Lasers
Laser Fundamentals
Quantum Theory from First Principles
Selected Papers on Fundamentals of Lasers
Fundamentals of Condensed Matter and Crystalline Physics
Laser Introduction to Modern Optics
Laser Experiments for Chemistry and Physics
Introduction to Quantum Optics
Cambridge Illustrated Handbook of Optoelectronics and Photonics
Symmetry and Its Applications
Mathematical Modelling Laser and Photonic Systems
Laser Physics and Spectroscopy
Optics in Our Time
Theory of Electromagnetic Wave Propagation
Quantum Optics for Engineers
Laser Spectroscopy and Laser Imaging
Solid-State Lasers
Laser Applications
Laser Physics Principles of Instrumental Analysis
Solid-State Laser Engineering
Lise Meitner A Student’s Guide to Atomic Physics
Technology of Quantum Devices
Laser Physics
Optical Nano and Micro Actuator Technology
Basic Health Physics Fundamentals of Photonics
Steel Design
Lasers and Their Application to the Observation of Bose-Einstein Condensates
Tunable Laser Optics
Fluid Mechanics
EBook
SI Edition
Steel Design
Crystal-Field Engineering of Solid-State Laser Materials
Kinematics, Dynamics, and Design of Machinery
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. This book examines the underlying science and design of laser materials. It emphasizes the principles of crystal-field engineering and discusses the basic physical concepts that determine laser gain and nonlinear frequency conversion in optical crystals. Henderson and Bartram develop the predictive capabilities of crystal-field engineering to show how modification of the symmetry and composition of optical centers can improve laser performance. They also discuss applications of the principles of crystal-field engineering to a variety of optical crystals in relation to the performances of laser devices. This book will be of considerable interest to physical, chemical, and material scientists and to engineers involved in the science and technology of solid-state lasers.
Even since their invention in 1960, lasers have assumed tremendous importance in the fields of science, engineering and technology because of their use both in basic research and in various technological applications. Lasers: Theory and Applications 2nd Edition will provide a coherent presentation of the basic physics behind the working of the laser along with some of their most important applications. Numerical examples are scattered throughout the book for helping the student gain a better appreciation of the concepts and problems at the end of each chapter and provides the student a better understanding of the basics and help in applying the concepts to practical situations. This book serves as a text in a course on lasers and their applications for students majoring in various disciplines such as Physics, Chemistry and Electrical Engineering. PRINCIPLES OF INSTRUMENTAL ANALYSIS is the standard for courses on the principles and applications of modern analytical instruments. In the 7th edition, authors Skoog, Holler, and Crouch infuse their popular text with updated techniques and several new Instrumental Analysis in Action case studies. Updated material enhances the book’s proven approach, which places an emphasis on the fundamental principles of operation for each type of instrument, its optimal area of application, its sensitivity, its precision, and its limitations. The text also introduces students to elementary analog and digital electronics, computers, and the treatment of analytical data. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version. Industry relies on heating for a wide variety of processes involving a broad range of materials. Each process and material requires heating methods suitable to its properties and the desired output. This reference is a general reference with design techniques for heating, especially for small- and medium-sized applications. Industrial Heating: Principles, Techniques, Materials, Applications, and Design fills this gap, presenting design information for both traditional and modern heating processes and auxiliary techniques. The author leverages more than 40 years of experience into this comprehensive, authoritative guide. The book opens with fundamental topics in steady state and transient heat transfer, fluid mechanics, and aerodynamics, emphasizing analytical concepts over mathematical rigor. A discussion of fuels, their combustion, and combustion devices follows, along with waste incineration and its associated problems. The author then examines techniques related to heating, such as vacuum technology, pyrometry, protective atmosphere, and heat exchangers as well as refractory, ceramic, and metallic materials and their advantages and disadvantages. Useful appendices round out the presentation, supplying information on underlying principles such as pressure and thermal diffusivity. Replete with illustrations, examples, and solved problems, Industrial Heating provides a much-needed treatment of all aspects of heating systems, reflecting the advances in both process and technology over the past half-century. STEEL DESIGN covers the fundamentals of structural steel design with an emphasis on the design of members and their connections, rather than the integrated design of buildings. The book is designed so that instructors can easily teach LRFD, ASD, or both, time-permitting. The application of fundamental principles is encouraged for design procedures as well as for practical design, but a theoretical approach is also provided to enhance student development. While the book is intended for junior-and senior-level engineering students, some of the later chapters can be used in graduate courses and practicing engineers will find this text to be an essential reference tool for reviewing current practices. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version. Covering a number of important subjects in quantum optics, this textbook is an excellent introduction for advanced undergraduate and beginning graduate students, familiarizing readers with the basic concepts and formalism as well as the most recent advances. The first part of the textbook covers the semi-classical approach where matter is quantized, but light is not. It describes significant phenomena in quantum optics, including the principles of lasers. The second part is devoted to the full quantum description of light and its interaction with...
matter, covering topics such as spontaneous emission, and classical and non-classical states of light. An overview of photon entanglement and applications to quantum information is also given. In the third part, non-linear optics and laser cooling of atoms are presented, where using both approaches allows for a comprehensive description. Each chapter describes basic concepts in detail, and more specific concepts and phenomena are presented in 'complements'. The book 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 courses. The book examines the key types of lasers and the use of key theoretical descriptions, and the extensive bibliography will also make this a valuable reference work for researchers. In Optical Nano and Micro Actuator Technology, leading engineers, material scientists, chemists, physicists, laser scientists, and manufacturing specialists offer an in-depth, wide-ranging look at the fundamental and unique characteristics of light-driven optical actuators. They discuss how light can initiate physical movement and control a variety of mechanisms that perform mechanical work at the micro- and nanoscale. The book begins with the scientific background necessary for understanding light-driven systems, discussing the nature of light and the interaction between light and NEMS/MEMS devices. It then covers innovative optical actuator technologies that have been developed for many applications. The book examines photoresponsive materials that enable the design of optically driven structures and mechanisms and describes specific light-driven technologies that permit the manipulation of micro- and nanoscale objects. It also explores applications in optofluidics, bioNEMS and biophotonics, medical device design, and micromachine control. Inspiring the next generation of scientists and engineers to advance light-driven technologies, this book gives readers a solid grounding in this emerging interdisciplinary area. It thoroughly explains the scientific language and fundamental principles, provides a holistic view of optical nano and micro actuator systems, and illustrates current and potential applications of light-driven systems. A complete basic undergraduate course in modern optics for physicists, chemists, and engineers. The first half examines the fundamental principles, level terms, and captures key nomenclature used in the field. Equations are used where necessary, and length derivations are avoided. Over 600 clear and self-explanatory illustrations are used to help convey key concepts, and enable readers to quickly grasp important concepts. A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. The term "laser" originated as an acronym for "light amplification by stimulated emission of radiation". Laser Applications provides a firm grounding in the fundamental concepts over governing the field on Optics. This reference book is useful for students of B.E., B.Tech. and M.Tech., courses. The present book is an attempt to treat the subject of Laser as an introductory course. With recent major breakthroughs in ultrafast laser technology and femtosecond nonlinear spectroscopic techniques, Femtosecond Laser Spectroscopy is currently a burgeoning field in many branches of science, including physics, chemistry, biology, and materials science. Attempts have also been made to cover the frontline areas in the subject. The development of Laser and its various applications in Communications, Radiation, medicine, Holography etc., has been given due importance. Light and light based technologies have played an important role in transforming our lives via scientific contributions spanning 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 an overview of discoveries of which have revolutionized the use of light in the last 40 years and 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. **a very valuable text 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 the techniques available today? The authors have taken on this daunting task in this 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 principles and concepts, followed by an overview of applications, advantages and pitfalls, and finally a brief discussion of seminal advances and developments. Many of the examples and cases that are used in this text span areas like atomic, molecular, and 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.New, significant scientific discoveries in laser and photonic technologies, systems perspectives, and integrated design approaches can improve even further the impact in critical areas of challenge. Yet this knowledge is dispersed across several disciplines and research arenas. Laser and Photonic Systems: Design and Integration brings together a multidisciplinary group of experts to increase understanding of the ways in which systems perspectives may influence laser and photonic innovations and application integration. By bringing together chapters from leading scientists and technologists, industrial and systems engineers, and managers, the book stimulates new thinking that would bring a systems, network, and system-of-systems perspective to bear on laser and photonic systems applications. The chapters challenge you to explore opportunities for revolutionary and broader advancements. The authors emphasize the existence of emerging frontiers where the potential contributions to lasers, optics, and photonics applications in fields such as manufacturing, healthcare, security, and communications. The book contains insights from leading researchers, inventors, implementers, and innovators. It explains a variety of techniques, models, and technologies proven to work with laser and photonic systems, their development, design, and integration. Such systems are of growing interest to many organizations, given their promise and potential solutions of grand societal challenges. Lastly, the book helps you leverage the knowledge into exciting new frontiers of successful solutions.Mathematical Modelling sets out the general principles of mathematical modelling as a means comprehending the world. Within the book are the problems of physics, engineering, chemistry, biology, medicine, economics, ecology, sociology, psychology, political science, etc. are all considered through this uniform lens. The author describes different classes of models, including lumped and distributed parameter systems, deterministic and stochastic models, continuous and discrete models, static and dynamical systems, and more. From a mathematical point of view, the considered models can be understood as equations and systems of equations of different nature and variational principles. In addition to this, mathematical features of mathematical models, applied control and optimization problems based on mathematical models, and identification of mathematical models are also presented. Features Each chapter includes four levels: a learning main material (the material), an appendix, additional information), notes (explanations, technical calculations, literature research work; this is for formative work for undergraduates and graduate students and does not require the reader to take any prerequisite course, but may be useful for researchers as well Described mathematical models are grouped both by areas of application and by the types of obtained mathematical problems, which contributes to both the breadth of coverage of the material and the depth of its understanding Can be used as the main textbook on a mathematical modelling course, and is also recommended for special courses on mathematical models for physics, chemistry, biology, economics, etc. Kinematics, Dynamics, and Design of Machinery, Third Edition, presents a fresh approach to kinematic design and analysis and is an ideal textbook for senior undergraduates and graduates in mechanical, automotive and production engineering Presents the traditional approach to the design and analysis of kinematic problems and shows how GCP can be used to solve the same problems more simply Provides a new and simpler approach to cam design Includes an increased number of exercise problems Accompanied by a website hosting a solutions manual, teaching slides and MATLAB® programs/lassers are employed throughout science and technology, in fundamental research, the remote sensing of atmospheric gases or pollutants, communications, medical diagnostics and therapies, and the manufacturing of microelectronic devices. Understanding the principles of their operation, which underlie all of these areas, is essential for a modern scientific education. This text introduces the characteristics and operation of lasers through laboratory experiments designed for the undergraduate curricula in Chemistry and Physics. Introductory chapters describe the properties of light, the history of laser invention, the atomic, molecular and optical principles behind how lasers work, and the kinds of lasers available today. Other chapters include the basic theory of spectroscopy and computational chemistry used to interpret laser experiments. Experiments range from simple in-class demonstrations to more elaborate configurations for advanced students. Each chapter has simple theoretical and background, as well as options suggested for variations on the prescribed experiments. The text will be useful for undergraduates in advanced lab classes, for instructors designing these classes, or for graduate students beginning in laser laboratories. This text also has the broad scope that many, codiscovered nuclear fission with Otto Hahn and Fritz Strassmann, but was denied recognition when the book received a Nobel Prize. This undergraduate textbook covers traditional solid state physics with contemporary condensed matter physics, providing an up-to-date introduction to the major concepts that form the foundations of condensed materials. The main foundational principles are emphasized, providing
students with the knowledge beginners in the field should understand. The book is structured in four parts and allows students to appreciate how the concepts in this broad area build upon each other to produce a cohesive whole as they work through the chapters. Illustrations work closely with the text to convey concepts and ideas visually, enhancing student understanding of difficult material, and end-of-chapter exercises vary in difficulty allowing students to put into practice the theory they have covered in each chapter and reinforce new concepts. 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. Technology of Quantum Devices offers a multi-disciplinary overview of solid state physics, photonics and semiconductor growth and fabrication. Readers will find up-to-date coverage of compound semiconductors, crystal growth techniques, silicon and compound semiconductor device technology, in addition to intersubband and semiconductor lasers. Recent findings in quantum tunneling transport, quantum well intersubband photodetection and quantum well infrared photodetectors (QWIP) are described in detail along with a thorough set of sample problems. A concise overview of the fundamental concepts and applications of atomic physics for students including examples, problems, and diagrams of key concepts. 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 focusing on 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). SPIE Milestones are collections of seminal papers from the world literature covering important discoveries and developments in optics. This book is updated with recent results. Its goal is to maintain Koechner's position as "the bible" of the field. Written from an industrial perspective, it provides a detailed discussion of, and data for, solid-state lasers, their characteristics, design and construction. Broadly tunable lasers have had, and continue to have, an enormous impact in many and diverse fields of science and technology. From a renaissance in spectroscopy to laser guide stars and laser cooling, the nexus is the tunable laser. Tunable Laser Optics offers a transparent and comprehensive treatment of the physics of tunable laser optics based on a detailed description of first principles. Authored by a leading expert in the field, the book covers the optics and optical principles needed to build lasers, the optical instrumentation necessary to characterize laser emission, and laser-based optical instrumentation, addressing key topics such as Dirac's notation, the interferometric equation, the uncertainty principle, pulse compression, and tunable narrow-linewidth lasers. This revised, expanded, and improved Second Edition: Contains new and additional material on tunable lasers and quantum optics Explains the first principles of tunable laser optics in a clear and concise manner Presents an explicit exposition of the relevant theory, without the use of short cuts Employs numerous examples, case studies, and figures to illustrate important concepts Includes carefully designed problems of direct practical significance to stimulate application Emphasizing the utilitarian aspects of the optics and applications, Tunable Laser Optics, Second Edition provides valuable insights into the optical and design trade-offs involved in the design and construction of tunable lasers and optical devices. It makes an ideal textbook for advanced undergraduate-level and graduate-level optics courses for physics and engineering students, as well as a handy reference for researchers and experimentalists. The first part of this book covers the physics of lasers and describes some of the more common types of lasers and their applications. Applications of lasers include CD/DVD players, laser printers and fiber optic communication devices. Part II of this book describes the phenomenon of Bose-Einstein condensation. The experimental techniques used to create a Bose-Einstein condensate provide an interesting and unconventional application of lasers; that is, the cooling and confinement of a dilute gas at very low temperature. In this book emphasis is laid on laser including its operation, different types, properties like coherence and monochromaticity, beam propagation, theoretical treatment of atom-field interaction, semi-classical laser theory, non-linear effects, quantum properties, photon concept and coherent states etc. Please note: Taylor & Francis does not sell or distribute the Hardback in India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka. Quantum Optics for Engineers provides a transparent and methodical introduction to quantum optics via the Dirac's bra–ket notation with an emphasis on practical applications and basic aspects of quantum mechanics such as Heisenberg's uncertainty principle and Schrodinger's equation. Self-contained and using mainly first-year calculus and algebra tools, the book illustrates the interferometric quantum origin of fundamental optical principles such as diffraction, refraction, and reflection. Provides a transparent introduction, via Dirac's notation, to the probability amplitude of quantum entanglement. Explores applications of the probability amplitude of quantum entanglement to optical communications, quantum cryptography, quantum teleportation, and quantum computing. Quantum Optics for Engineers is succinct, transparent, and practical, revealing the intriguing world of quantum entanglement via many practical examples. Ample illustrations are used throughout its presentation and the theory is presented in a methodical, detailed approach. Quantum theory is the soul of theoretical physics. It is not just a theory of specific physical systems, but rather a new framework with universal applicability. This book shows how the theory can be reconstructed from first principles, by rebuilding the quantum rules from the bottom up. Step by step, the reader will learn how to master the counterintuitive aspects of the quantum world, and how to efficiently reconstruct quantum information protocols from first principles. Using intuitive graphical notation to represent equations, and with shorter and more efficient derivations, the theory can be understood and assimilated with
exceptional ease. Offering a radically new perspective on the field, the book contains an efficient course of quantum theory and quantum information for undergraduates. The book is aimed at researchers, professionals, and students in physics, computer science and philosophy, as well as the curious outsider seeking a deeper understanding of the theory. For Fluid Mechanics courses found in Civil and Environmental, General Engineering, and Engineering Technology and Industrial Management departments, Fluid Mechanics is intended to provide a comprehensive guide to a full understanding of the theory and many applications of fluid mechanics. The text features many of the hallmark pedagogical aids unique to Hibbeler texts, including its student-friendly, clear organisation. The text supports the development of student problem-solving skills through a large variety of problems, representing a broad range of engineering disciplines that stress practical, realistic situations encountered in professional practice, and provide varying levels of difficulty. The text offers flexibility in that basic principles are covered in chapters 1-6, and the remaining chapters can be covered in any sequence without the loss of continuity. Updates to the 2nd Edition result from comments and suggestions from colleagues, reviewers in the teaching profession, and many of the author’s students, and include expanded topic coverage and new Example and Fundamental Problems intended to further students’ understanding of the theory and its applications. The full text downloaded to your computer. With eBooks you can: search for key concepts, words and phrases make highlights and notes as you study share your notes with friends eBooks are downloaded to your computer and accessible either offline through the Bookshelf (available as a free download), available online and also via the iPad and Android apps. Upon purchase, you will receive via email the code and instructions on how to access this product. Time limit The eBooks products do not have an expiry date. You will continue to access your digital ebook products whilst you have your Bookshelf installed. An essential introduction to the principles of laser operation and design for graduates in physics and engineering. Designed to prepare candidates for the American Board of Health Physics Comprehensive examination (Part I) and other certification examinations, this monograph introduces professionals in the field to radiation protection principles and their practical application in routine and emergency situations. It features more than 650 worked examples illustrating concepts under discussion along with in-depth coverage of sources of radiation, standards and regulations, biological effects of ionizing radiation, instrumentation, external and internal dosimetry, counting statistics, monitoring and interpretations, operational health physics, transportation and waste, nuclear emergencies, and more. Reflecting for the first time the true scope of health physics at an introductory level, Basic Health Physics: Problems and Solutions gives readers the tools to properly evaluate challenging situations in all areas of radiation protection, including the medical, university, power reactor, fuel cycle, research reactor, environmental, non-ionizing radiation, and accelerator health physics. Clear, coherent work for graduate-level study discusses the Maxwell field equations, radiation from wire antennas, wave aspects of radio-astronomical antenna theory, the Doppler effect, and more. This is the first text specifically designed to train potential health physicists to think and respond like professionals. Written by a former chairman of the American Board of Health Physics Comprehensive Panel of Examiners with more than 20 years of professional and academic experience in the field, it offers a balanced presentation of all the theoretical and practical issues essential for a full working knowledge of radiation exposure assessments. As the only book to cover the entire radiation protection field, it includes detailed coverage of the medical, university, reactor, fuel cycle, environmental and accelerator areas, while exploring key topics in radiation basics, external and internal dosimetry, the biological effects of ionizing radiation, and much more besides. Backed by more than 500 worked examples developed within the context of various scenarios and spanning the full spectrum of real-world challenges, it quickly instills in readers the professional acumen and practical skills they need to perform accurate radiation assessments in virtually any routine or emergency situation. The result is a valuable resource for upper-level students and anyone preparing to take the American Board of Health Physics Comprehensive Examination, as well as for professionals seeking to expand their scope and sharpen their skills.