An Introduction To Lasers And Their Applications | 7b69b1e6b5fa4c85b2e161c8d5c74f81


This book reviews basic electromagnetic (EM) wave theory and applies it specifically to lasers in order to give the reader not only tangible examples of how the theory is manifested in real life, but also practical knowledge about lasers, and their operation and usage. The latter can be useful for those who have an interest in this subject matter, which is not the appropriate chapter for this book. Rather the aim of this book is to offer a quick overview, which will allow the reader to gain a competent general understanding of EM waves and lasers.

*a very valuable book for graduate students and researchers in the field of Laser Spectroscopy, which I can fully recommend* — Wolfgang Demtröder, Kaiserslautern University of Technology How would it be possible to provide a coherent picture of this field given all the techniques available today? The authors have taken on this daunting task with impressive, groundbreaking text. Readers will benefit from the broad overview of basic concepts, focusing on practical scientific and real-life applications of laser spectroscopic analysis and imaging. Chapters follow a consistent structure, beginning with a succinct summary of key concepts and followed, by an overview of applications, advantages and pitfalls, and finally a brief discussion of seminal advances and current developments. The examples used in this text span physics and chemistry to environmental science, biology, and medicine. Focuses on practical use in the laboratory and real-world applications.Covers the basic concepts, common experimental setups Highlights advantages and caveats of the techniques Concludes each chapter with a snapshot of cutting-edge advances This book is appropriate for anyone in the physical sciences, biology, or medicine looking for an introduction to laser spectroscopic and imaging methodologies. Helmut H. Telle is a full professor at the Instituto Pluridisciplinar, Universidad Complutense de Madrid, Spain. Ángel González Ureña is head of the Department of Molecular Beams and Lasers, Instituto Pluridisciplinar, Universidad Complutense de Madrid, Spain.

Chapters will provide specific content-related treatment of the topic in question, as well as a detailed understanding of the reader to directly to the appropriate chapter to deal with a particular topic of concern. This sharp focus is necessary to maintain the emphasis, and to make this a practical reference. The knowledge and experience of key laser oscillators, amplifiers, laser oscillators, laser systems, and engineering of rugged laser cavities, design and engineering of laser-based instrumentation, and design of highly reliable laser systems for material processing applications. * Provides a sharp focus practical aspects of reference material. * Offers an approach that will be simple, direct, and focused, and consists of a wide variety of laser oscillators and optics * Integrates aspects of laser oscillators, amplifiers, laser oscillators, laser systems, and engineering of rugged laser cavities, design and engineering of laser-based instrumentation, and design of highly reliable laser systems for material processing applications.

Introduction to Laser Spectroscopy is a well-written, easy-to-read guide to understanding the fundamentals of lasers, experimental methods of modern laser spectroscopy and applications. It provides a solid grounding in the fundamentals of many aspects of laser physics, nonlinear optics, and molecular spectroscopy. In addition, by comprehensively combining theory and experimental techniques it explicates a variety of issues that are essential to understanding broad areas of physics, chemistry, and biological science. Topics include: laser types, gas, solid state, and semiconductor lasers, as well as the rapidly evolving field of ultrafast laser phenomena for femtosecond applications. The examples used are well researched and clearly presented. Introduction to Laser Spectroscopy is strongly recommended to newcomers as well as researchers in physics, engineering, chemistry, and biology. * A comprehensive course that combines theory and practice * Includes a systematic and comprehensive description for key laser types * Written for students and professionals looking to gain a thorough understanding of modern laser spectroscopy

The expanded fourth edition of the book that offers an essential introduction to laser technology and the newest developments in the field. The revised and updated fourth edition of Understanding Lasers offers an essential guide and introduction that explores how lasers work, what they do, and how they are applied in the real world. The author—a Fellow of The Optical Society—reviews the key concepts of physics and optics that are essential for understanding lasers and how lasers operate. The book also contains information on the optical accessories used with lasers. Written in non-technical terms, the book gives an overview of the wide variety of laser types and configurations. Understanding Lasers covers fiber, solid-state, excimer, helium-neon, carbon dioxide, free-electron lasers, and more. In addition, the book also explains concepts such as the difference between laser oscillation and amplification, the importance of laser gain, and tunable lasers. The updated fourth edition highlights the most recent research and development in the field. This important resource: Includes a new chapter on fiber lasers and amplifiers Reviews new topics on physics of optical fibers and fiber lasers Discusses the requirements and implications of laser safety Contains new sections on Laser Spectroscopy, Parametric Sources, and 3D Printing and Additive Manufacturing Puts the focus on research and emerging developments in areas such as spectroscopy, slow light, laser cooling, and extremely precise measurements Contains appendices, glossary, and index that help make this book a useful reference Written for engineers and physics students, engineers, scientists, and technicians, the fourth edition of Understanding Lasers contains the basic concepts of lasers and the most recent advances in the technology.

An introduction to photonics and lasers that does not rely on complex mathematics This book evolved from a series of courses developed by the author taught in the areas of lasers and photonics. This thoroughlyclassroom-tested work fills a unique need for students, instructors, and industry professionals in search of an introductory-level book that covers a wide range of topics in these areas. Comparable books tend to be aimed either too high or too low, or they cover only a portion of the topics that are needed for comprehensive treatment. Photonics and Lasers is divided into four parts: * Propagation of Light * Generation and Detection of Light * Laser Light * Light-Based Communication The author has ensured that complex mathematics does not become an obstacle to understanding key physical concepts. Physical arguments and explanations are clearly set forth while, at the same time, sufficient mathematical detail is provided for a quantitative understanding. As an additional aid to readers who are learning to think symbolically, some equations are expressed in words as well as symbols. Problem sets are provided throughout the book for readers to test their knowledge and grasp of key concepts. A solutions manual is also available for instructors. Finally, the detailed bibliography leads readers to in-depth explorations of particular topics. The book's topics, lasers and photonics, are often treated separately in other texts; however, the author skillfully demonstrates their natural synergy. Because of the combined coverage, this text can be used for a two-semester course or a one-semester course emphasizing either lasers or photonics. This is perfect introductory textbook for both undergraduate and graduate students, additionally serving as a practical reference for engineers in telecommunication, optics, and lasers electronics.

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, coherent light, polarized lasers and new applications of lasers. The textbook covers 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.

An up-to-date perspective on laser technology for students at advanced undergraduate or introductory graduate level. The principles of operation and applications of modern laser systems are analysed in detail. The text has over 300 diagrams and each chapter is accompanied with questions (solutions available on application).

One of the biggest challenges of organic optoelectronics is the realization of the first organic laser diode (electrically pumped) which has a very strong potential for many applications. Similar to what happened in the field of inorganic optoelectronics when transforming LEDs into LDs, the race is on to transform an OLED into an OLD. This involves the development of innovative solutions to overcome the difficulties inherent in organic materials and the electric pump. This book

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Read Free An Introduction To Lasers And Their Applications

An Introduction To Lasers And Their Applications 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.

The book describes the latest advancements in the development of organic lasers, one of the most challenging issues of the early part of this century. Provides a detailed description of material features and their potential applications. Contains several topics currently under development.

Gasdynamic Lasers: An Introduction is a 12-chapter introductory text to major development generations of gasdynamic lasers, focusing on their underlying physical and fundamental aspects. The opening chapters discuss the basic detailed physical phenomena that ultimately are responsible for producing gasdynamic laser action and the methods of calculating the performance of these devices. These topics are followed by a chapter on confirmation of the performance calculations through arc and shock tunnel experiments. The discussion then shifts to vibrational relaxation process behind normal shock waves in CO2-N2-He mixtures and assesses their population inversions occurring in the nonequilibrium flow. Other chapters explore the concepts of downstream mixing and optical cavity in gasdynamic lasers, as well as the laser beam extracted from these devices. A systematic study of aerodynamic windows that use supersonic flow across the aperture is presented in the concluding chapters, along with the phenomena associated with gasdynamic laser diffusers. This introductory text will be of great value to professional scientists and engineers, as well as to students and workers in the field who are interested in interdisciplinary applied science.

Here is the first graduate-level textbook to introduce readers to the field of laser spectroscopy. Chapters cover a broad range of topics in detail, emphasizing the theoretical and experimental aspects of the field. This much-needed text will allow students to explore current research and gain an understanding of the analytical and industrial applications of laser spectroscopy.

Basic Theory | Types Of Lasers | Laser Beam Characteristics | Techniques For Control Of Laser Output | Applications Of Lasers

This text is designed to fill the gap between brief reviews of lasers provided in modern physical optics texts and the thorough, graduate-level texts on lasers an quantum mechanics. For those students who may not want to invest a substantial amount of their elective time in extensive course work in this area, it represents a reasonable alternative to a more lengthy treatment.

Do you know, what is laser technology & how it is generated? Keep reading to know about the technology that is transforming the industries. These notes, workbook, and self-test booklet are intended for Level I Laser Technicians. To be fully effective in their job functions, they must understand laser and optics principles, and laser beam performance specifications. This booklet focuses on all aforementioned topics.

Updated to reflect advancements since the publication of the previous edition, Understanding Lasers: An Entry-Level Guide, 3rd Edition is an introduction to lasers and associated equipment. You need only a minimal background in algebra to understand the nontechnical language in this book, which is a practical, easy-to-follow guide for beginners. By studying the conceptual drawings, tables, and multiple-choice quizzes with answers provided at the back of the book you can understand applications of semiconductor lasers, solid-state lasers, and gas lasers for information processing, medicine, communications, industry, and military systems.

This book provides a comprehensive overview of laser sources and their applications in various fields of science, industry, and technology. After an introduction to the basics of laser physics, different laser types and materials for lasers are summarized in the context of a historical survey, outlining the evolution of the laser over the past five decades. This includes, amongst other aspects, gases, lasers, excimer of aerodynamic windows that use supersonic flow across the aperture. 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.

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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.

This book is the result of more than ten years of research and teaching in the field of quantum electronics. The purpose of the book is to introduce the principles of lasers, starting from elementary notions of quantum mechanics and electromagnetism. Because it is an introductory book, an effort has been made to make it self-contained to minimize the need for reference to other works. For the same reason; the references have been limited (whenever possible) either to review papers or to papers of seminal importance. The organization of the book is based on the fact that a laser can be thought of as consisting of three elements: (i) an active material, (ii) a pumping system, and (iii) a suitable resonator. Accordingly, after an introductory chapter, the next three chapters deal, respectively, with the interaction of radiation with matter, pumping processes, and the theory of passive optical resonators.

The only introductory text on the market that describes 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 the concepts and understanding of what it takes to use lasers 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: Materials and Wavelength Diode Laser Arrays Quantum-cascade lasers Fiber lasers Thin-disk and slab lasers Ultraviolet 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.

Most of the texts available on lasers deal with laser engineering and laser applications, only a few of them treating theoretical aspects of the laser at an advanced level. Introduction to Laser Physics provides an introduction to the essential physics of quantum electronics and lasers. Fundamental topics in modern optics, the applicability of various theoretical approaches, and the physical meaning of laser-related phenomena are carefully described. Experimental results and properties of practical lasers are interwoven, thereby allowing an explicit demonstration of the rate equation approach and the semiclassical treatment. The basic concepts of nonlinear optical devices and laser spectroscopy are intro-duced.

The second edition includes additional information on optical resonators, minor improvements of the text and several new problems, completed with solutions.

An introductory text on laser physics features an emphasis on basic laser principles and theory, without requiring a quantum mechanical background.

This book is especially written for physicians and dentists who are new to the exciting field of lasers. It will give you a good reference for the physical and biophysical part of laser medicine and dentistry. It may also serve you well as a reference and study material in a fellowship or master's program. There are many books about lasers and laser physics, but these are written by physicists for physicists - and they generally do not address the specific knowledge a doctor needs to be aware of when it comes to laser-tissue-interaction. In this book, I want to cut to the chase. I will give you the background information you need when new to the field of laser medicine or laser dentistry: Your laser: what is that thing you just bought or are considering to use? How does absorption, scattering and transmission in biological tissues take place? On what parameters do the clinical effects depend? How can a laser be used as a minimally invasive tool in modern medicine?

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.

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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.