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Optics and Lasers

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Lasers for Scientists and Engineers Cambridge University Press
Covering a broad range of topics in modern optical physics and engineering, this textbook is invaluable for undergraduate students studying laser physics, optoelectronics, photonics, applied optics and optical engineering. This new edition has been re-organized, and now covers many new topics such as the optics of stratified media, quantum well lasers and modulators, free electron lasers, diode-pumped solid state and gas lasers, imaging and non-imaging optical systems, squeezed light, periodic poling in nonlinear media, very short pulse lasers and new applications of lasers. The textbook gives a detailed introduction to the basic physics and engineering of lasers, as well as covering the design and operational principles of a wide range of optical systems and electro-optic devices. It features full details of important derivations and results, and provides many practical examples of the design, construction and performance characteristics of different types of lasers and electro-optic devices.
Laser Cleaning MJP Publisher
A textbook on lasers and optical engineering should include all aspects of lasers and optics; however, this is a large undertaking. The objective of this book is to give an introduction to the subject on a level such that under graduate students (mostly juniors/seniors), from disciplines like electrical engineering, physics, and optical engineering, can use the book. To achieve this goal, a lot of basic background material, central to the subject, has been covered in optics and laser physics. Students with an elementary knowledge of freshman physics and with no formal courses in electromagnetic theory should be able to follow the book, although for some sections, knowledge of electromagnetic theory, the Fourier transform, and linear systems would be highly beneficial. There are excellent books on optics, laser physics, and optical engineering. Actually, most of my knowledge was acquired through these. However, when I started teaching an undergraduate course in 1974, under the same heading as the title of this book, I had to use four books to cover the material I thought an electrical engineer needed for his introduction to the world of lasers and optical engineering. In my sabbatical year, 1980-1981, I started writing class notes for my students, so that they could get through the course by possibly buying only one book. Eventually, these notes grew with the help of my undergraduate and graduate students, and the final result is this book.
Laser Fundamentals Springer
This practical book summarizes the latest research results of orthogonally polarized lasers, birefringence laser cavities, and their applications. Coverage ranges from basic principles and technologies to the characteristics of different cavities and lasers to various measurement techniques. A number of figures, experimental designs, and measurement curves are included, helping readers gain a thorough understanding of the

many applications in modern engineering and start their own projects. Many types of relevant lasers (Helium/Neon lasers, Nd:YAG lasers, laser diodes, etc.) are also discussed.

Optics and Lasers

Springer Science & Business Media

This book is intended for upperclass college students as an introduction to the growing field of coherent optics and to the increasing number of its applications, and also for those versed in other fields who wish to gain per spective and insight without detailed calculations. It is an outgrowth of the author's Science Study Series book Lasers and HolographY. * Besides being an updated and expanded version of that book, it includes discussions of numerous recent applications. It differs in its slightly higher analytical level and in the inclusion oflarge numbers of references, which enable the reader to obtain further information on subjects of interest to him. The level was selected to match the capabilities of students in their middle college years so as to permit them to make an early assessment of possible career interests in any of the many interdisciplinary fields now embracing the technologies of modern optics. It is hoped that the book can be used (as has occurred rather extensively with another of the author's Science Study Series books, Sound Waves and Light Wavest) as an auxiliary reading assignment for students in various disciplines. The author strongly believes that the promise of continued growth in this field, as evidenced by the extensive participation in technology develop ments by industry, both within the U. S. and abroad, identifies the subject as * Doubleday, 1969 (hard cover and paperback).

Lasers and Electro-optics

National Academies Press

This third edition, motivated by the numerous and significant developments in the laser field since the publication of the second edition in 1982, is a substantially revised version of the previous edition. The basic philosophy has, however, remained the same, namely, to provide a broad and unified descrip tion of laser behavior at the simplest level that is compatible with a correct physical understanding. The basic organization of the book has also remained the same. The book is therefore aimed at both classroom teaching and self-study by students in electrical engineering, physics, and chemistry who have an interest in understanding the principles of laser operation. The major additions to this edition are the following: 1. New sections dealing with laser types, in particular x-ray lasers and new solid-state lasers, including alexandrite devices, and a greatly extended description of semiconductor lasers. 2. A more extended treatment of laser mode-locking, including new sections on cavity dumping and pulse compression. 3. A more extended and greatly simplified description of the coherence and statistical properties of laser light as opposed to those of conven tional light. 4. A greatly extended discussion of the physics of gas discharges. Other important additions include a discussion of some topics from conven tional optics (e.g., ray matrix methods, Fabry-Perot interferometers, and multilayer dielectric mirrors), Gaussian beam propagation (e.g., the ABeD law), and the theory

of relaxation oscillations and active mode-locking.
Laser-Plasma Interactions 4 CRC Press
Engineering Physics is designed to cater to the needs of first year undergraduate engineering students. Written in a lucid style, this book assimilates the best practices of conceptual pedagogy, dealing at length with various topics such as crystallography, principles of quantum mechanics, free electron theory of metals, dielectric and magnetic properties, semiconductors, nanotechnology, etc.
Advanced Lasers CRC Press
The interaction of high-power lasers with matter can generate Terahertz radiations that efficiently contribute to THz Time-Domain Spectroscopy and also would replace X-rays in medical and security applications. When a short intense laser pulse ionizes a gas, it may produce new frequencies even in VUV to XUV domain. The duration of XUV pulses can be confined down to the isolated attosecond pulse levels, required to study the electronic re-arrangement and ultrafast processes. Another important aspect of laser-matter interaction is the laser thermonuclear fusion control where accelerated particles also find an efficient use. This book provides comprehensive coverage of the most essential topics, including Electromagnetic waves and lasers THz radiation using semiconducting materials / nanostructures / gases / plasmas Surface plasmon resonance THz radiation detection Particle acceleration technologies X-ray lasers High harmonics and attosecond lasers Laser based techniques of thermonuclear fusion Controlled fusion devices including NIF and ITER The book comprises of 11 chapters and every chapter starts with a lucid introduction to the main topic. Then sub-topics are sedulously discussed keeping in mind their basics, methodology, state-of-the-art and future perspective that will prove to be salutary for readers. High quality solved examples are appended to the chapters for their deep understanding and relevant applications. In view of the nature of the topics and their level of discussion, this book is expected to have pre-eminent potential for researchers along with postgraduate and undergraduate students all over the world.
Handbook of Laser Technology and Applications University Science Books
This book is written from an industrial perspective and provides a detailed discussion of solid-state lasers, their characteristics, design and construction. Emphasis is placed on engineering and practical considerations. The book is aimed mainly at the practicing scientist or engineer who is interested in the design or use of solid-state lasers, but the comprehensive treatment of the subject will make the work useful also to students of laser physics who seek to supplement their theoretical knowledge with engineering information. In order to present the subject as clearly as possible, phenomenological descriptions using models have been used rather than abstract mathematical descriptions. This results in a simplified presentation. The descriptions are enhanced by the inclusion of numerical and technical data, tables and graphs. This new edition has been updated and revised to

take account of important new developments, concepts, and technologies that have emerged since the publication of the first and second editions.
Solid-State Mid-Infrared Laser Sources Pearson Education India
This book presents lectures and seminars given at a Summer School, organized by the International College of Applied Physics, on the physics and technology and the industrial applications of high-power gas lasers.
Orthogonal Polarization in Lasers Springer
This comprehensive handbook gives a fully updated guide to lasers and laser technologies, including the complete range of their technical applications. This third volume covers modern applications in engineering and technology, including all new and updated case studies spanning telecommunications and data storage to medicine, optical measurement, defense and security, nanomaterials processing and characterization. Key Features: • Offers a complete update of the original, bestselling work, including many brand-new chapters. • Deepens the introduction to fundamentals, from laser design and fabrication to host matrices for solid-state lasers, energy level diagrams, hosting materials, dopant energy levels, and lasers based on nonlinear effects. • Covers new laser types, including quantum cascade lasers, silicon-based lasers, titanium sapphire lasers, terahertz lasers, bismuth-doped fiber lasers, and diode-pumped alkali lasers. • Discusses the latest applications, e.g., lasers in microscopy, high-speed imaging, attosecond metrology, 3D printing, optical atomic clocks, time-resolved spectroscopy, polarization and profile measurements, pulse measurements, and laser-induced fluorescence detection. • Adds new sections on laser materials processing, laser spectroscopy, lasers in imaging, lasers in environmental sciences, and lasers in communications. This handbook is the ideal companion for scientists, engineers, and students working with lasers, including those in optics, electrical engineering, physics, chemistry, biomedicine, and other relevant areas.
Lasers and Optical Engineering Springer
Lasers and Optical EngineeringLasers for Scientists and EngineersWorld Scientific Publishing Company
Laser Physics CRC Press
Although the basic principles of lasers have remained unchanged in the past 20 years, there has been a shift in the kinds of lasers generating interest. Providing a comprehensive introduction to the operating principles and applications of lasers, this second edition of the classic book on the subject reveals the latest developments and applications of lasers. Placing more emphasis on applications of lasers and on optical physics, the book's self-contained discussions will appeal to physicists, chemists, optical scientists, engineers, and advanced undergraduate students.
Engineering applications of lasers and holography Società Editrice Esculapio
There is hardly any book that aims at solving problems typically encountered in the laser field, and this book intends to fill the void. Following some initial exercises related to general aspects in laser

physics (Chapt. 1), the subsequent problems are organized along the following topics: (i) Interaction of radiation with matter either made of atoms or ions, weakly interacting with surrounding species, or made of more complicated elements such as molecules or semiconductors (Chapters 2 and 3). (ii) Wave propagation in optical media and optical resonators (Chapters 4 and 5). (iii) Optical and electrical pumping processes and systems (Chapter 6): (iv) Continuous wave and transient laser behaviors (Chapters 7 and 8). (v) Solid-state, dye, semiconductor, gas and X-ray lasers (Chapters 9 and 10). (vi) Proper ties of the output beam and beam transformation by amplification, frequency conversion and pulse compression or expansion (Chapters 11 and 12). Problems are proposed here and solved following the contents of Orazio Svelto's Principles of Lasers (fourth edition; Plenum Press, New York, 1998). Whenever needed, equations and figures of the book mentioned above are currently used with an appropriate reference [e. g. , Eq. (1. Ll) of the book is referred to as Eq. (Ll. 1) of PL]. One can observe, however, that the types of problems proposed and discussed are of general validity and many of these problems have actually been suggested by our own long-time experience in performing theoretical and experimental researches in the field.

Basics of Laser Physics John Wiley & Sons

This textbook provides an introductory presentation of all types of lasers. It contains a general description of the laser, a theoretical treatment and a characterization of its operation as it deals with gas, solid state, free-electron and semiconductor lasers. This expanded and updated second edition of the book presents a description of the dynamics of free-electron laser oscillation using a model introduced in the first edition that allows a reader to understand basic properties of a free-electron laser and makes the difference to “conventional” lasers. The discussions and the treatment of equations are presented in a way that a reader can immediately follow. The book addresses graduate and undergraduate students in science and engineering, featuring problems with solutions and over 400 illustrations.

CRC Press

Introduction to Laser Science and Engineering provides a modern resource for a first course in lasers for both students and professionals. Starting from simple descriptions, this text builds upon them to give a detailed modern physical understanding of the concepts behind light, optical beams and lasers. The coverage starts with the nature of light and the principles of photon absorption and transmission, leading to the amplified and stimulated emission principals governing lasers. The specifics of lasers and their application, safe use and future prospects are then covered, with a wealth of illustrations to provide readers with a visual sense of optical and laser principles.

Opportunities in Intense Ultrafast Lasers Cambridge University Press

The laser has revolutionized many areas of science and society, providing bright and versatile light sources that transform the ways we investigate science

and enables trillions of dollars of commerce. Now a second laser revolution is underway with pulsed petawatt-class lasers (1 petawatt: 1 million billion watts) that deliver nearly 100 times the total world's power concentrated into a pulse that lasts less than one-trillionth of a second. Such light sources create unique, extreme laboratory conditions that can accelerate and collide intense beams of elementary particles, drive nuclear reactions, heat matter to conditions found in stars, or even create matter out of the empty vacuum. These powerful lasers came largely from U.S. engineering, and the science and technology opportunities they enable were discussed in several previous National Academies' reports. Based on these advances, the principal research funding agencies in Europe and Asia began in the last decade to invest heavily in new facilities that will employ these high-intensity lasers for fundamental and applied science. No similar programs exist in the United States. Opportunities in Intense Ultrafast Lasers assesses the opportunities and recommends a path forward for possible U.S. investments in this area of science.

Laser-Matter Interaction for Radiation and Energy SPIE Press

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.

High-Intensity Lasers for Nuclear and Physical Applications John Wiley & Sons

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.

Introduction to Laser Science and Engineering Springer Science & Business Media

Applied Atomic Collision Physics, Volume 3: Gas Lasers describes the applications of atomic collision physics in the development of many types of gas lasers. Topics covered range from negative ion formation in gas lasers to high-pressure ion kinetics and relaxation of molecules exchanging vibrational energy. Ion-ion recombination in high-pressure plasmas is also discussed, along with electron-ion recombination in gas lasers and collision processes in chemical lasers. Comprised of 14 chapters, this volume begins with a historical summary of gas laser developments and an overview of the basic operating principles of major gas laser types. The discussion then turns to the mechanism of formation of negative ions in gas lasers; ion-ion recombination in high-pressure plasmas; electron-ion recombination in gas lasers; and collision processes in chemical lasers. Subsequent chapters focus on high-energy carbon dioxide laser amplifiers; spectroscopy and excited state chemistry of excimer lasers; rare-gas halide lasers; transient optical absorption in the ultraviolet; and pre-ionized self-sustained laser discharges. The final chapter considers the stability of excimer laser discharges. This book will be of interest to physicists and chemists.

Engineering Applications of Lasers and Holography Springer

This textbook originates from a lecture course in laser physics at the Karlsruhe School of Optics and Photonics at the Karlsruhe Institute of Technology (KIT). A main goal in the conception of this textbook was to describe the fundamentals of lasers in a uniform and especially lab-oriented notation and formulation as well as many currently well-known laser types, becoming more and more important in the future. It closes a gap between the measureable spectroscopic quantities and the whole theoretical description and modeling. This textbook contains not only the fundamentals and the context of laser physics in a mathematical and methodical approach important for university-level studies. It allows simultaneously, owing to its conception and its modern notation, to directly implement and use the learned matter in the practical lab work. It is presented in a format suitable for everybody who wants not only to understand the fundamentals of lasers but also use modern lasers or even develop and make laser setups. This book tries to limit prerequisite knowledge and fundamental understanding to a minimum and is intended for students in physics, chemistry and mathematics after a bachelor degree, with the intention to create as much joy and interest as seen among the participants of the corresponding lectures. This university textbook describes in its first three chapters the fundamentals of lasers: light-matter interaction, the amplifying laser medium and the laser resonator. In the fourth chapter, pulse generation and related techniques

are presented. The fifth chapter gives a closing overview on different laser types gaining importance currently and in the future. It also contains a set of examples on which the theory learned in the first four chapters is applied and extended.