



Semiconductor Lasers I

**John E. Carroll, James Whiteaway, Dick
Plumb**



Semiconductor Lasers I:

Semiconductor Lasers I Eli Kapon, 1999-01-12 This book covers the device physics of semiconductor lasers in five chapters written by recognized experts in this field The volume begins by introducing the basic mechanisms of optical gain in semiconductors and the role of quantum confinement in modern quantum well diode lasers Subsequent chapters treat the effects of built in strain one of the important recent advances in the technology of these lasers and the physical mechanisms underlying the dynamics and high speed modulation of these devices The book concludes with chapters addressing the control of photon states in squeezed light and microcavity structures and electron states in low dimensional quantum wire and quantum dot lasers The book offers useful information for both readers unfamiliar with semiconductor lasers through the introductory parts of each chapter as well as a state of the art discussion of some of the most advanced semiconductor laser structures intended for readers engaged in research in this field This book may also serve as an introduction for the companion volume **Semiconductor Lasers II Materials and Structures** which presents further details on the different material systems and laser structures used for achieving specific diode laser performance features Introduces the reader to the basics of semiconductor lasers Covers the fundamentals of lasing in semiconductors including quantum confined and microcavity structures Beneficial to readers interested in the more general aspects of semiconductor physics and optoelectronic devices such as quantum confined heterostructures and integrated optics Each chapter contains a thorough introduction to the topic geared toward the non expert followed by an in depth discussion of current technology and future trends Useful for professionals engaged in research and development Contains numerous schematic and data containing illustrations

Semiconductor Lasers Alexei Baranov, Eric Tournié, 2013-04-23 Semiconductor lasers have important applications in numerous fields including engineering biology chemistry and medicine They form the backbone of the optical telecommunications infrastructure supporting the internet and are used in information storage devices bar code scanners laser printers and many other everyday products **Semiconductor Lasers Fundamentals and Applications** is a comprehensive review of this vital technology Part one introduces the fundamentals of semiconductor lasers beginning with key principles before going on to discuss photonic crystal lasers high power semiconductor lasers and laser beams and the use of semiconductor lasers in ultrafast pulse generation Part two then reviews applications of visible and near infrared emitting lasers Nonpolar and semipolar GaN based lasers advanced self assembled InAs quantum dot lasers and vertical cavity surface emitting lasers are all considered in addition to semiconductor disk and hybrid silicon lasers Finally applications of mid and far infrared emitting lasers are the focus of part three Topics covered include GaSb based type I quantum well diode lasers interband cascade and terahertz quantum cascade lasers whispering gallery mode lasers and tunable mid infrared laser absorption spectroscopy With its distinguished editors and international team of expert contributors **Semiconductor Lasers** is a valuable guide for all those involved in the design operation and application of these important lasers including

laser and telecommunications engineers scientists working in biology and chemistry medical practitioners and academics working in this field Provides a comprehensive review of semiconductor lasers and their applications in engineering biology chemistry and medicine Discusses photonic crystal lasers high power semiconductor lasers and laser beams and the use of semiconductor lasers in ultrafast pulse generation Reviews applications of visible and near infrared emitting lasers and mid and far infrared emitting lasers

Physics of Semiconductor Lasers B. Mroziwicz, M. Bugajski, W. Nakwaski, 2017-01-31
Written for readers who have some background in solid state physics but do not necessarily possess any knowledge of semiconductor lasers this book provides a comprehensive and concise account of fundamental semiconductor laser physics technology and properties The principles of operation of these lasers are therefore discussed in detail with the interrelations between their design and optical electrical and thermal properties The relative merits of a large number of laser structures and their parameters are described to acquaint the reader with the various aspects of the semiconductor lasers and the trends in their development

Semiconductor Lasers Govind P. Agrawal, Niloy K. Dutta, 2013-11-27 Since its invention in 1962 the semiconductor laser has come a long way Advances in material purity and epitaxial growth techniques have led to a variety of semiconductor lasers covering a wide wavelength range of 0.3-100 μm The development during the 1970s of GaAs semiconductor lasers emitting in the near infrared region of 0.8-0.9 μm resulted in their use for the first generation of optical fiber communication systems However to take advantage of low losses in silica fibers occurring around 1.3 and 1.55 μm the emphasis soon shifted toward long wavelength semiconductor lasers The material system of choice in this wavelength range has been the quaternary alloy InGaAsP During the last five years or so the intense development effort devoted to InGaAsP lasers has resulted in a technology mature enough that lightwave transmission systems using InGaAsP lasers are currently being deployed throughout the world This book is intended to provide a comprehensive account of long wave length semiconductor lasers Particular attention is paid to InGaAsP lasers although we also consider semiconductor lasers operating at longer wave lengths The objective is to provide an up to date understanding of semiconductor lasers while incorporating recent research results that are not yet available in the book form Although InGaAsP lasers are often used as an example the basic concepts discussed in this text apply to all semiconductor lasers irrespective of their wavelengths

Semiconductor Lasers: Basic Physics, Technology, and Design Heinrich Rieck, 1970 *Semiconductor Lasers II* Eli Kapon, 1999-01-12
This volume presents state of the art information on several important material systems and device structures employed in modern semiconductor lasers The first two chapters discuss several III-V, II-VI and VI-VI compound semiconductor material systems employed in diode lasers whose emission spectra cover the range from the blue to the mid infrared Subsequent chapters describe the elaboration of special laser structures designed for achieving narrow spectral linewidths and wavelength tunability as well as high power emission devices The last chapter covers the development of surface emitting diode lasers particularly vertical cavity structures In all five chapters the underlying device physics as well as the state of the

art and future trends are discussed This book introduces the non expert to the design and fabrication issues involved in the development of these important laser devices In addition it reviews the current status of the different material systems and cavity configurations for the benefit of readers engaged in research in this field Useful background material related to the fundamentals of lasing in semiconductors can be found in the companion volume Semiconductor Lasers I Fundamentals Covers important recent advances in materials design fabrication and device structure of semiconductor lasers aspects not covered in previously existing literature Introduces the non expert to the subject Useful for professionals engaged in research and development Numerous schematic and data containing illustrations Written by leading experts in the field

Semiconductor Lasers Junji Ohtsubo,2006 This monograph describes fascinating recent progress in the field of chaos stability and instability of semiconductor lasers Applications and future prospects are discussed in detail The book emphasizes the various dynamics induced in semiconductor lasers by optical and electronic feedback optical injection and injection current modulation Recent results of both theoretical and experimental investigations are presented Demonstrating applications of semiconductor laser chaos control and noise Semiconductor Lasers describes suppression and chaotic secure communications For those who are interested in optics but not familiar with nonlinear systems a brief introduction to chaos analysis is presented

Single Frequency Semiconductor Lasers Jens Buus,1991 This tutorial text describes the properties of advanced semiconductor lasers in detail Although the text gives a detailed theoretical account a number of practical examples and experimental results are described as well The material presented is at an advanced level and is of particular interest to scientists and engineers with a basic familiarity with semiconductor lasers who would like a description of the properties of single frequency semiconductor lasers and of the possibilities offered by these devices [Laser Diode](#)

[Microsystems](#) Hans Zappe,2013-03-14 Laser Diode Microsystems provides the reader with the basic knowledge and understanding required for using semiconductor laser diodes in optical microsystems and micro optical electromechanic systems This tutorial addresses the fundamentals of semiconductor laser operation and design coupled with an overview of the types of laser diodes suitable for use in Microsystems along with their distinguishing characteristics Emphasis is placed on laser diode characterization and measurement as well as the assembly techniques and optical accessories required for incorporation of semiconductor lasers into complex microsystems Equipped with typical results and calculation examples this hand on text helps readers to develop a feel for how to choose a laser diode characterize it and incorporate it into a microsystem

Single Frequency Semiconductor Lasers Zujie Fang,Haiwen Cai,Gaoting Chen,Ronghui Qu,2017-07-29 This book systematically introduces the single frequency semiconductor laser which is widely used in many vital advanced technologies such as the laser cooling of atoms and atomic clock high precision measurements and spectroscopy coherent optical communications and advanced optical sensors It presents both the fundamentals and characteristics of semiconductor lasers including basic F P structure and monolithic integrated structures interprets laser noises and their measurements and

explains mechanisms and technologies relating to the main aspects of single frequency lasers including external cavity lasers frequency stabilization technologies frequency sweeping optical phase locked loops and so on It paints a clear physical picture of related technologies and reviews new developments in the field as well It will be a useful reference to graduate students researchers and engineers in the field

Fundamentals of Semiconductor Lasers Takahiro Numai,2014-08-27 This book explains physics under the operating principles of semiconductor lasers in detail based on the experience of the author dealing with the first manufacturing of phase shifted DFB LDs and recent research on transverse modes The book also bridges a wide gap between journal papers and textbooks requiring only an undergraduate level knowledge of electromagnetism and quantum mechanics and helps readers to understand journal papers where definitions of some technical terms vary depending on the paper Two definitions of the photon density in the rate equations and two definitions of the phase shift in the phase shifted DFB LD are explained and differences in the calculated results are indicated depending on the definitions Readers can understand the physics of semiconductor lasers and analytical tools for Fabry Perot LDs DFB LDs and VCSELs and will be stimulated to develop semiconductor lasers themselves

Process Technology for Semiconductor Lasers Kenichi Iga,Susumu Kinoshita,2013-03-07 Process Technology for Semiconductor Lasers describes the design principles of semiconductor lasers mainly from the fabrication point of view A review is given of the history of semiconductor laser development and applications and of the materials used in lasing at short to long wavelengths The basic design principles for semiconductor laser devices and the epitaxy for laser production are discussed An entire chapter is devoted to the technology of liquid phase epitaxy and another one to vapor phase and beam epitaxies The characterizations of laser materials and the fabrication and characteristics of semiconductor lasers are treated Mode control techniques are presented and surface emitting lasers are introduced in the final chapter

Introduction to Semiconductor Lasers for Optical Communications David J. Klotzkin,2020-01-07 This updated second edition textbook provides a thorough and accessible treatment of semiconductor lasers from a design and engineering perspective It includes both the physics of devices as well as the engineering designing and testing of practical lasers The material is presented clearly with many examples provided Readers of the book will come to understand the finer aspects of the theory design fabrication and test of these devices and have an excellent background for further study of optoelectronics

Semiconductor Disk Lasers Oleg G. Okhotnikov,2010-03-30 This timely publication presents a review of the most recent developments in the field of Semiconductor Disk Lasers Covering a wide range of key topics such as operating principles thermal management nonlinear frequency conversion semiconductor materials short pulse generation electrical pumping and laser applications the book provides readers with a comprehensive account of the fundamentals and latest advances in this rich and diverse field In so doing it brings together contributions from world experts at major collaborative research centers in Europe and the USA Each chapter includes a tutorial style introduction to the selected topic suitable for postgraduate students and scientists with

a basic background in optics making it of interest to a wide range of scientists researchers engineers and physicists working and interested in this rapidly developing field It will also serve as additional reading for students in the field

Semiconductor Lasers II Eli Kapon,1999-01-14 This volume presents state of the art information on several important material systems and device structures employed in modern semiconductor lasers The first two chapters discuss several III V II VI and VI VI compound semiconductor material systems employed in diode lasers whose emission spectra cover the range from the blue to the mid infrared Subsequent chapters describe the elaboration of special laser structures designed for achieving narrow spectral linewidths and wavelength tunability as well as high power emission devices The last chapter covers the development of surface emitting diode lasers particularly vertical cavity structures In all five chapters the underlying device physics as well as the state of the art and future trends are discussed This book introduces the non expert to the design and fabrication issues involved in the development of these important laser devices In addition it reviews the current status of the different material systems and cavity configurations for the benefit of readers engaged in research in this field Useful background material related to the fundamentals of lasing in semiconductors can be found in the companion volume *Semiconductor Lasers I Fundamentals* Covers important recent advances in materials design fabrication and device structure of semiconductor lasers aspects not covered in previously existing literature Introduces the non expert to the subject Useful for professionals engaged in research and development Numerous schematic and data containing illustrations Written by leading experts in the field

Advances In Semiconductor Lasers And Applications To Optoelectronics (Ijhses Vol. 9 No. 4) Mitra Dutta,Michael A Stroschio,2000-06-21 Foreword by Charles H Townes This volume includes highlights of the theories underlying the essential phenomena occurring in novel semiconductor lasers as well as the principles of operation of selected heterostructure lasers To understand scattering processes in heterostructure lasers and related optoelectronic devices it is essential to consider the role of dimensional confinement of charge carriers as well as acoustical and optical phonons in quantum structures Indeed it is important to consider the confinement of both phonons and carriers in the design and modeling of novel semiconductor lasers such as the tunnel injection laser quantum well intersubband lasers and quantum dot lasers The full exploitation of dimensional confinement leads to the exciting new capability of scattering time engineering in novel semiconductor lasers As a result of continuing advances in techniques for growing quantum heterostructures recent developments are likely to be followed in coming years by many more advances in semiconductor lasers and optoelectronics As our understanding of these devices and the ability to fabricate them grow so does our need for more sophisticated theories and simulation methods bridging the gap between quantum and classical transport

Advances in Semiconductor Lasers ,2012-06-12 *Semiconductors and Semimetals* has distinguished itself through the careful selection of well known authors editors and contributors Originally widely known as the Willardson and Beer Series it has succeeded in publishing numerous landmark volumes and chapters The series publishes timely highly

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Semiconductor Lasers and Heterojunction LEDs Henry Kressel,2012-12-02 Semiconductor Lasers and Heterojunction LEDs presents an introduction to the subject of semiconductor lasers and heterojunction LEDs The book reviews relevant basic solid state and electromagnetic principles the relevant concepts in solid state physics and the p n junctions and heterojunctions The text also describes stimulated emission and gain the relevant concepts in electromagnetic field theory and the modes in laser structures The relation between electrical and optical properties of laser diodes epitaxial technology binary III V compounds and diode fabrication are also considered The book further tackles the heterojunction devices of alloys other than GaAs AlAs the devices for special applications distributed feedback lasers and the transient effects in laser diodes Students taking courses in semiconductor lasers and heterojunction LEDs will find the book useful

Distributed Feedback Semiconductor Lasers John E. Carroll,James Whiteaway,Dick Plumb,1998 Concentrating on presenting a thorough analysis of DFB lasers from a level suitable for research students this book emphasises and gives extensive coverage of computer aided modeling techniques

Semiconductor-Laser Fundamentals Weng W. Chow,Stephan W. Koch,1999-07-21 This in depth title discusses the underlying physics and operational principles of semiconductor lasers It analyzes the optical and electronic properties of the semiconductor medium in detail including quantum confinement and gain engineering effects The text also includes recent developments in blue emitting semiconductor lasers

Unveiling the Magic of Words: A Review of "**Semiconductor Lasers I**"

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