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Pure and applied mathematicians, physicists, scientists, and engineers use matrices and operators and their eigenvalues in quantum mechanics, fluid mechanics, structural analysis, acoustics, ecology, numerical analysis, and many other areas. However, in some applications the usual analysis based on eigenvalues fails. For example, eigenvalues are often ineffective for analyzing dynamical systems such as fluid flow, Markov chains, ecological models, and matrix iterations. That's where this book comes in. This is the authoritative work on nonnormal matrices and operators, written by the authorities who made them famous. Each of the sixty sections is written as a self-contained essay. Each document is a lavishly illustrated introductory survey of its topic, complete with beautiful numerical experiments and all the right references. The breadth of included topics and the numerous applications that provide links between fields will make this an essential reference in mathematics and related sciences.

The Frequency-Resolved Optical-Gating (FROG) technique has revolutionized our ability to measure and understand ultrashort laser pulses. This book contains everything you need to know to measure even the shortest, weakest, or most complex ultrashort laser pulses. Whether you're an undergrad or an advanced researcher, you'll find easy-to-understand descriptions of all the key ideas behind all the FROG techniques, all the practical details of pulse measurement, and many new directions of research. This book is not like any other scientific book. It is a lively discussion of the basic concepts. It is an advanced treatment of research-level issues.

This book appears at a time of intense activity in optical phase conjugation. We chose not to await the maturation of the field, but instead to provide this material in time to be useful in its development. We have tried very hard to elucidate and interrelate the various nonlinear phenomena which can be used for optical phase conjugation.

An introduction to the fundamentals of lasers and pulsed optics, teaching readers the physics behind short and ultrashort laser pulses, and how to manipulate and measure them. Additionally, the text presents experiments and discusses the spectroscopic implications. This well-rounded book provides an up-to-date insight into one of the most exciting fields of laser physics.

The resonator can be considered the real heart of any laser system, the key element that determines the properties of laser radiation, including mode structure or temporal and spatial characteristics. The theory of different laser types has been well-developed in the last few decades of the 20th century, starting with the pioneering papers of Fox, Li, Body and Gordon. But today, due to the development of new types of lasers (fibre, diode), new optical elements (adaptive mirrors, phase conjugation techniques, graded phase correctors), the development of optical technology, and new needs for

industrial lasers, novel types of resonators are under investigation. Unlike some monographs on laser resonators, this work does not present classical theory and the derivation of the basic equations of laser mode generation and so on. Instead, based on the well-known earlier literature, new results in the field of laser resonators are presented. Although it is not a textbook, it outlines the novel trends in the development of laser resonators science, shows what has already been achieved in this field, and indicates directions for research and applications.

Because of the favorable characteristics of solid-state lasers, they have become the preferred candidates for a wide range of applications in science and technology, including spectroscopy, atmospheric monitoring, micromachining, and precision metrology. Presenting the most recent developments in the field, Solid-State Lasers and Applications focuses on the design and applications of solid-state laser systems. With contributions from leading international experts, the book explores the latest research results and applications of solid-state lasers as well as various laser systems. The beginning chapters discuss current developments and applications of new solid-state gain media in different wavelength regions, including cerium-doped lasers in the ultraviolet range, ytterbium lasers near 1?m, rare-earth ion-doped lasers in the eye-safe region, and tunable Cr2+:ZnSe lasers in the mid-infrared range. The remaining chapters study specific modes of operation of solid-state laser systems, such as pulsed microchip lasers, high-power neodymium lasers, ultrafast solid-state lasers, amplification of femtosecond pulses with optical parametric amplifiers, and noise characteristics of solid-state lasers. Solid-State Lasers and Applications covers the most important aspects of the field to provide current, comprehensive coverage of solid-state lasers.

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.

This fifth edition of Principles of Lasers includes corrections to the previous edition as well as being the first available as an ebook. Its mission remains to provide a broad, unified description of laser behavior, physics, technology, and applications.

Optical Resonators provides a detailed discussion of the properties of optical resonators for lasers from basic theory to recent research. In addition to describing the fundamental theories of resonators such as geometrical optics, diffraction, and polarisation the characteristics of all important resonator schemes and their calculation are presented. Experimental examples, practical problems and a collection of measurement techniques support the comprehensive treatment of the subject. Optical Resonators is the only book currently available that provides a comprehensive overview of the the subject. Combined with the structure of the text and the autonomous nature of the chapters this work will be as suitable for those new to the field as it will be invaluable to specialists conducting research. This second edition has been enlarged by new sections on Q-switching and resonators with internal phase/amplitude control.

Keeping abreast of the latest techniques and applications, this new edition of the standard reference and graduate text on laser spectroscopy has been completely revised and expanded. While the general concept is unchanged, the new edition features a broad array of new material, including applications in chemical analysis, medical diagnostics, and engineering. No other book with such a broad scope is available. The author is one of the most renowned experts in this area. The book is well illustrated, and is supplemented by an extensive set of references. It will benefit all students and scientists working in the field.

Since the advent of the laser about 40 years ago, the fields of laser physics and quantum optics have evolved into a major disciplines. The early studies included optical coherence theory and semiclassical and quantum mechanical theories of the laser. More recently many new and interesting effects have been predicted. These include the role of coherent atomic effects in lasing without inversion and electromagnetically induced transparency, atom optics, laser cooling and trapping, teleportation, the single-atom micromaser and its role in quantum measurement theory, to name a few. The International Conference on Laser Physics and Quantum Optics was held in Shanghai, China, from August 25 to August 28,1999, to discuss these and many other exciting developments in laser physics and quantum optics. The international character of the conference was manifested by the fact that scientists from over 13 countries participated and lectured at the conference. There were four keynote lectures delivered by Nobel laureate Willis Lamb, Jr., Profs. H. Walther, A.E. Siegman,and M.O. Scully. In addition, there were 34 invited lectures, 27 contributed oral presentations, and 59 poster papers. We are grateful to all the participants of the conference and the contributors of this volume.

High-power dye lasers provide a versatile tool in many scientific, industrial and medical applications. This book offers an up-to-date and practical guide to the physics and technology of these lasers for all those designing, building and using such systems. Individual topics include dispersive resonators, signal amplification, and dye laser pumping by excimer lasers, copper-vapor lasers and flashlamps.

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.

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.

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

This book deals with theoretical and experimental aspects of solid-state lasers, including optimum waveguide design of end pumped and diode pumped lasers. Nonlinearity, including the nonlinear conversion, up frequency conversion and chirped pulse oscillators are discussed. Some new rare-earth-doped lasers, including double borate and halide crystals, and feedback in quantum dot semiconductor nanostructures are included.

The Seventh Rochester Conference on Coherence and Quantum Optics was held on the campus of the University of Rochester during the four-day period June 7 - 10, 1996. More than 280 scientists from 33 countries participated. This book contains the Proceedings of the meeting. This Conference differed from the previous six in the series in having only a limited number of oral presentations, in order to avoid too many parallel sessions. Another new feature was the introduction of tutorial lectures. Most contributed papers were presented in poster sessions. The Conference was sponsored by the American Physical Society, by the Optical Society of America, by the International Union of Pure and Applied Physics and by the University of Rochester. We wish to express our appreciation to these organizations for their support and we especially extend our thanks to the International Union of Pure and Applied Physics for providing financial assistance to a number of speakers from Third World countries, to enable them to take part in the meeting.

Koechner's well-known ‘bible’ on solid-state laser engineering is now available in an accessible format at the graduate level. Numerous exercises with hints for solution, new text and updated material where needed make this text very accessible.

A practical book with a variety of uses, this book can help applications engineers spark problem-solving techniques through the use of lasers. Industrial Application of Lasers, Second Edition takes the reader through laser fundamentals, unusual properties of laser light, types of practical lasers available, and commonly used accessory equipment. The book also applies this information to existing and developing applications. Current uses of lasers, including laser welding and cutting, electronic fabrication techniques,

lightwave communications, laser-based applications in alignment, surveying, and metrology are all covered as well as discussing the potential for future applications such as all-optical computers,remote environmental monitoring, and laser-assisted thermonuclear fusion. Explains basic laser fundamentals as well as emphasizing how lasers are used for real applications in industry Describes the importance of laser safety Discusses potentially important future applications such as remote environmental monitoring Includes rare expert lore and opinion

Industrial Applications of Lasers focuses on how lasers have been used for practical applications in industry. This text aims to stimulate the imagination of the readers, who can then evaluate the potential application of lasers to solve their own problems. Comprised of 21 chapters, this book starts with an overview of the fundamental background of lasers, and then discusses the basic principles of how lasers operate. Other chapters provide an understanding of how holograms really work. This text also discusses several topics relevant to lasers, themselves, including the types of practical lasers and laser properties. This book considers laser safety, which is very important for anyone considering a laser application. Finally, this text explores the various developed laser applications, including scribing of ceramics, laser welding and cutting of metals, as well as applications in surveying, alignment, and metrology. This book is a valuable resource to laser technicians, physicists, scientists, researchers, and readers whose interests span a variety of fields.

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Laser Fundamentals provides a clear and comprehensive introduction to the physical and engineering principles of laser operation and design. Simple explanations, based throughout on key underlying concepts, lead the reader logically from the basics of laser action to advanced topics in laser physics and engineering. Much new material has been added to this second edition, especially in the areas of solid-state lasers, semiconductor lasers, and laser cavities. This 2004 edition contains a new chapter on laser operation above threshold, including extensive discussion of laser amplifiers. The clear explanations, worked examples, and many homework problems will make this book invaluable to undergraduate and first-year graduate students in science and engineering taking courses on lasers. The summaries of key types of lasers, the use of many unique theoretical descriptions, and the extensive bibliography will also make this a valuable reference work for researchers.

High power lasers of either the gas or solid state type can be used to generate a focal spot with a diameter of about a tenth of a millimetre and a power density of up to 100 Mio W/cm2. With these intensities all materials can be heated up rapidly, leading to fast melting, violent evaporation or even plasma formation. So laser beams can be utilized for various processing tasks, such as transformation hardening, cutting and ablation or welding and cladding or even rapid prototyping. With these processes, important advantages are achieved compared to conventional tools such as high processing speed due to the high concentration of energy and high quality of the processed workpiece without deformations due to the small overall heat input to the workpiece that corresponds to the small spot diameter. All these advantages finally result in strongly reduced production costs, which is the main reason for a world-wide substitution of conventional processes and other beam tools by laser technology.This monograph offers a

great insight into the operation principles of high power laser sources, the phenomena of interaction of laser beams and materials and the mechanisms of the various production processes with lasers ? thus enabling production engineers and others to make optimum use of the benefits of laser technology and to understand the technical properties and the physical limitations of this most recent technology (especially in comparison to conventional tools and other beam tools), and providing a sufficient basis for the understanding and use of future developments in this area.

A complete review of the state of the art of phase conjugate lasers, including laser demonstrations, performances, technology and selection of the most important class of nonlinear media. * Emphasizes the basic aspects of phase conjugation. * Chapter authors have all made major contributions to their subjects.

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.

This volume contains the lectures and seminars presented at the NATO Ad vanced Study Institute on "Solid State Lasers: New Developments and Appli cations" the fifteenth course of the Europhysics School of Quantum Electronics, held under the supervision of the Quantum Electronics Division of the European Physical Society. The Institute was held at Elba International Physics Center, Marciana Marina, Elba Island, Tuscany, Italy, August 31 -September 11, 1992. The Europhysics School of Quantum Electronics was started in 1970 with the aim of providing instruction for young researchers and advanced students al ready engaged in the area of quantum electronics or wishing to switch to this area from a different background. Presently the school is under the direction of Professors F.T. Arecchi and M. Inguscio, University of Florence, and Prof. H. Walther, University of Munich, and has its headquarters at the National Insti tute of Optics (INO), Florence, Italy. Each time the directors choose a subject of particular interest, alternating fundamental topics with technological ones, and ask colleagues specifically competent in a given area to take the scientific responsibility for that course.

Keeping abreast of the latest techniques and applications, this new edition of the standard reference and graduate text on laser spectroscopy has been completely revised and expanded. While the general concept is unchanged, the new edition features a broad array of new material, e.g., ultrafast lasers (atto- and femtosecond lasers) and parametric oscillators, coherent matter waves, Doppler-free Fourier spectroscopy with optical frequency combs, interference spectroscopy, quantum optics, the

interferometric detection of gravitational waves and still more applications in chemical analysis, medical diagnostics, and engineering.

Since the invention of the laser, the variety of lasers and their uses have grown at a phenomenal rate. Scientists and engineers have at their disposal an enormous array of sophisticated laser equipments with the possibility of carrying out experiments that were inconceivable only a few decades ago. Lasers for Scientists and Engineers is a grand and glorious book that discusses the principles of laser operation and the details of how selected lasers operate. This book is short and easy to read, enabling the reader to thoroughly grasp the subject, with discussions that begin at an elementary level and lead to a complete understanding of lasers. This book is suitable for a one semester college course for upper-level undergraduate or first year graduate level students in physics, chemistry, biology, astronomy, and the various fields of engineering. The background needed for this book would be junior level courses in optics and modern physics including elementary quantum mechanics. Request Inspection Copy