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Fundamentals of Fiber Lasers and Fiber Amplifiers - Vartan V. Ter-Mikirtychev 2019-12-30

This book covers the fundamental aspects of fiber lasers and fiber amplifiers, and includes a wide range of material from laser physics fundamentals to state-of-the-art topics in this rapidly growing field of quantum electronics. This expanded and updated new edition includes substantial new material on nonlinear frequency conversion and Raman fiber lasers and amplifiers, as well as an expanded list of references inclusive of the recent literature in the field. Emphasis is placed on the nonlinear processes taking place in fiber lasers and amplifiers, their similarities, differences to, and their advantages over other solid-state lasers. The reader will learn the basic principles of solid-state physics and optical spectroscopy of laser active centers in fibers, the main operational laser regimes, and will receive practical recommendations and suggestions on fiber laser research, laser applications, and laser product development. The book will be useful for students, researchers, and professional physicists and engineers who work with lasers in the optical and telecommunications field, as well as those in the chemical and biological industries.

Laser Crystals - Alexander A. Kaminskii
2013-06-29

It was a greatest pleasure for me to learn that

Springer-Verlag wished to produce a second edition of my book. In this connection, Dr. H. Lotsch asked me to send him a list of misprints, mistakes, and inaccuracies that had been noticed in the first edition and to make corresponding corrections without disturbing the layout or the typography too much. I accepted this opportunity with alacrity and, moreover, found some free places in the text where I was able to insert some concise, up-to-date information about new lasing compounds and stimulated emission channels. It was also possible to increase the number of reference citations. The reader of the second edition hence has access to more complete data on insulating laser crystals. However, sections on laser-crystal physics have not been updated, because a satisfactory description of the progress made in the last ten years in this field would have required the sections to be extended enormously or even a new book to be written. Moscow, July 1989
ALEXANDER A. KAMINSKII Preface to the First Edition
The greatest reward for an author is the feeling of satisfaction he gets when it becomes clear to him that readers find his work useful. After my book appeared in the USSR in 1975 I received many letters from fellow physicists including colleagues from Western European countries and the USA.

MID-INFRARED FIBER PHOTONICS - Stuart

Jackson 2021-11-26

Mid-Infrared Fibre Photonics: Glass Materials, Fibre Fabrication and Processing, Laser Sources and Devices combines the latest glass chemistry, fibre fabrication and post processing techniques to provide a comprehensive reference on the fundamental science and latest research in fibre photonics for the mid-infrared range. The book systematically reviews the key glass materials systems including fluorides, chalcogenides, and oxides. Each materials chapter includes discussion of composition, structure, thermal, optical and mechanical properties, extrinsic and intrinsic loss mechanisms, materials preparation and purification techniques. Then Mid-Infrared Fibre Photonics: Glass Materials, Fibre Fabrication and Processing, Laser Sources and Devices covers the most relevant fabrication, post-processing, and spectroscopy techniques. Fibre sources are also addressed including fibre sources for continuous wave emission, pulsed emission, and broadband emission. The book concludes with a brief overview of important medical, sensing and defence applications. Systematic coverage of the most relevant materials for mid-infrared fibre photonics including discussion of composition, structure, thermal, optical and mechanical properties, loss mechanisms, materials preparation and purification techniques Reviews the key fabrication and processing techniques of mid-infrared fibre technologies Addresses the important medical, sensing and defence applications

Fiber Lasers - Liang Dong 2016-09-19

The fiber laser, with its humble beginning in the late 1980s, has undergone tremendous development in the past decade or so, transforming itself from a research curiosity to a major force in modern manufacturing. Today, it is revolutionizing our economy by fundamentally changing the way we mark, machine, and process materials on an industrial scale. The recent development of high-power fiber lasers is also fundamentally shaping a wide range of other areas from physical sciences and medicine to geology and space exploration. In the past few years, the tactical deployment of direct energy weapons based on fiber lasers has become a reality. The development of fiber lasers is rooted in a number of technical areas including optical

materials, optical waveguide design, nonlinear optics, optical fiber fabrication, and optical characterization, in addition to optical fiber components, and fiber laser design and architecture. No comprehensive in-depth coverage of such diverse topical areas has appeared in a single book. Many important developments have taken place in the past decade in both academia and industry. This book comprehensively covers the basics, technology and applications of fiber lasers including up-to-date developments in both academia and industry and is aimed to serve as both an introduction and research aid for graduate students, engineers, and scientists who are new to this field and also for veterans in the field

Lasers and Optoelectronics - Anil K. Maini 2013-08-05

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 undergraduate and graduate students of lasers and optoelectronics, also PhD students in electronics, optoelectronics and physics.

The Interaction of High-Power Lasers with Plasmas - Shalom Eliezer 2002-08-16

The Interaction of High-Power Lasers with Plasmas provides a thorough self-contained

discussion of the physical processes occurring in laser-plasma interactions, including a detailed review of the relevant plasma and laser physics. The book analyzes laser absorption and propagation, electron transport, and the relevant plasma waves in detail. It al

Self-focusing: Past and Present - Robert W. Boyd 2008-12-16

Self-focusing has been an area of active scientific investigation for nearly 50 years. This book presents a comprehensive treatment of this topic and reviews both theoretical and experimental investigations of self-focusing. This book should be of interest to scientists and engineers working with lasers and their applications. From a practical point of view, self-focusing effects impose a limit on the power that can be transmitted through a material medium. Self-focusing also can reduce the threshold for the occurrence of other nonlinear optical processes. Self-focusing often leads to damage in optical materials and is a limiting factor in the design of high-power laser systems. But it can be harnessed for the design of useful devices such as optical power limiters and switches. At a formal level, the equations for self-focusing are equivalent to those describing Bose-Einstein condensates and certain aspects of plasma physics and hydrodynamics. There is thus a unifying theme between nonlinear optics and these other disciplines. One of the goals of this book is to connect the extensive early literature on self-focusing, filament-ation, self-trapping, and collapse with more recent studies aimed at issues such as self-focusing of fs pulses, white light generation, and the generation of filaments in air with lengths of more than 10 km. It also describes some modern advances in self-focusing theory including the influence of beam nonparaxiality on self-focusing collapse. This book consists of 24 chapters. Among them are three reprinted key landmark articles published earlier. It also contains the first publication of the 1964 paper that describes the first laboratory observation of self-focusing phenomena with photographic evidence.

Photonics - Ralf Menzel 2013-04-18

Deals with the fundamental properties of photon and light beams, both experimentally and theoretically. It covers the essentials of linear interactions and most of the nonlinear

interactions between light and matter in both the transparent and absorbing cases. About 4000 references open access to original literature.

Fiber Lasers - Johan Meyer 2022-02-03

Over the past two decades, the use of fiber lasers in engineering applications has gradually become established as an engineering discipline on its own. The development of fiber lasers is mainly the result of studies from various domains like photonics, optical sensing, fiber optics, nonlinear optics, and telecommunication. Though many excellent books exist on each of these subjects, and several have been written specifically to address lasers and fiber lasers, it is still difficult to find one book where the diverse core of subjects that are central to the study of fiber laser systems are presented in simple and straight forward way. *Fiber Lasers: Fundamentals with MATLAB Modelling*, is an introduction to the fundamentals of fiber lasers. It provides clear explanations of physical concepts supporting the field of fiber lasers. Fiber lasers' characteristics are analyzed theoretically through simulations derived from numerical models. The authors cover fundamental principles involved in the generation of laser light through both continuous-wave (CW) and pulsing. It also covers experimental configuration and characterization for both CW and Q-switching. The authors describe the simulation of fiber laser systems and propose numerical modelling of various fiber laser schemes. MATLAB® modelling and numerical computational methods are used throughout the book to simulate different fiber laser system configurations. This book will be highly desirable and beneficial for both academics and industry professionals to have ample examples of fiber laser approaches that are well thought out and fully integrated with the subjects covered in the text. This book is written to address these needs.

High Power Diode Lasers - Friedrich Bachmann 2007-05-26

This book summarizes a five year research project, as well as subsequent results regarding high power diode laser systems and their application in materials processing. The text explores the entire chain of technology, from the semiconductor technology, through cooling mounting and assembly, beam shaping and system technology, to applications in the

processing of such materials as metals and polymers. Includes theoretical models, a range of important parameters and practical tips.

Raman Fiber Lasers - Yan Feng 2017-10-05

This book serves as a comprehensive, up-to-date reference about this cutting-edge laser technology and its many new and interesting developments. Various aspects and trends of Raman fiber lasers are described in detail by experts in their fields. Raman fiber lasers have progressed quickly in the past decade, and have emerged as a versatile laser technology for generating high power light sources covering a spectral range from visible to mid-infrared. The technology is already being applied in the fields of telecommunication, astronomy, cold atom physics, laser spectroscopy, environmental sensing, and laser medicine. This book covers various topics relating to Raman fiber laser research, including power scaling, cladding and diode pumping, cascade Raman shifting, single frequency operation and power amplification, mid-infrared laser generation, specialty optical fibers, and random distributed feedback Raman fiber lasers. The book will appeal to scientists, students, and technicians seeking to understand the recent developments and future trends of this promising and multifaceted technology.

Photonic Devices - Jia-ming Liu 2009-06-11

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.

Laser Ablation and Its Applications - Claude Phipps 2007

Laser ablation describes the interaction of intense optical fields with matter, in which atoms are selectively driven off by thermal or nonthermal mechanisms. This is the first book that combines the most recent results in this rapidly advancing field with authoritative treatment of laser ablation and its applications, including the physics of high-power laser-matter interaction.

Ultrashort Pulse Laser Technology - Stefan Nolte 2015-10-19

Ultrashort laser pulses with durations in the femtosecond range up to a few picoseconds provide a unique method for precise materials processing or medical applications. Paired with the recent developments in ultrashort pulse lasers, this technology is finding its way into various application fields. The book gives a comprehensive overview of the principles and applications of ultrashort pulse lasers, especially applied to medicine and production technology. Recent advances in laser technology are discussed in detail. This covers the development of reliable and cheap low power laser sources as well as high average power ultrashort pulse lasers for large scale manufacturing. The fundamentals of laser-matter-interaction as well as processing strategies and the required system technology are discussed for these laser sources with respect to precise materials processing. Finally, different applications within medicine, measurement technology or materials processing are highlighted.

Coherent Laser Beam Combining - Arnaud Brignon 2013-11-13

Laser beam combining techniques allow increasing the power of lasers far beyond what it is possible to obtain from a single conventional laser. One step further, coherent beam combining (CBC) also helps to maintain the very unique properties of the laser emission with respect to its spectral and spatial properties. Such lasers are of major interest for many applications, including industrial, environmental, defense, and scientific applications. Recently, significant progress has been made in coherent beam combining lasers, with a total output power of 100 kW already achieved. Scaling analysis indicates that further increase of output power with excellent beam quality is feasible by using existing state-of-the-art lasers. Thus, the

knowledge of coherent beam combining techniques will become crucial for the design of next-generation highpower lasers. The purpose of this book is to present the more recent concepts of coherent beam combining by world leader teams in the field.

Vertical External Cavity Surface Emitting Lasers - Michael Jetter 2021-09-16

Vertical External Cavity Surface Emitting Lasers Provides comprehensive coverage of the advancement of vertical-external-cavity surface-emitting lasers Vertical-external-cavity surface-emitting lasers (VECSELs) emit coherent light from the infrared to the visible spectral range with high power output. Recent years have seen new device developments - such as the mode-locked integrated (MIXSEL) and the membrane external-cavity surface emitting laser (MECSEL) - expand the application of VECSELs to include laser cooling, spectroscopy, telecommunications, biophotonics, and laser-based displays and projectors. In Vertical External Cavity Surface Emitting Lasers: VECSEL Technology and Applications, leading international research groups provide a comprehensive, fully up-to-date account of all fundamental and technological aspects of vertical external cavity surface emitting lasers. This unique book reviews the physics and technology of optically-pumped disk lasers and discusses the latest developments of VECSEL devices in different wavelength ranges. Topics include OP-VECSEL physics, continuous wave (CW) lasers, frequency doubling, carrier dynamics in SESAMs, and characterization of nonlinear lensing in VECSEL gain samples. This authoritative volume: Summarizes new concepts of DBR-free and MECSEL lasers for the first time Covers the mode-locking concept and its application Provides an overview of the emerging concept of self-mode locking Describes the development of next-generation OPS laser products Vertical External Cavity Surface Emitting Lasers: VECSEL Technology and Applications is an invaluable resource for laser specialists, semiconductor physicists, optical industry professionals, spectroscopists, telecommunications engineers and industrial physicists.

Laser Beam Shaping - Fred M. Dickey 2018-09-03
Laser Beam Shaping: Theory and Techniques addresses the theory and practice of every

important technique for lossless beam shaping. Complete with experimental results as well as guidance on when beam shaping is practical and when each technique is appropriate, the Second Edition is updated to reflect significant developments in the field. This authoritative text: Features new chapters on axicon light ring generation systems, laser-beam-splitting (fan-out) gratings, vortex beams, and microlens diffusers Describes the latest advances in beam profile measurement technology and laser beam shaping using diffractive diffusers Contains new material on wavelength dependence, channel integrators, geometrical optics, and optical software Laser Beam Shaping: Theory and Techniques, Second Edition not only provides a working understanding of the fundamentals, but also offers insight into the potential application of laser-beam-profile shaping in laser system design.

Introduction to Laser Technology - C. Breck Hitz 2012-04-10

The only introductory text on the market today that explains the underlying physics and engineering applicable to all lasers Although lasers are becoming increasingly important in our high-tech environment, many of the technicians and engineers who install, operate, and maintain them have had little, if any, formal training in the field of electro-optics. This can result in less efficient usage of these important tools. Introduction to Laser Technology, Fourth Edition provides readers with a good understanding of what a laser is and what it can and cannot do. The book explains what types of laser to use for different purposes and how a laser can be modified to improve its performance in a given application. With a unique combination of clarity and technical depth, the book explains the characteristics and important applications of commercial lasers worldwide and discusses light and optics, the fundamental elements of lasers, and laser modification.? In addition to new chapter-end problems, the Fourth Edition includes new and expanded chapter material on: Material and wavelength Diode Laser Arrays Quantum-cascade lasers Fiber lasers Thin-disk and slab lasers Ultrafast fiber lasers Raman lasers Quasi-phase matching Optically pumped semiconductor lasers Introduction to Laser Technology, Fourth Edition is an excellent book

for students, technicians, engineers, and other professionals seeking a fuller, more formal introduction to the field of laser technology.

Laser Materials Processing - Michael Bass
2012-12-02

Laser Materials Processing aims to introduce lasers and laser systems to the newcomers to laser terminology and to provide enough background material on lasers to reduce one's hesitation to employ these devices. The book covers the use of lasers in materials processing, including its application in cutting and welding, as well as the principles behind them; laser heat treatment; rapid solidification laser processing at high power density; shaping of materials using lasers; and laser processing of semiconductors. The selection also covers considerations in laser manufacturing and a survey in laser applications. The text is recommended for both experienced laser users, engineers, or scientists yet unfamiliar with the subject. The book is also recommended for those who wish to know about the importance of lasers in the field of materials processing, as the bulk of the book is devoted to the discussions of some of the most important materials processing activities in use or under development.

Image-guided Laser Ablation - Claudio Maurizio Pacella
2019-09-28

This book offers a comprehensive guide to the technical basis of laser ablation, describing and reporting in detail on the latest findings. The world of medicine is currently working to reduce the invasiveness of treatment, in order to improve patients' quality of life. Image-guided ablations are rapidly becoming an effective alternative to several surgical treatments. Among the many techniques available for ablation, laser is still not widely used, though its efficacy has been amply demonstrated. The scientific community is now showing a growing interest in laser techniques for image-guided ablations, and many physicians are willing to start using lasers in their clinical practice. The book is divided into 16 chapters, including historical notes, technical aspects, outcomes of ex-vivo experiments, and results of the application of this technique in various clinical scenarios. It will be of great interest to a broad range of physicians (interventional radiologists, surgeons, gastroenterologists, endocrinologists, urologists),

from less experienced trainees to expert physicians who want to introduce a novel clinical practice.

High-Energy Ecologically Safe HF/DF Lasers
- Victor V. Apollonov
2020-02-13

This book explores new principles of Self-Initiating Volume Discharge for creating high-energy non-chain HF(DF) lasers, as well as the creation of highly efficient lasers with output energy and radiation power in the spectral region of 2.6–5 μm . Today, sources of high-power lasing in this spectral region are in demand in various fields of science and technology including remote sensing of the atmosphere, medicine, biological imaging, precision machining and other special applications. These applications require efficient laser sources with high pulse energy, pulsed and average power, which makes the development of physical fundamentals of high-power laser creation and laser complexes of crucial importance. High-Energy Ecologically Safe HF/DF Lasers: Physics of Self-Initiated Volume Discharge-Based HF/DF Lasers examines the conditions of formation of SSVD, gas composition and the mode of energy input into the gas on the efficiency and radiation energy of non-chain HF(DF) lasers. Key Features: Shares research results on SSVD in mixtures of non-chain HF(DF) lasers Studies the stability and dynamics of the development of SSVD Discusses the effect of the gas composition and geometry of the discharge gap (DG) on its characteristics Proposes recommendations for gas composition and for the method of obtaining SSVD in non-chain HF(DF) lasers Develops simple and reliable wide-aperture non-chain HF(DF) lasers and investigates their characteristics Investigates the possibilities of expanding the lasing spectrum of non-chain HF(DF) lasers

Advanced Lasers - Oleksiy Shulika
2015-04-28

Presenting a blend of applied and fundamental research in highly interdisciplinary subjects of rapidly developing areas, this book contains contributions on the frontiers and hot topics of laser physics, laser technology and laser engineering, and covers a wide range of laser topics, from all-optical signal processing and chaotic optical communication to production of superwicking surfaces, correction of extremely high-power beams, and generation of ultrabroadband spectra. It presents both review-

type contributions and well researched and documented case studies, and is intended for graduate students, young scientist, and emeritus scientist working/studying in laser physics, optoelectronics, optics, photonics, and adjacent areas. The book contains both experimental and theoretical studies, as well as combinations of these two, which is known to be a most useful and interesting form of reporting scientific results, allowing students to really learn from each contribution. The book contains over 130 illustrations.

Lasers in Oral and Maxillofacial Surgery - Stefan Stübinger 2020-03-25

This book provides surgeons with important insights into laser technologies as well as a sound understanding of their current and potential applications within oral and maxillofacial surgery and related disciplines. The opening chapters focus on the relevant physical background, the technology of the typically used lasers, laser-tissue interactions, and the treatment systems. Detailed information is then provided on the various established applications of laser treatments, including in relation to skin and mucosa and the dental hard tissues and bone. Special applications are also described, for example with respect to periodontal surgery, peri-implantitis therapy, photodynamic treatment, holography and additive manufacturing. The book closes by examining technologies that will soon be available for application in hospitals, topics which are currently the subject of research, and laser safety. Beyond surgeons, the book will be of value for engineers and scientists working in the field of medical engineering using lasers.

An Engineering Guide to Photoinjectors - Triveni Rao 2013-04-02

This book is an introduction to the basic theory and engineering of advanced electron beam sources known as photoinjectors. Photoinjectors produce relativistic electrons for exciting new devices such as x-ray free electron lasers and the polarized beams for very high energy physics linear colliders. The chapters are written by renowned experts in the field who share their working knowledge of the technologies needed for designing and building photoinjectors.

Lasers in Dentistry—Current Concepts - Donald J. Coluzzi 2017-09-21

This book provides information on the basic science and tissue interactions of dental lasers and documents the principal current clinical uses of lasers in every dental discipline. The applications of lasers in restorative dentistry, endodontics, dental implantology, pediatric dentistry, periodontal therapy, and soft tissue surgery are clearly described and illustrated. Information is also provided on laser-assisted multi-tissue management, covering procedures such as crown lengthening, gingival troughing, gingival recontouring, and depigmentation. The closing chapters look forward to the future of lasers in dentistry and the scope for their widespread use in everyday clinical practice. When used in addition to or instead of conventional instrumentation, lasers offer many unique patient benefits. Furthermore, research studies continue to reveal further potential clinical applications, and new laser wavelengths are being explored, developed, and delivered with highly specific power configurations to optimize laser-tissue interaction. This book will bring the reader up to date with the latest advances and will appeal to all with an interest in the application of lasers to the oral soft and/or hard tissues.

Rare-Earth-Doped Fiber Lasers and Amplifiers, Revised and Expanded - Michel J.F. Dignonnet 2001-05-31

A discussion of the theories, operating characteristics, and current technology of main fiber laser and amplifier devices based on rare-earth-doped silica and fluorozirconate fibers. It describes the principles, designs, and properties of the erbium-doped fiber amplifier and its role as the cornerstone component in optical communication systems. This second edition contains new and revised material reflecting major developments in academia and industry.

Organic Solid-State Lasers - Sébastien Forget 2013-07-03

Organic lasers are broadly tunable coherent sources, potentially compact, convenient and manufactured at low-costs. Appeared in the mid 60's as solid-state alternatives for liquid dye lasers, they recently gained a new dimension after the demonstration of organic semiconductor lasers in the 90's. More recently, new perspectives appeared at the nanoscale, with organic polariton and surface plasmon lasers.

After a brief reminder to laser physics, a first chapter exposes what makes organic solid-state organic lasers specific. The laser architectures used in organic lasers are then reviewed, with a state-of-the-art review of the performances of devices with regard to output power, threshold, lifetime, beam quality etc. A survey of the recent trends in the field is given, highlighting the latest developments with a special focus on the challenges remaining for achieving direct electrical pumping of organic semiconductor lasers. A last chapter covers the applications of organic solid-state lasers.

Materials for Optoelectronics - Maurice Quillec
1996-01-31

Optoelectronics ranks one of the highest increasing rates among the different industrial branches. This activity is closely related to devices which are themselves extremely dependent on materials. Indeed, the history of optoelectronic devices has been following closely that of the materials. KLUWER Academic Publishers has thus rightly identified "Materials for Optoelectronics" as a good opportunity for a book in the series entitled "Electronic Materials; Science and Technology". Although a sound background in solid state physics is recommended, the authors have confined their contribution to a graduate student level, and tried to define any concept they use, to render the book as a whole as self-consistent as possible. In the first section the basic aspects are developed. Here, three chapters consider semiconductor materials for optoelectronics under various aspects. Prof. G. E. Stillman begins with an introduction to the field from the point of view of the optoelectronic market. Then he describes how III-V materials, especially the Multi Quantum Structures meet the requirements of optoelectronic functions, including the support of microelectronics for optoelectronic integrated circuits. In chapter 2, Prof.

Particle Image Velocimetry - Markus Raffel
2007-08-09

This immensely practical guide to PIV provides a condensed, yet exhaustive guide to most of the information needed for experiments employing the technique. This second edition has updated chapters on the principles and extra information on microscopic, high-speed and three component measurements as well as a description of

advanced evaluation techniques. What's more, the huge increase in the range of possible applications has been taken into account as the chapter describing these applications of the PIV technique has been expanded.

Laser Material Processing - William M. Steen
2013-04-18

New chapters on bending and cleaning reflect the changes in the field since the last edition, completing the range of practical knowledge about the processes possible with lasers already familiar to users of this well-known text.

Professor Steen's lively presentation is supported by a number of original cartoons by Patrick Wright and Noel Ford, which will bring a smile to your face and ease the learning process. From the reviews: "...well organized, and the text is very practical...The engineering community will find this book informative and useful." (OPTICS AND PHOTONICS NEWS, July/August 2005)

Monolithic Diode-Laser Arrays - Nils W. Carlson
2012-12-06

Although semiconductor-diode lasers are the most compact, highest gain and most efficient laser sources, difficulties remain in developing structures that will produce high-quality, diffraction-limited output beams. Indeed, only a few designs have emerged with the potential for producing high-power, high-brightness monolithic sources. This book presents and analyzes the results of work performed over the past two decades in the development of such diode-laser arrays.

Ultrafast Photonics - A. Miller
2019-08-22

Ultrafast photonics has become an interdisciplinary topic of high international research interest because of the spectacular development of compact and efficient lasers producing optical pulses with durations in the femtosecond time domain. Present day long-haul telecommunications systems are almost entirely based on the transmission of short burst

Femtosecond Laser-Matter Interaction - Eugene G. Gamaly
2011-10-06

This is the first comprehensive treatment of the interaction of femtosecond laser pulses with solids at nonrelativistic intensity. It connects phenomena from the subtle atomic motion on the nanoscale to the generation of extreme pressure and temperature in the interaction zone confined inside a solid. The femtosecond laser-matter

interaction has already found numerous applications in industry, medicine, and materials science. However, there is no consensus on the interpretation of related phenomena. With mathematics kept to a minimum, this is a highly engaging and readable treatment for students and researchers in science and engineering. The book avoids complex mathematical formulae, and hence the content is accessible to nontechnical readers. Useful summaries after each chapter provide compressed information for quick estimates of major parameters in planned or performed experiments. The book connects the basic physics of femtosecond laser-solid interactions to a broad range of applications. Throughout the text, basic assumptions are derived from the first principles, and new results and ideas are presented. From such analyses, a qualitative and predictive framework for the field emerges, the impact of which on applications is also discussed.

LiDAR Technologies and Systems - Paul F. McManamon 2019

"LiDAR technology and Systems is a tutorial book, covering LiDAR Technology. The introduction sets lidar in context, as one of many sensor technologies utilizing electro-magnetic radiation. LiDAR is in the optical and infrared wavelengths, and it is an active sensor, which collects reflected EM radiation. It is similar to more familiar passive EO/IR sensors in wavelength, and similar to radar in that it uses reflected radiation emitted by the sensor. The second chapter goes the > 50 years of lidar history. Chapter 3 covers the link budget - how much signal a LiDAR must emit in order to get a certain number of reflected photons back. Chapter 4 discusses the rich phenomenology of LiDAR. One of the strengths of LiDAR is its' diverse phenomenology's. As a result, there are many flavors of LiDAR. The most common is 3D imaging, but there are many other types of lidars, with different measurement objectives. The next 4 chapters discuss components of a LiDAR. Chapter 5 discusses laser sources, chapter 6 LiDAR receivers, chapter 7 beam steering approaches, and chapter 8 LiDAR processing. The last 3 chapters are testing, metrics, and applications. Chapter 11, the applications chapter, picks 4 popular applications and discusses these LiDARs, and how to build

them, for these applications. Chapter 11 as a result will repeats some information in earlier chapters, but in the context of a particular application"--

Stimulated Brillouin Scattering - M J Damzen 2003-09-01

Stimulated Brillouin scattering (SBS) is the most important example of a stimulated scattering process-light scattering that occurs when the intensity of the light field itself affects the propagating medium. A phenomenon that has been known of for some 35 years in solid state laser research, it has recently become relevant in the optical fiber industry, due to the increasing intensity required in optical fiber cores (and their long interaction lengths). SBS is one of the major limiting factors-- on the amount of power that can be transmitted via an optical fiber. This book describes the underlying physics of SBS, much of which are applicable to other fields of research, including, to some extent, plasma physics. It provides references to experimental details throughout. Later chapters investigate more advanced concepts and feature the problems faced by researchers using optical fibers.

Directed-Energy Beam Weapons - Bahman Zohuri 2020-08-15

This book introduces modern directed-energy beam weaponry and emerging technical concepts based on unclassified and declassified information. The book covers laser systems, analyzing the interaction between high-power laser beams and matter, and examines penetration of high power beams such as microwave and scalar wave. It also covers the use of particle and high-power radar beams and scalar wave as weapons of the future. In-depth coverage of the relevant mathematical and engineering topics and concepts are included. The book will provide scientists and engineers with valuable guidance on the fundamentals needed to understand state-of-the-art directed energy weaponry technology research and applications. Provides guidance on the fundamentals of state-of-the-art directed-energy weaponry technology; Introduces the physics behind directed-energy weapons; Offers in-depth coverage of mathematical and engineering topics.

High-Power Diode Lasers - Roland Diehl 2003-07-01

Starting from the basics of semiconductor lasers with emphasis on the generation of high optical output power the reader is introduced in a tutorial way to all key technologies required to fabricate high-power diode-laser sources. Various applications are exemplified.

Laser-Tissue Interactions - Markolf H. Niemz
2013-03-14

Basic concepts such as the optical and thermal properties of tissue, the various types of tissue ablation, and optical breakdown and its related effects are treated in detail. Special attention is given to mathematical tools (Monte Carlo simulations, the Kubelka—Munk theory etc.) and approved techniques (photodynamic therapy, laser-induced interstitial thermotherapy etc.). The part on applications reviews clinically relevant methods in modern medicine using the latest references. The last chapter covers today's standards of laser safety, with a careful selection of essential guidelines published by the Laser Institute of America. With numerous research photographs, illustrations, tables and comprehensive summaries.

Packaging of High Power Semiconductor Lasers - Xingsheng Liu
2014-07-14

This book introduces high power semiconductor laser packaging design. The challenges of the design and various packaging and testing techniques are detailed by the authors. New technologies and current applications are described in detail.

Optics in Our Time - Mohammad D. Al-Amri
2016-12-12

Light and light based technologies have played an important role in transforming our lives via scientific contributions spanned over thousands

of years. In this book we present a vast collection of articles on various aspects of light and its applications in the contemporary world at a popular or semi-popular level. These articles are written by the world authorities in their respective fields. This is therefore a rare volume where the world experts have come together to present the developments in this most important field of science in an almost pedagogical manner. This volume covers five aspects related to light. The first presents two articles, one on the history of the nature of light, and the other on the scientific achievements of Ibn-Haitham (Alhazen), who is broadly considered the father of modern optics. These are then followed by an article on ultrafast phenomena and the invisible world. The third part includes papers on specific sources of light, the discoveries of which have revolutionized optical technologies in our lifetime. They discuss the nature and the characteristics of lasers, Solid-state lighting based on the Light Emitting Diode (LED) technology, and finally modern electron optics and its relationship to the Muslim golden age in science. The book's fourth part discusses various applications of optics and light in today's world, including biophotonics, art, optical communication, nanotechnology, the eye as an optical instrument, remote sensing, and optics in medicine. In turn, the last part focuses on quantum optics, a modern field that grew out of the interaction of light and matter. Topics addressed include atom optics, slow, stored and stationary light, optical tests of the foundation of physics, quantum mechanical properties of light fields carrying orbital angular momentum, quantum communication, and Wave-Particle dualism in action.