and graduate students of lasers and optoelectronics, also PhD

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students in electronics, optoelectronics and physics.

Discussing the principles of physical and geometrical optics from an engineering point of view, this book explains current optical technology and the applications of optical methods in a wide variety of fields, from astronomy and agriculture to medicine and semiconductors. It offers guidance in the selection of optical components for the construction of bread-board models using commercially available, standard components, and provides immediately useful equations without unnecessary mathematical derivations.

This book takes a fresh look at the last three decades and enormous developments in the new electro-optic devices and associated materials. General Treatment and various proofs are at a semiquantitative level without going into detailed physics. Contains numerous worked examples and solved problems. Chapter topics include wave nature of light, dielectric waveguides and optical fibers, semiconductor science and light emitting diodes, photodetectors, photovoltaic devices, and polarization and modulation of light. For the study of optoelectronics by electrical engineers.

Structural colors in living beings are one of the most marvelous arts that nature has ever created during the long history of the evolution. These colors originate from surprisingly sophisticated microstructures which gave rise to a new field of

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research—bionanophotonics. This book occupies a special position among similar books in the field of photonics, because it places a special emphasis on the detailed physical basis for the optical processes that are deeply connected with the structural colors, and also on the biological and physiological bases concerning what a variety of animals are living and how they are seen by human vision. In addition, it contains ample examples for the recent technological advances in photonics that are rooted in the nature.

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.

This is the eBook of the printed book and may not include any media, website access codes, or print supplements that may come packaged with the bound book. For one-

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semester, undergraduate-level courses in Optoelectronics and Photonics, in the departments of electrical engineering, engineering physics, and materials science and engineering. This text takes a fresh look at the enormous developments in electro-optic devices and associated materials.

Over the course of its 60-year history, holography has enabled new insights into the nature of light and has contributed to innovative applications, including many unrelated to optics. Introduction to Holography explains how to use holographic techniques to solve specific problems in a variety of fields. The text focuses on the state of development of existing and emerging holographic applications. Numerical problems are provided at the end of each chapter. After a review of essential optics, the book presents basic holographic principles. It introduces the theory of thick holograms, along with a less demanding and more insightful path to important results based on the work of Jacques Ludman. Examining the use of holography in practice, the author then describes the conditions for successful holography in the laboratory, including various lasers commonly used for holography. He also discusses recording materials and their key holographic characteristics. The final portion of the book deals with applications of holography, including imaging, holographic interferometry, holographic optical elements, and data storage. The text also explores digital and computer-generated holography, light-in-flight and first-arriving light techniques and their applications, polarization holography, and holography for sensing applications. Since its invention in

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1948, holography has evolved into a mature technology with a wide range of applications. This practical guide to the field offers a comprehensive survey of contemporary holographic techniques and applications.

Since the invention of the laser, our fascination with the photon has led to one of the most dynamic and rapidly growing fields of technology. As the reality of all-optical systems comes into focus, it is more important than ever to stay current with the latest advances in the optics and components that enable photonics technology. Comprising chapters drawn from the author's highly anticipated book *Photonics: Principles and Practices*, *Physical Optics: Principles and Practices* offers a detailed and focused treatment for anyone in need of authoritative information on this critical area underlying photonics. Using a consistent approach, the author leads you step-by-step through each topic. Each skillfully crafted chapter first explores the theoretical concepts of each topic, and then demonstrates how these principles apply to real-world applications by guiding you through experimental cases illuminated with numerous illustrations. The book works systematically through the principles of waves, diffraction, interference, diffraction gratings, interferometers, spectrometers, and several aspects of laser technology to build a thorough understanding of how to study and manipulate the behavior of light for various applications. In addition, it includes a four-page insert containing several full-color illustrations as well as a chapter on laboratory safety. Containing several topics presented for the first time in book form, *Physical Optics:*

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Principles and Practices is simply the most modern, detailed, and hands-on text in the field.

The importance of photonics in science and engineering is widely recognized and will continue to increase through the foreseeable future. In particular, applications in telecommunications, medicine, astronomy, industrial sensing, optical computing and signal processing continue to become more diverse. Essentials of Photonics, Second Edition describes the entire range of photonic principles and techniques in detail.

Previously named Essentials of Optoelectronics, this newly named second edition of a bestseller reflects changes that have occurred in this field. The book presents a new approach that concentrates on the physical principles, demonstrating their interdependence, and developing them to explain more complex phenomena. It gives insight into the underlying physical processes in a way that is readable and easy to follow, as well as entirely self-contained. Written by an author with many years of experience in teaching and research, this book includes a detailed treatment of lasers, waveguides (including optical fibres), modulators, detectors, non-linear optics and optical signal processing. This new edition is brought up-to-date with additional sections on photonic crystal fibres, distributed optical-fibre sensing, and the latest developments in optical-fibre communications.

Silicon photonics has evolved rapidly as a research topic with enormous application potential. The high refractive index contrast of silicon-on-insulator (SOI) shows great



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promise for submicron waveguide structures suited for integration on the chip scale in the near-infrared region. Ge- and GeSn-Si heterostructures with different elastic strain levels already provide expansion of the spectral range, high-speed operation, efficient modulation and switching of optical signals, and enhanced light emission and lasing. This book focuses on the integration of heterostructure devices with silicon photonics. The authors have attempted to merge a concise treatment of classical silicon photonics with a description of principles, prospects, challenges, and technical solution paths of adding silicon-based heterostructures. The book discusses the basics of heterostructure-based silicon photonics, system layouts, and key device components, keeping in mind the application background. Special focus is placed on SOI-based waveguide configurations and Ge- and GeSn-Si heterostructure devices for light detection, modulation, and light emission and lasing. The book also provides an overview of the technological and materials science challenges connected with integration on silicon. The first half of the book is mainly for readers who are interested in the topic because of its increasing importance in different fields, while the latter half covers different device structures for light emission, detection, modulation, extension of the wavelength beyond 1.6  $\mu\text{m}$ , and lasing, as well as future challenges. Principles of Electronic Materials and Devices, Third Edition, is a greatly enhanced version of the highly successful text Principles of Electronic Materials and Devices, Second Edition. It is designed for a first course on electronic materials given in

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Materials Science and Engineering, Electrical Engineering, and Physics and Engineering Physics Departments at the undergraduate level. The third edition has numerous revisions that include more beautiful illustrations and photographs, additional sections, more solved problems, worked examples, and end-of-chapter problems with direct engineering applications. The revisions have improved the rigor without sacrificing the original semiquantitative approach that both the students and instructors liked and valued. Some of the new end-of-chapter problems have been especially selected to satisfy various professional engineering design requirements for accreditation across international borders. Advanced topics have been collected under Additional Topics, which are not necessary in a short introductory treatment.

Since the invention of the laser, our fascination with the photon has led to one of the most dynamic and rapidly growing fields of technology. An explosion of new materials, devices, and applications makes it more important than ever to stay current with the latest advances. Surveying the field from fundamental concepts to state-of-the-art developments, *Photonics: Principles and Practices* builds a comprehensive understanding of the theoretical and practical aspects of photonics from the basics of light waves to fiber optics and lasers. Providing self-contained coverage and using a consistent approach, the author leads you step-by-step through each topic. Each skillfully crafted chapter first explores the theoretical concepts of each topic and then demonstrates how these principles apply to real-world applications by guiding you

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through experimental cases illuminated with numerous illustrations. Coverage is divided into six broad sections, systematically working through light, optics, waves and diffraction, optical fibers, fiber optics testing, and laboratory safety. A complete glossary, useful appendices, and a thorough list of references round out the presentation. The text also includes a 16-page insert containing 28 full-color illustrations. Containing several topics presented for the first time in book form, Photonics: Principles and Practices is simply the most modern, comprehensive, and hands-on text in the field.

For one-semester, undergraduate-level courses in Optoelectronics and Photonics, in the departments of electrical engineering, engineering physics, and materials science and engineering. This text takes a fresh look at the enormous developments in electro-optic devices and associated materials—such as Pockels (Lithium Niobate) modulators.

A comprehensive guide to the theory, practice and applications of optical tweezers, combining state-of-the-art research with a strong pedagogic approach.

The combination of laser and optoelectronics with optical fiber technology can enhance the seamless activities of fiber-optic communications and fiber-sensor arena. This book discusses foundations of laser technology, non-linear optics, laser and fiber-optic applications in telecommunication and sensing fields including fundamentals and recent developments in photonics technology. Accumulated chapters cover constituent materials, techniques of measurement of non-linear optical properties of nanomaterials, photonic crystals and pertinent applications in medical, high voltage engineering and, in optical computations and designing

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logic gates.

This 2007 book comprehensively covers the theory, techniques and practice of all types of fiber OPAs and related devices.

In a very short time, lasers advanced from research interest to increasingly useful, commercially available tools for material processing, precision measurements, surgery, communication, and even entertainment. This 1996 book provides the background in theoretical physics necessary to understand engineering applications. It summarises relevant theories of geometrical optics, physical optics, quantum optics, and laser physics and ties them to applications in such areas as fluid mechanics, combustion, surface analysis, material processing and laser machining. Advanced topics such as laser Doppler velocimetry, laser-induced fluorescence, and holography are clearly and thoroughly explained. The book includes numerous examples and homework problems. A unique feature is the advanced research problems in each chapter that simulate real-world research and encourage independent reading and analysis.

This book addresses fabrication as well as characterization and modeling of semiconductor nanostructures in the optical regime, with a focus on nonlinear effects. The visible range as well as near and far infrared spectral region will be considered with a view to different envisaged applications. The book covers the current key challenges of the research in the area, including: exploiting new material platforms, fully extending the device operation into the nonlinear regime, adding re-configurability to the envisaged devices and proposing new modeling tools to help in conceiving new functionalities. • Explores several topics in the field of semiconductor nonlinear nanophotonics, including fabrication, characterization and modeling

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of semiconductor nanostructures in the optical regime, with a focus on nonlinear effects • Describes the research challenges in the field of optical metasurfaces in the nonlinear regime • Reviews the use and achievements of all-dielectric nanoantennas for strengthening the nonlinear optical response • Describes both theoretical and experimental aspects of photonic devices based on semiconductor optical nanoantennas and metasurfaces • Gathers contributions from several leading groups in this research field to provide a thorough and complete overview of the current state of the art in the field of semiconductor nonlinear nanophotonics

Costantino De Angelis has been full professor of electromagnetic fields at the University of Brescia since 1998. He is an OSA Fellow and has been responsible for several university research contracts in the last 20 years within Europe, the United States, and Italy. His technical interests are in optical antennas and nanophotonics. He is the author of over 150 peer-reviewed scientific journal articles.

Giuseppe Leo has been a full professor in physics at Paris Diderot University since 2004, and in charge of the nonlinear devices group of MPQ Laboratory since 2006. His research areas include nonlinear optics, micro- and nano-photonics, and optoelectronics, with a focus on AlGaAs platform. He has coordinated several research programs and coauthored 100 peer-reviewed journal articles, 200 conference papers, 10 book chapters and also has four patents.

Dragomir Neshev is a professor in physics and the leader of the experimental photonics group in the Nonlinear Physics Centre at Australian National University (ANU). His activities span over several branches of optics, including nonlinear periodic structures, singular optics, plasmonics, and photonic metamaterials. He has coauthored 200 publications in international peer-reviewed scientific journals.

Photonic devices lie at the heart of the communications revolution, and have become a large

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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. With the maturation of laser technology in diagnostic and conservation applications, conservation scientists, archeologists, art historians, researchers, and advanced science-oriented students now have the tools necessary for preserving the future of our past-our cultural heritage. Presenting recent developments in the field, *Lasers in the Preservation of Cultural Heritage: Principles and Applications* addresses the basic concepts of laser applications and supplies case studies of analytical, structural diagnostic, and laser cleaning applications. The book provides a comprehensive presentation of the fundamental principles and applications of modern laser technology in the analysis of composition, diagnostics of structural integrity, and conservation of artworks and antiquities. Beginning with an introduction to the basic techniques used in art conservation and archeology, the book describes the fundamental aspects of laser-matter interactions, emphasizing laser diagnostics and laser processing applications. The next few chapters focus on laser-based spectroscopic techniques for the analysis of the composition of materials in art and archaeology, including laser-induced

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breakdown, Raman, and laser-induced fluorescence spectroscopic techniques. The book proceeds to highlight nondestructive diagnostic techniques, laser processing applications, laser applications for the cleaning of paintings and stone, and methods for the removal of encrustations. It concludes with case studies for the conservation of materials like parchment, paper, metal, ivory, and wood, and includes conservation approaches for modern paintings. Bridging science with art, *Lasers in the Preservation of Cultural Heritage* presents a systematic overview of the fundamentals and applications of laser techniques in artwork conservation and archeological science.

As different laser technologies continue to make it possible to change laser parameters and improve beam quality and performance, a multidisciplinary theoretical knowledge and grasp of cutting-edge technological developments also become increasingly important. The revised and updated *Laser Technology, Second Edition* reviews the principles and basic physical laws of lasers needed to learn from past developments and solve the many technical problems arising in this challenging field. The first edition of *Laser Technology* was classified by the Chinese National Education Committee as a "national-level key textbook." This updated second edition logically presents the various types of laser technology currently available and discusses the transmission of information using optical waves with modulating technology. It assesses how to enhance beam energy or power through Q switching, mode-locking, and amplification, and it illustrates how mode selection and frequency stabilizing technology can improve light beam directionality or monochromaticity. The text also covers nonlinear optical

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techniques for obtaining new frequencies and light waves. Features Self-Contained, Independent Chapters for Flexible Use The author presents the fundamentals of physical effects in technical devices and implementation methods to create a clear and systematic understanding of the physical processes of different laser technologies. Technical improvements to enhance laser performance in different applications have given rise to new physical phenomena. These have resulted in a series of new laser branches and fields of applied technologies, such as laser physics, nonlinear optics, laser spectroscopy, laser medicine, and information optoelectronic technology. This book analyzes this growth, stressing basic principles but also including key technical methods and examples where needed to properly combine practical and theoretical coverage of this distinct area.

Praise for the First Edition "Now a new laboratory bible for optics researchers has joined the list: it is Phil Hobbs's Building Electro-Optical Systems: Making It All Work." —Tony Siegman, Optics & Photonics News Building a modern electro-optical instrument may be the most interdisciplinary job in all of engineering. Be it a DVD player or a laboratory one-off, it involves physics, electrical engineering, optical engineering, and computer science interacting in complex ways. This book will help all kinds of technical people sort through the complexity and build electro-optical systems that just work, with maximum insight and minimum trial and error. Written in an engaging and conversational style, this Second Edition has been updated and expanded over the



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previous edition to reflect technical advances and a great many conversations with working designers. Key features of this new edition include: Expanded coverage of detectors, lasers, photon budgets, signal processing scheme planning, and front ends Coverage of everything from basic theory and measurement principles to design debugging and integration of optical and electronic systems Supplementary material is available on an ftp site, including an additional chapter on thermal Control and Chapter problems highly relevant to real-world design Extensive coverage of high performance optical detection and laser noise cancellation Each chapter is full of useful lore from the author's years of experience building advanced instruments. For more background, an appendix lists 100 good books in all relevant areas, introductory as well as advanced. Building Electro-Optical Systems: Making It All Work, Second Edition is essential reading for researchers, students, and professionals who have systems to build. Originally developed by Claude Shannon in the 1940s, information theory laid the foundations for the digital revolution, and is now an essential tool in telecommunications, genetics, linguistics, brain sciences, and deep space communication. In this richly illustrated book, accessible examples are used to introduce information theory in terms of everyday games like '20 questions' before more advanced topics are explored. Online MatLab and Python computer programs provide hands-on experience of information theory in action, and PowerPoint slides give support for teaching. Written in an informal style, with a comprehensive glossary

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and tutorial appendices, this text is an ideal primer for novices who wish to learn the essential principles and applications of information theory.

Since the invention of the laser, our fascination with the photon has led to one of the most dynamic and rapidly growing fields of technology. As the reality of all-optical systems quickly comes into focus, it is more important than ever to have a thorough understanding of light and the optical components used to control it. Comprising chapters drawn from the author's highly anticipated book *Photonics: Principles and Practices*, *Light and Optics: Principles and Practices* offers a detailed and focused treatment for anyone in need of authoritative information on this critical area underlying photonics. Using a consistent approach, the author leads you step-by-step through each topic. Each skillfully crafted chapter first explores the theoretical concepts of each topic, and then demonstrates how these principles apply to real-world applications by guiding you through experimental cases illuminated with numerous illustrations. The book works systematically through light, light and shadow, thermal radiation, light production, light intensity, light and color, the laws of light, plane mirrors, spherical mirrors, lenses, prisms, beamsplitters, light passing through optical components, optical instruments for viewing applications, polarization of light, optical materials, and laboratory safety. Containing several topics presented for the first time in book form, *Light and Optics: Principles and Practices* is simply the most modern, comprehensive, and hands-on text in the field.

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This consistent and systematic review of recent advances in optical antenna theory and practice brings together leading experts in the fields of electrical engineering, nano-optics and nano-photonics, physical chemistry and nanofabrication. Fundamental concepts and functionalities relevant to optical antennas are explained, together with key principles for optical antenna modelling, design and characterisation. Recognising the tremendous potential of this technology, practical applications are also outlined. Presenting a clear translation of the concepts of radio antenna design, near-field optics and field-enhanced spectroscopy into optical antennas, this interdisciplinary book is an indispensable resource for researchers and graduate students in engineering, optics and photonics, physics and chemistry.

Holographic and speckle interferometry are optical techniques which use lasers to make non-contacting field view measurements at a sensitivity of the wavelength of light on optically rough (i.e. non-mirrored) surfaces. They may be used to measure static or dynamic displacements, the shape of objects, and refractive index variations of transparent media. As such, these techniques have been applied to the solution of a wide range of problems in strain and vibrational analysis, non-destructive testing (NDT), component inspection and design analysis and fluid flow visualisation. This book provides a self-contained, unified, theoretical analysis of the basic principles and associated opto-electronic techniques (for example Electronic Speckle Pattern Interferometry). In addition, a detailed discussion of experimental design and practical

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application to the solution of physical problems is presented. In this new edition, the authors have taken the opportunity to include a much more coherent description of more than twenty individual case studies that are representative of the main uses to which the techniques are put. The Bibliography has also been brought up to date. *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

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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.

The fields of photonics and phononics encompass the fundamental science of light and sound propagation and interactions in complex structures, as well as its technological applications. This book reviews new and fundamental mathematical tools, computational approaches, and inversion and optimal design methods to address challenging problems in photonics and phononics. An emphasis is placed on analyzing sub-wavelength resonators, super-focusing and super-resolution of electromagnetic and acoustic waves, photonic and phononic crystals, electromagnetic cloaking, and electromagnetic and elastic metamaterials and metasurfaces. Throughout this book, the authors demonstrate the power of layer potential techniques for solving challenging problems in photonics and phononics when they are combined with asymptotic analysis. This book might be of interest to researchers and graduate students working in the fields of applied and computational mathematics, partial differential equations, electromagnetic theory, elasticity, integral equations, and inverse and optimal design problems in photonics and phononics.

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This book provides a broad overview of photonic crystals and, as the title suggests, covers their principles and applications. It is written from a physics point of view with an emphasis on materials science. Equations are well explained and often completely avoided to increase the readability of the book. The book is divided into eight chapters, starting with a brief introduction. The second chapter deals with different dimensionalities of the photonic crystals and their properties. The third chapter is very interestingly written and provides a survey of the various synthesis methods used for production of photonic crystals, including chemical routes, lithography, and self-assembly of colloidal photonic crystals. Chapters 4–8 constitute the bulk of the book and provide examples of applications of these photonic crystals. Chapter 4 offers a good explanation of optical switching. Bandgap and defect mode switching are also brought into focus along with many other mechanisms—14 different switching mechanisms in all, including thermal, electro, and magneto switching. Frequency tuning of photonic crystal filters with special attention to nanosize photonic crystals is illustrated, providing a direct perspective on applications of these materials in integrated photonic circuits. The transition from chapter 5 to 6 dealing with photonic crystal lasers is smooth, especially after a clear description of frequency tuning. Here, one- to three-dimensional photonic lasers are explained along with laser oscillations produced by a variety of microcavity methods. Metallodielectric and liquid-crystal photonic lasers are equally well illustrated. Chapter 7 introduces logic devices based on photonic crystals.

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This chapter clearly explains, with the help of simple illustrations, how to obtain AND, OR, and XOR logic gates. Chapter 8 concludes the book by presenting possible applications, including gas, chemical, fluid, and cell sensing; their workings are very well described from a fundamental point of view. The diagrams and illustrations are appropriate and eye catching. There are ample references; thus readers are able to find more detailed information to satisfy their curiosity if the book does not suffice. Even though the introduction provides basics of these photonic crystals, I do get the impression that the bigger picture is missing. A nonexpert may not understand the direct application of such materials right from the beginning of the book. A flowchart or a diagram of these photonic crystals, illustrating applications in daily life at the beginning of the book, could attract a broader readership. In this regard, I believe that this book is most adapted to physicists with a materials science background or vice versa. However, one should take into consideration that the principles of photonic crystals cannot be explained without physics, and therefore the quality of this book remains intact and could very well serve as a textbook for future physicists.

This book addresses material growth, device fabrication, device application, and commercialization of energy-efficient white light-emitting diodes (LEDs), laser diodes, and power electronics devices. It begins with an overview on basics of semiconductor materials, physics, growth and characterization techniques, followed by detailed discussion of advantages, drawbacks, design issues, processing, applications, and key

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challenges for state of the art GaN-based devices. It includes state of the art material synthesis techniques with an overview on growth technologies for emerging bulk or free standing GaN and AlN substrates and their applications in electronics, detection, sensing, optoelectronics and photonics. Wengang (Wayne) Bi is Distinguished Chair Professor and Associate Dean in the College of Information and Electrical Engineering at Hebei University of Technology in Tianjin, China. Hao-chung (Henry) Kuo is Distinguished Professor and Associate Director of the Photonics Center at National Chiao-Tung University, Hsin-Tsu, Taiwan, China. Pei-Cheng Ku is an associate professor in the Department of Electrical Engineering & Computer Science at the University of Michigan, Ann Arbor, USA. Bo Shen is the Cheung Kong Professor at Peking University in China.

A concise, yet deep introduction to geometrical optics, developing the practical skills and research techniques routinely used in modern laboratories. Suitable for both students and self-learners, this accessible text teaches readers how to build their own optical laboratory, and design and perform optical experiments.

One of the Top Selling Physics Books according to YBP Library Services The exotic effects of slow light have been widely observed in the laboratory. However, current literature fails to explore the wider field of slow light in photonic structures and optical fibers. Reflecting recent research, *Slow Light: Science and Applications* presents a comprehensive introduction to slow light and its potential applications, including



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storage, switching, DOD applications, and nonlinear optics. The book covers fundamentals of slow light in various media, including atomic media, semiconductors, fibers, and photonic structures. Leading authorities in such diverse fields as atomic vapor spectroscopy, fiber amplifiers, and integrated optics provide an interdisciplinary perspective. They uncover potential applications in both linear and nonlinear optics. While it is impossible to account for all the captivating developments that have occurred in the last few years, this book provides an exceptional survey of the current state of the slow light field.

Since it was first published in 1995, Photonic Crystals has remained the definitive text for both undergraduates and researchers on photonic band-gap materials and their use in controlling the propagation of light. This newly expanded and revised edition covers the latest developments in the field, providing the most up-to-date, concise, and comprehensive book available on these novel materials and their applications. Starting from Maxwell's equations and Fourier analysis, the authors develop the theoretical tools of photonics using principles of linear algebra and symmetry, emphasizing analogies with traditional solid-state physics and quantum theory. They then investigate the unique phenomena that take place within photonic crystals at defect sites and surfaces, from one to three dimensions. This new edition includes entirely new chapters describing important hybrid structures that use band gaps or periodicity only in some directions: periodic waveguides, photonic-crystal slabs, and photonic-crystal fibers. The

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authors demonstrate how the capabilities of photonic crystals to localize light can be put to work in devices such as filters and splitters. A new appendix provides an overview of computational methods for electromagnetism. Existing chapters have been considerably updated and expanded to include many new three-dimensional photonic crystals, an extensive tutorial on device design using temporal coupled-mode theory, discussions of diffraction and refraction at crystal interfaces, and more. Richly illustrated and accessibly written, Photonic Crystals is an indispensable resource for students and researchers. Extensively revised and expanded Features improved graphics throughout Includes new chapters on photonic-crystal fibers and combined index-and band-gap-guiding Provides an introduction to coupled-mode theory as a powerful tool for device design Covers many new topics, including omnidirectional reflection, anomalous refraction and diffraction, computational photonics, and much more.

Optical and Molecular Physics: Theoretical Principles and Experimental Methods addresses many important applications and advances in the field. This book is divided into 5 sections: Plasmonics and carbon dots physics with applications Optical films, fibers, and materials Optical properties of advanced materials Molecular physics and diffusion Macromolecular physics Weaving together science and engineering, this new volume addresses important applications and advances in optical and molecular physics. It covers plasmonics and carbon dots physics with applications; optical films, fibers, and materials; optical properties of advanced materials; molecular physics and

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diffusion; and macromolecular physics. This book looks at optical materials in the development of composite materials for the functionalization of glass, ceramic, and polymeric substrates to interact with electromagnetic radiation and presents state-of-the-art research in preparation methods, optical characterization, and usage of optical materials and devices in various photonic fields. The authors discuss devices and technologies used by the electronics, magnetics, and photonics industries and offer perspectives on the manufacturing technologies used in device fabrication.

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