

LASERS, PHOTONICS, AND ELECTRO-OPTICS  
Series Editor: H. Kogelnik

# FUNDAMENTALS OF LASER OPTICS

KENICHI IGA

# Fundamentals Of Laser Optics

**See Leang Chin**



## **Fundamentals Of Laser Optics:**

*Fundamentals of Laser Optics* Ken'ichi Iga, Richard Bryant Miles, 1994 Developed from a lecture series for graduate and advanced undergraduate students in information processing and applied electronics sets out the fundamental principles and optical behavior of lasers that need to be understood for industrial laser use Annotation copyright Book News Inc Portland Or

Lasers K. Thyagarajan, Ajoy Ghatak, 2010-09-27 Ever 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 **Fundamentals Of Laser Optoelectronics (Second Edition)** See Leang Chin, Huailiang Xu, Shuai Yuan, 2022-08-18 This textbook is based on a course given by the first named author to third and fourth year undergraduate students from physics engineering physics and electrical engineering The purpose is to introduce and explain some of the fundamental principles underlying laser beam control in optoelectronics especially those in relation to optical anisotropy which is at the heart of many optical devices The book attempts to give the reader the background knowledge needed to work in a laser optoelectronic or photonic environment and to manage and handle laser beam equipment with ease In this edition recent research results on modern technologies and instruments relevant to laser optoelectronics have been added to each chapter New material include chirped pulse amplification for petawatt lasers optical anisotropy physical explanations for group velocity dispersion group delay dispersion and third order dispersion an introduction of different types of laser systems and both optical isotropy and anisotropy in different types of harmonic generation Theories based upon mode locking and chirped pulse amplifications have become increasingly more important It is thus necessary that students learn all these in a course devoted to laser optoelectronics As such Chapter 12 is now devoted to mode locking and carrier envelope phase locking A new chapter Chapter 13 which focuses on chirped pulse amplification has also been added *Laser Fundamentals* William T. Silfvast, 2008-07-21 *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.

*Fundamentals of Laser Optics* Kenichi Iga, 1994-04-14. The laser initially called the optical maser was proposed in 1958 by Charles Townes and Arthur Schawlow. In 1960 Theodore Maiman was the first among several researchers to achieve laser oscillation by using a ruby crystal. In the following quarter of a century a considerable amount of research and development has taken place and the laser is now utilized for many diverse applications ranging from the commonplace compact disk to intricate surgical applications in medicine. Since I first entered the laboratory of Professor Yasuharu Suematsu in 1962 to complete my thesis I have been studying the new field of laser optics. In spite of many expectations and a vast investment in research the first practical use of lasers was difficult to achieve. At the Univ. of Erlangen-Nürnberg I once jokingly achieved this. The late Professor K. H. Zschau remarked that laser was defined by an English physicist as 'Less Application of Stimulated Expensive Research'. In a similar vein Dr. Herwig Kogelnik reminded me that in the early 1960s maser was often called 'Money Acquisition Scheme for Expensive Research'. Initially I worked with a ruby laser then with a helium-neon gas laser and am presently engaged in semiconductor laser research. There are probably not a large number of researchers who have had the opportunity to build these three representative types of lasers. My primary objective of study lies in optical communications, however, and therefore I have been approaching the laser mainly as a lightwave propagator.

**Laser Fundamentals** H. Weber, G. Herziger, R. Poprawe, 2005. The three volumes VIII 1A, B, C document the state of the art of Laser Physics and Applications. Scientific trends and related technological aspects are considered by compiling results and conclusions from phenomenology, observation and experience. Reliable data, physical fundamentals and detailed references are presented. In the recent decades the laser beam source matured to a universal tool common to scientific research as well as to industrial use. Today a technical goal is the generation of optical power towards shorter wavelengths, shorter pulses and higher power for application in science and industry. Tailoring the optical energy in wavelength, space and time is a requirement for the investigation of laser-induced processes, i.e. excitation, non-linear amplification, storage of optical energy, etc. According to the actual trends in laser research and development Vol. VIII 1 is split into three parts. Vol. VIII 1A with its two subvolumes 1A1 and 1A2 covers laser fundamentals. Vol. VIII 1B deals with laser systems and Vol. VIII 1C gives an overview on laser applications.

**Fundamentals Of Laser Optoelectronics** See Leang Chin, 1989-11-01. This book is based on a course given by the author to third and fourth year undergraduate students from physics, engineering physics and electrical engineering. The purpose is to introduce and explain some of the fundamental principles underlying laser beam control in optoelectronics, especially those in relation to optical anisotropy which is at the heart of many optical devices. The contents of the book are scattered in many sources and there seems to be no single source available at the undergraduate level. That is why the present book is written. The book attempts to give the reader a good

background needed for working in a laser optoelectronic or photonic laboratory so that the use of equipment and the control of laser beams can be mastered without difficulty

**Lasers and Electro-optics** Christopher C. Davis, 2014-03-20 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 reorganized 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 Fundamentals** , 2005-10-24 The three volumes VIII 1A B C document the state of the art of Laser Physics and Applications Scientific trends and related technological aspects are considered by compiling results and conclusions from phenomenology observation and experience Reliable data physical fundamentals and detailed references are presented In the recent decades the laser beam source matured to a universal tool common to scientific research as well as to industrial use Today a technical goal is the generation of optical power towards shorter wavelengths shorter pulses and higher power for application in science and industry Tailoring the optical energy in wavelength space and time is a requirement for the investigation of laser induced processes i e excitation non linear amplification storage of optical energy etc According to the actual trends in laser research and development Vol VIII 1 is split into three parts Vol VIII 1A with its two subvolumes 1A1 and 1A2 covers laser fundamentals Vol VIII 1B deals with laser systems and Vol VIII 1C gives an overview on laser applications

**Principles of Lasers and Optics** William S. C. Chang, 2005-01-20 Principles of Lasers and Optics first published in 2005 describes both the fundamental principles of the laser and the propagation and application of laser radiation in bulk and guided wave components All solid state gas and semiconductor lasers are analysed uniformly as macroscopic devices with susceptibility originated from quantum mechanical interactions to develop an overall understanding of the coherent nature of laser radiation Analyses of the unique properties of coherent laser light in bulk and guided wave components are presented together and derived from fundamental principles to allow students to appreciate the differences and similarities Topics covered include discussions on how laser radiation should be analysed the macroscopic differences and similarities of various analyses special techniques types of lasers and setting up laser analyses This text will be useful for first year graduates in electrical engineering and physics and also as a reference book on analytical techniques

Semiconductor Laser Fundamentals Toshiaki Suhara, 2004-03-16 Ranging from fundamental theoretical concepts to advanced device technologies this reference text explores the engineering characteristics and performance of specific

semiconductor lasers It defines key principles in electromagnetics optoelectronics and laser implementation for novel applications in optical communications storage processing measurement and sensing This text prepares students for advanced experimental and theoretical research in semiconductor laser technology and provides the only comprehensive systematic and concise description of semiconductor lasers available for an understanding of the physics and parameters of laser operation and function *Fiber Lasers* Johan Meyer,Justice Sompot,Suné von Solms,2022-02-03 Over the past two decades the use of fiber lasers in engineering applications has gradually become established as an engineering discipline on its own The development of fiber lasers is mainly the result of studies from various domains like photonics optical sensing fiber optics nonlinear optics and telecommunication Though many excellent books exist on each of these subjects and several have been written specifically to address lasers and fiber lasers it is still difficult to find one book where the diverse core of subjects that are central to the study of fiber laser systems are presented in simple and straight forward way *Fiber Lasers Fundamentals with MATLAB Modelling* is an introduction to the fundamentals of fiber lasers It provides clear explanations of physical concepts supporting the field of fiber lasers Fiber lasers characteristics are analyzed theoretically through simulations derived from numerical models The authors cover fundamental principles involved in the generation of laser light through both continuous wave CW and pulsing It also covers experimental configuration and characterization for both CW and Q switching The authors describe the simulation of fiber laser systems and propose numerical modelling of various fiber laser schemes MATLAB modelling and numerical computational methods are used throughout the book to simulate different fiber laser system configurations This book will be highly desirable and beneficial for both academics and industry professionals to have ample examples of fiber laser approaches that are well thought out and fully integrated with the subjects covered in the text This book is written to address these needs **Fundamentals of Laser Optoelectronics** S. L. Chin,1989 This book is based on a course given by the author to third and fourth year undergraduate students from physics engineering physics and electrical engineering The purpose is to introduce and explain some of the fundamental principles underlying laser beam control in optoelectronics especially those in relation to optical anisotropy which is at the heart of many optical devices The contents of the book are scattered in many sources and there seems to be no single source available at the undergraduate level That is why the present book is written The book attempts to give the reader a good background needed for working in a laser optoelectronic or photonic laboratory so that the use of equipment and the control of laser beams can be mastered without difficulty *Lasers in Ophthalmology* Franz Fankhauser,Sylvia Kwasniewska,2003 Overview of the status of the broad range of laser applications **Fundamentals of Optical Waveguides** Katsunari Okamoto,2000-02-04 *Fundamentals of Optical Waveguides* gives a complete theoretical basis of optical fibers and planar lightwave circuits while being the first book to deal with the principles and applications of Arrayed Waveguide Grating multiplexers and Planar Lightwave Circuits This comprehensive book enables researchers and graduate students working

with optoelectronics to acquire and utilize the analysis techniques necessary for designing and simulating novel optical fibers and devices

*Fundamentals of Fiber Lasers and Fiber Amplifiers* Vartan V. Ter-Mikirtychev, 2019-12-30 This book covers the fundamental aspects of fiber lasers and fiber amplifiers and includes a wide range of material from laser physics fundamentals to state of the art topics in this rapidly growing field of quantum electronics This expanded and updated new edition includes substantial new material on nonlinear frequency conversion and Raman fiber lasers and amplifiers as well as an expanded list of references inclusive of the recent literature in the field Emphasis is placed on the nonlinear processes taking place in fiber lasers and amplifiers their similarities differences to and their advantages over other solid state lasers The reader will learn the basic principles of solid state physics and optical spectroscopy of laser active centers in fibers the main operational laser regimes and will receive practical recommendations and suggestions on fiber laser research laser applications and laser product development The book will be useful for students researchers and professional physicists and engineers who work with lasers in the optical and telecommunications field as well as those in the chemical and biological industries

*Lasers: Principles, Types and Applications* K. R. Nambiar, 2006 This Book On Lasers Is The Culmination Of Several Years Of Relentless Personal Research Exhaustive Literature Survey Critical Analysis Of All The Facets Of The Subject And Interactions With The Subject Experts And Students In India And Abroad By The Author This Book Has Been Very Systematically Structured And Organised The Subject Has Been Divided Into Three Parts Part A Deals With All The Established Principles And Theories Of Laser Science Prefixed With A Journey Through The Relevant Areas Of Optics And Modern Physics Part B Presents A Galaxy Of All The Available Laser Schemes Of The Day With A Peep Into The Future Part C Deals With The Myriads Of Applications Of This Wonder Beam In Every Walk Of Life While Giving An Exhaustive Account About Lasers The Book Also Covers All The Relevant Aspects Of Related Subjects Such As Fibre Optics Holography Laser Safety Etc Apart From The Excellent Presentation Of The Topics As They Unfold This Book Contains A Rich Fund Of Worked Out Examples And Student Exercises With Answers The Language Is Simple And Reader Friendly The Treatise Logical And Even The Intricate Mathematical Derivations And Clear And Lucid This Book Is Meant To Be A Very Valuable Guide To Students At Graduate And Postgraduate Levels And To Those Working Or Intending To Work In The Field Of Lasers To Add To What They Already Know This Is Perhaps The Only Book At Present On Lasers By An Indian Author With Such A Vast Coverage Of The Subject Itself And The Associated Disciplines

*Fundamentals of Attosecond Optics* Zenghu Chang, 2016-04-19 Attosecond optical pulse generation along with the related process of high order harmonic generation is redefining ultrafast physics and chemistry A practical understanding of attosecond optics requires significant background information and foundational theory to make full use of these cutting edge lasers and advance the technology toward the n

**USAF Formal Schools** United States. Department of the Air Force, 1987 *The Physical Fundamentals of Electro-Optics* Irit Juwiler, Nathan Blaunstein, 2022-07-29 This book offers a much needed practical guide to characterizing

difficulties met by designers of electro optical current devices such as lasers laser diodes and photodiodes and advanced optical devices such as avalanche and erbium diodes to overcome drawbacks associated with optical communication links wireless for LIDAR applications and wired for fiber optical communication All these drawbacks suffer from various types of noises inside each element of the devices under analysis and the corresponding fading phenomenon when various types of optical signals with information data transverse these channels It will appeal to undergraduate and postgraduate students and professionals dealing with optical communication and the design of electro optic devices The book explores the theoretical background and practical aspects both when optical signals propagate through a wireless channel for LIDAR atmospheric applications and when they propagate through an optical fiber



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