

An Introduction To Semiconductor Devices By Donald Neamen Solution Manual

Retaining the comprehensive and in-depth approach that cemented the bestselling first edition's place as a standard reference in the field, the Handbook of Semiconductor Manufacturing Technology, Second Edition features new and updated material that keeps it at the vanguard of today's most dynamic and rapidly growing field. Iconic experts Robert Doering and Yoshio Nishi have again assembled a team of the world's leading specialists in every area of semiconductor manufacturing to provide the most reliable, authoritative, and industry-leading information available. Stay Current with the Latest Technologies

In addition to updates to nearly every existing chapter, this edition features five entirely new contributions on... Silicon-on-insulator (SOI) materials and devices Supercritical CO₂ in semiconductor cleaning Low- ϵ dielectrics Atomic-layer deposition Damascene copper electroplating Effects of terrestrial radiation on integrated circuits (ICs)

Reflecting rapid progress in many areas, several chapters were heavily revised and updated, and in some cases, rewritten to reflect rapid advances in such areas as interconnect technologies, gate

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dielectrics, photomask fabrication, IC packaging, and 300 mm wafer fabrication. While no book can be up-to-the-minute with the advances in the semiconductor field, the Handbook of Semiconductor Manufacturing Technology keeps the most important data, methods, tools, and techniques close at hand.

This book covers the physics of semiconductors on an introductory level, assuming that the reader already has some knowledge of condensed matter physics. Crystal structure, band structure, carrier transport, phonons, scattering processes and optical properties are presented for typical semiconductors such as silicon, but III–V and II–VI compounds are also included. In view of the increasing importance of wide-gap semiconductors, the electronic and optical properties of these materials are dealt with too.

The 3rd edition of this successful textbook contains ample material for a comprehensive upper-level undergraduate or beginning graduate course, guiding readers to the point where they can choose a special topic and begin supervised research. The textbook provides a balance between essential aspects of solid-state and semiconductor physics, on the one hand, and the principles of various semiconductor devices and their applications in electronic and photonic devices, on the other. It highlights many practical aspects of semiconductors such as alloys, strain, heterostructures, nanostructures, that are necessary in modern

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semiconductor research but typically omitted in textbooks. Coverage also includes additional advanced topics, such as Bragg mirrors, resonators, polarized and magnetic semiconductors, nanowires, quantum dots, multi-junction solar cells, thin film transistors, carbon-based nanostructures and transparent conductive oxides. The text derives explicit formulas for many results to support better understanding of the topics. The Physics of Semiconductors requires little or no prior knowledge of solid-state physics and evolved from a highly regarded two-semester course. In the third edition several topics are extended and treated in more depth including surfaces, disordered materials, amorphous semiconductors, polarons, thermopower and noise. More than 1800 references guide the reader to historic and current literature including original and review papers and books.

Semiconductor Device Physics and Design teaches readers how to approach device design from the point of view of someone who wants to improve devices and can see the opportunity and challenges. It begins with coverage of basic physics concepts, including the physics behind polar heterostructures and strained heterostructures. The book then details the important devices ranging from p-n diodes to bipolar and field effect devices. By relating device design to device performance and then relating device needs to system use the student

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can see how device design works in the real world.

An Introduction to Semiconductor Devices McGraw-Hill Science Engineering
Electrical Engineering Advanced Theory of Semiconductor Devices

Semiconductor devices are ubiquitous in today's world and are found increasingly in cars, kitchens and electronic door locks, attesting to their presence in our daily lives. This comprehensive book provides the fundamentals of semiconductor device theory from basic quantum physics to computer-aided design. Advanced Theory of Semiconductor Devices will improve your understanding of computer simulation of devices through a thorough discussion of basic equations, their validity, and numerical solutions as they are contained in current simulation tools. You will gain state-of-the-art knowledge of devices used in both III–V compounds and silicon technology. Specially featured are novel approaches and explanations of electronic transport, particularly in p–n junction diodes. Close attention is also given to innovative treatments of quantum-well laser diodes and hot electron effects in silicon technology. This in-depth book is written for engineers, graduate students, and research scientists in solid-state electronics who want to gain a better understanding of the principles underlying semiconductor devices.

The new edition of the most detailed and comprehensive single-volume reference

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on major semiconductor devices The Fourth Edition of Physics of Semiconductor Devices remains the standard reference work on the fundamental physics and operational characteristics of all major bipolar, unipolar, special microwave, and optoelectronic devices. This fully updated and expanded edition includes approximately 1,000 references to original research papers and review articles, more than 650 high-quality technical illustrations, and over two dozen tables of material parameters. Divided into five parts, the text first provides a summary of semiconductor properties, covering energy band, carrier concentration, and transport properties. The second part surveys the basic building blocks of semiconductor devices, including p-n junctions, metal-semiconductor contacts, and metal-insulator-semiconductor (MIS) capacitors. Part III examines bipolar transistors, MOSFETs (MOS field-effect transistors), and other field-effect transistors such as JFETs (junction field-effect-transistors) and MESFETs (metal-semiconductor field-effect transistors). Part IV focuses on negative-resistance and power devices. The book concludes with coverage of photonic devices and sensors, including light-emitting diodes (LEDs), solar cells, and various photodetectors and semiconductor sensors. This classic volume, the standard textbook and reference in the field of semiconductor devices: Provides the practical foundation necessary for understanding the devices currently in use and

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evaluating the performance and limitations of future devices Offers completely updated and revised information that reflects advances in device concepts, performance, and application Features discussions of topics of contemporary interest, such as applications of photonic devices that convert optical energy to electric energy Includes numerous problem sets, real-world examples, tables, figures, and illustrations; several useful appendices; and a detailed solutions manual Explores new work on leading-edge technologies such as MODFETs, resonant-tunneling diodes, quantum-cascade lasers, single-electron transistors, real-space-transfer devices, and MOS-controlled thyristors Physics of Semiconductor Devices, Fourth Edition is an indispensable resource for design engineers, research scientists, industrial and electronics engineering managers, and graduate students in the field.

This textbook gives a complete and fundamental introduction to the properties of III-V compound semiconductor devices, highlighting the theoretical and practical aspects of their device physics. Beginning with an introduction to the basics of semiconductor physics, it presents an overview of the physics and preparation of compound semiconductor materials, as well as a detailed look at the electrical and optical properties of compound semiconductor heterostructures. The book concludes with chapters dedicated to a number of heterostructure electronic and

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photonic devices, including the high-electron-mobility transistor, the heterojunction bipolar transistor, lasers, unipolar photonic devices, and integrated optoelectronic devices. Featuring chapter-end problems, suggested references for further reading, as well as clear, didactic schematics accompanied by six information-rich appendices, this textbook is ideal for graduate students in the areas of semiconductor physics or electrical engineering. In addition, up-to-date results from published research make this textbook especially well-suited as a self-study and reference guide for engineers and researchers in related industries.

This book is an introduction to the principles of semiconductor physics, linking its scientific aspects with practical applications. It is addressed to both readers who wish to learn semiconductor physics and those seeking to understand semiconductor devices. It is particularly well suited for those who want to do both. "An Introduction to Semiconductor Devices by Donald Neamen is designed to provide a fundamental understanding of the characteristics, operations, and limitations of semiconductor devices. In order to meet this goal, the book brings together explanations of fundamental physics of semiconductor materials and semiconductor device physics." "This new text provides an accessible and modern approach to the material. Aimed at the undergraduate, Neamen keeps

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coverage of quantum mechanics to a minimum and labels the most advanced material as optional. MOS transistors are covered before bipolar transistors to reflect the dominance of MOS coverage in today's world."--BOOK JACKET. Introduction to Semiconductor Device Physics is a popular and established text that offers a thorough introduction to the underlying physics of semiconductor devices. It begins with a review of basic solid state physics, then goes on to describe the properties of semiconductors including energy bands, the concept of effective mass, carrier concentration, and conduction in more detail. Thereafter the book is concerned with the principles of operation of specific devices, beginning with the Gunn Diode and the p-n junction. The remaining chapters cover the on specific devices, including the LED, the bipolar transistor, the field-effect transistor, and the semiconductor laser. The book concludes with a chapter providing a brief introduction to quantum theory. Not overtly mathematical, Introduction to Semiconductor Device Physics introduces only those physical concepts required for an understanding of the semiconductor devices being considered. The author's intuitive style, coupled with an extensive set of worked problems, make this the ideal introductory text for those concerned with understanding electrical and electronic engineering, applied physics, and related subjects.

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The first advanced textbook to provide a useful introduction in a brief, coherent and comprehensive way, with a focus on the fundamentals. After having read this book, students will be prepared to understand any of the many multi-authored books available in this field that discuss a particular aspect in more detail, and should also benefit from any of the textbooks in photochemistry or spectroscopy that concentrate on a particular mechanism. Based on a successful and well-proven lecture course given by one of the authors for many years, the book is clearly structured into four sections: electronic structure of organic semiconductors, charged and excited states in organic semiconductors, electronic and optical properties of organic semiconductors, and fundamentals of organic semiconductor devices.

CD-ROM contains: "Win32 version of SGFramework and the simulations contains in the book."

For some time there has been a need for a semiconductor device book that carries diode and transistor theory beyond an introductory level and yet has space to touch on a wider range of semiconductor device principles and applications. Such topics are covered in specialized monographs numbering many hundreds, but the voluminous nature of this literature limits access for students. This book is the outcome of attempts to develop a broad course on devices and

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integrated electronics for university students at about senior-year level. The educational prerequisites are an introductory course in semiconductor junction and transistor concepts, and a course on analog and digital circuits that has introduced the concepts of rectification, amplification, oscillators, modulation and logic and SWitching circuits. The book should also be of value to professional engineers and physicists because of both, the information included and the detailed guide to the literature given by the references. The aim has been to bring some measure of order into the subject area examined and to provide a basic structure from which teachers may develop themes that are of most interest to students and themselves. Semiconductor devices and integrated circuits are reviewed and fundamental factors that control power levels, frequency, speed, size and cost are discussed. The text also briefly mentions how devices are used and presents circuits and comments on representative applications. Thus, the book seeks a balance between the extremes of device physics and circuit design.

This book covers the fundamentals and significance of 2-D materials and related semiconductor transistor technologies for the next-generation ultra low power applications. It provides comprehensive coverage on advanced low power transistors such as NCFETs, FinFETs, TFETs, and flexible transistors for future

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ultra low power applications owing to their better subthreshold swing and scalability. In addition, the text examines the use of field-effect transistors for biosensing applications and covers design considerations and compact modeling of advanced low power transistors such as NCFETs, FinFETs, and TFETs. TCAD simulation examples are also provided. FEATURES Discusses the latest updates in the field of ultra low power semiconductor transistors Provides both experimental and analytical solutions for TFETs and NCFETs Presents synthesis and fabrication processes for FinFETs Reviews details on 2-D materials and 2-D transistors Explores the application of FETs for biosensing in the healthcare field This book is aimed at researchers, professionals, and graduate students in electrical engineering, electronics and communication engineering, electron devices, nanoelectronics and nanotechnology, microelectronics, and solid-state circuits.

The technological progress is closely related to the developments of various materials and tools made of those materials. Even the different ages have been defined in relation to the materials used. Some of the major attributes of the present-day age (i.e., the electronic materials' age) are such common tools as computers and fiber-optic telecommunication systems, in which semiconductor materials provide vital components for various mic- electronic and optoelectronic

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devices in applications such as computing, memory storage, and communication. The field of semiconductors encompasses a variety of disciplines. This book is not intended to provide a comprehensive description of a wide range of semiconductor properties or of a continually increasing number of the semiconductor device applications. Rather, the main purpose of this book is to provide an introductory perspective on the basic principles of semiconductor materials and their applications that are described in a relatively concise format in a single volume. Thus, this book should especially be suitable as an introductory text for a single course on semiconductor materials that may be taken by both undergraduate and graduate engineering students. This book should also be useful, as a concise reference on semiconductor materials, for researchers working in a wide variety of fields in physical and engineering sciences.

The Third Edition of the standard textbook and reference in the field of semiconductor devices This classic book has set the standard for advanced study and reference in the semiconductor device field. Now completely updated and reorganized to reflect the tremendous advances in device concepts and performance, this Third Edition remains the most detailed and exhaustive single source of information on the most important semiconductor devices. It gives readers immediate access to detailed descriptions of the underlying physics and performance characteristics of all major bipolar, field-effect,

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microwave, photonic, and sensor devices. Designed for graduate textbook adoptions and reference needs, this new edition includes: A complete update of the latest developments New devices such as three-dimensional MOSFETs, MODFETs, resonant-tunneling diodes, semiconductor sensors, quantum-cascade lasers, single-electron transistors, real-space transfer devices, and more Materials completely reorganized Problem sets at the end of each chapter All figures reproduced at the highest quality Physics of Semiconductor Devices, Third Edition offers engineers, research scientists, faculty, and students a practical basis for understanding the most important devices in use today and for evaluating future device performance and limitations. A Solutions Manual is available from the editorial department.

From semiconductor fundamentals to semiconductor devices used in the telecommunications and computing industries, this 2005 book provides a solid grounding in the most important devices used in the hottest areas of electronic engineering. The book includes coverage of future approaches to computing hardware and RF power amplifiers, and explains how emerging trends and system demands of computing and telecommunications systems influence the choice, design and operation of semiconductors. Next, the field effect devices are described, including MODFETs and MOSFETs. Short channel effects and the challenges faced by continuing miniaturisation are then addressed. The rest of the book discusses the structure, behaviour, and operating requirements of semiconductor devices used in lightwave and

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wireless telecommunications systems. This is both an excellent senior/graduate text, and a valuable reference for engineers and researchers in the field.

Market_Desc: · Electrical Engineers Special Features: · Over 150 solved examples that clarify concepts are integrated throughout the text. · End-of-chapter summary tables and hundreds of figures are included to reinforce the intricacies of modern semiconductor devices· Coverage of device optimization issues shows the reader how in each device one has to trade one performance against another About The Book: This introductory text presents a well-balanced coverage of semiconductor physics and device operation and shows how devices are optimized for applications. The text begins with an exploration of the basic physical processes upon which all semiconductor devices are based. Next, the author focuses on the operation of the important semiconductor devices along with issues relating to the optimization of device performance.

Electronic components made out of semiconductors surround us in our daily lives. Semiconductor devices are used in computers, hand-held devices, and cell phones. They are also used to control the power in refrigerators, ovens, and dish-washers. They are used extensively in the cars we drive, the trains we ride in, and the airplanes we fly in. Semiconductor devices are also the principle component of solar panels on our homes. In short, semiconductor devices are present in most anything that pertains to energy, communications, or information. This book is an introduction to the operating

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principles of these semiconductor devices. This book is appropriate for undergraduate students in engineering.

Semiconductor device modelling has developed in recent years from being solely the domain of device physicists to span broader technological disciplines involved in device and electronic circuit design and development. The rapid emergence of very high speed, high density integrated circuit technology and the drive towards high speed communications has meant that extremely small-scale device structures are used in contemporary designs. The characterisation and analysis of these devices can no longer be satisfied by electrical measurements alone. Traditional equivalent circuit models and closed-form analytical models cannot always provide consistently accurate results for all modes of operation of these very small devices. Furthermore, the highly competitive nature of the semiconductor industry has led to the need to minimise development costs and lead-time associated with introducing new designs. This has meant that there has been a greater demand for models capable of increasing our understanding of how these devices operate and capable of predicting accurate quantitative results. The desire to move towards computer aided design and expert systems has reinforced the need for models capable of representing device operation under DC, small-signal, large-signal and high frequency operation. It is also desirable to relate the physical structure of the device to the electrical performance. This demand for better models has led to the introduction of improved equivalent circuit models and a

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upsurge in interest in using physical models.

This introduction to semiconductor microtechnology covers the structure & manufacture of semiconductor devices. The Second Edition has been updated to reflect advances in the design & fabrication of semiconductor devices. Provides background material on semiconductor microtechnology & describes the properties of semiconductor materials & each step of the manufacturing process. Includes more photographs & larger diagrams; also provides instructional objectives & self-evaluation questions at the beginning of each chapter & problems at the end.

Optoelectronics has become an important part of our lives. Wherever light is used to transmit information, tiny semiconductor devices are needed to transfer electrical current into optical signals and vice versa. Examples include light emitting diodes in radios and other appliances, photodetectors in elevator doors and digital cameras, and laser diodes that transmit phone calls through glass fibers. Such optoelectronic devices take advantage of sophisticated interactions between electrons and light. Nanometer scale semiconductor structures are often at the heart of modern optoelectronic devices. Their shrinking size and increasing complexity make computer simulation an important tool to design better devices that meet ever rising performance requirements. The current need to apply advanced design software in optoelectronics follows the trend observed in the 1980's with simulation software for silicon devices. Today, software for technology computer-aided design (TCAD) and electronic design automation (EDA)

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represents a fundamental part of the silicon industry. In optoelectronics, advanced commercial device software has emerged recently and it is expected to play an increasingly important role in the near future. This book will enable students, device engineers, and researchers to more effectively use advanced design software in optoelectronics. Provides fundamental knowledge in semiconductor physics and in electromagnetics, while helping to understand and use advanced device simulation software Demonstrates the combination of measurements and simulations in order to obtain realistic results and provides data on all required material parameters Gives deep insight into the physics of state-of-the-art devices and helps to design and analyze of modern optoelectronic devices

This book provides one of the most rigorous treatments of compound semiconductor device physics yet published. A complete understanding of modern devices requires a working knowledge of low-dimensional physics, the use of statistical methods, and the use of one-, two-, and three-dimensional analytical and numerical analysis techniques. With its systematic and detailed**discussion of these topics, this book is ideal for both the researcher and the student. Although the emphasis of this text is on compound semiconductor devices, many of the principles discussed will also be useful to those interested in silicon devices. Each chapter ends with exercises that have been designed to reinforce concepts, to complement arguments or derivations, and to emphasize the nature of approximations by critically evaluating realistic conditions. One

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of the most rigorous treatments of compound semiconductor device physics yet published**Essential reading for a complete understanding of modern devices**Includes chapter-ending exercises to facilitate understanding

Microfabrication is the key technology behind integrated circuits, microsensors, photonic crystals, ink jet printers, solar cells and flat panel displays. Microsystems can be complex, but the basic microstructures and processes of microfabrication are fairly simple. Introduction to Microfabrication shows how the common microfabrication concepts can be applied over and over again to create devices with a wide variety of structures and functions. Featuring:

- * A comprehensive presentation of basic fabrication processes
- * An emphasis on materials and microstructures, rather than device physics
- * In-depth discussion on process integration showing how processes, materials and devices interact
- * A wealth of examples of both conceptual and real devices

Introduction to Microfabrication includes 250 homework problems for students to familiarise themselves with micro-scale materials, dimensions, measurements, costs and scaling trends. Both research and manufacturing topics are covered, with an emphasis on silicon, which is the workhorse of microfabrication. This book will serve as an excellent first text for electrical engineers, chemists, physicists and materials scientists who wish to learn about microstructures and microfabrication techniques, whether in MEMS, microelectronics or emerging applications.

The first edition of "Semiconductor Physics" was published in 1973 by Springer-Verlag

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Wien-New York as a paperback in the Springer Study Edition. In 1977, a Russian translation by Professor Yu. K. Pozhela and coworkers at Vilnius/USSR was published by Izdatelstvo "MIR", Moscow. Since then new ideas have been developed in the field of semiconductors such as electron hole droplets, dangling bond saturation in amorphous silicon by hydrogen, or the determination of the fine structure constant from surface quantization in inversion layers. New techniques such as molecular beam epitaxy which has made the realization of the Esaki superlattice possible, deep level transient spectroscopy, and refined a. c. Hall techniques have evolved. Now that the Viennese edition is about to go out of print, Springer-Verlag, Berlin-Heidelberg-New York is giving me the opportunity to include these new subjects in a monograph to appear in the Solid-State Sciences series. Again it has been the intention to cover the field of semiconductor physics comprehensively, although some chapters such as diffusion of hot carriers and their galvanomagnetic phenomena, as well as superconducting degenerate semiconductors and the appendices, had to go for commercial reasons. The emphasis is more on physics than on device aspects.

Offers an innovative and accessible new approach to the teaching of the fundamentals of semiconductor components by exploiting simulation to explain the mechanisms behind current in semiconductor structures. Simulation is a popular tool used by engineers and scientists in device and process research and the accompanying two dimensional process and device simulation software 'MicroTec', enables students to

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make their own devices and allows the recreation of real performance under varying parameters. There is also an accompanying ftp site containing ICECREAM software (Integrated Circuits and Electronics group Computerized Remedial Education And Mastering) which improves understanding of the physics involved and covers semiconductor physics, junction diodes, silicon bipolar and MOS transistors and photonic devices like LEDs and lasers. Features include: * MicroTec diskette containing a two-dimensional process and device simulator on which the many simulation exercises mentioned in the text can be performed thereby facilitating learning through experimentation * Computer aided education software (accessible via ftp) featuring question and answer games, which enables students to enhance their understanding of the physics involved and allows lecturers to set assignments * Broad coverage spanning the common devices: pn junctions, metal semiconductor junctions, photocells, lasers, bipolar transistors, and MOS transistors * Discussion of fundamental concepts and technological principles offering the student a valuable grounding in semiconductor physics * Examination of the implications of recent research on small dimensions, reliability problems and breakdown mechanisms. Semiconductor Devices Explained offers a comprehensive new approach to teaching the fundamentals of semiconductor components based on the use of the accompanying process and device simulation software. Simulation is a popular tool used by engineers and scientists in device and process research. It supports the understanding of basic phenomena by linking the

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theory to hands on applications and real world problems with semiconductor devices. Throughout the text students are encouraged to augment their understanding by undertaking simulations and creating their own devices. The ICECREAM programme (Integrated Circuits and Electronics group Computerized Remedial Education And Mastering) question and answer game leads students through the concepts of common devices and makes learning fun. There is also a self-test element in which a data bank generates questions on the fundamentals of semiconductor junctions enabling students to assess their progress. Larger projects suitable for use as examination assignments are also incorporated. The test package is freely available to lecturers from the author on request. The remedial component of ICECREAM is available from the Wiley ftp site. MicroTec comes on a disk in the back of the book.

This comprehensive introduction to the elementary theory and properties of semiconductors describes the basic physics of semiconductor materials and technologies for fabrication of semiconductor devices. Addresses approaches to modeling and provides details of measurement techniques. Includes numerous illustrative examples and graded problems.

Modern Semiconductor Devices for Integrated Circuits, First Edition introduces readers to the world of modern semiconductor devices with an emphasis on integrated circuit applications. KEY TOPICS: Electrons and Holes in Semiconductors; Motion and Recombination of Electrons and Holes; Device Fabrication Technology; PN and

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Metal–Semiconductor Junctions; MOS Capacitor; MOS Transistor; MOSFETs in ICs—Scaling, Leakage, and Other Topics; Bipolar Transistor. MARKET: Written by an experienced teacher, researcher, and expert in industry practices, this succinct and forward-looking text is appropriate for anyone interested in semiconductor devices for integrated circuits, and serves as a suitable reference text for practicing engineers. Filling the gap in the literature currently available, this book presents an overview of our knowledge of the physics behind organic semiconductor devices. Contributions from 18 international research groups cover various aspects of this field, ranging from the growth of organic layers and crystals, their electronic properties at interfaces, their photophysics and electrical transport properties to the application of these materials in such different devices as organic field-effect transistors, photovoltaic cells and organic light-emitting diodes. From the contents: * Excitation Dynamics in Organic Semiconductors * Organic Field-Effect Transistors * Spectroscopy of Organic Semiconductors * Interfaces between Organic Semiconductors and Metals * Analysis and Modeling of Devices * Exciton Formation and Energy Transfer in Organic Light Emitting Diodes * Deposition and Characterization

A semiconductor interface is the contact between the semiconductor itself and a metal. The interface is a site of change, and it is imperative to ensure that the semiconducting material is sealed at this point to maintain its reliability. This book examines various aspects of interfaces, showing how they can affect microstructures and devices such as

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infrared photodetectors (as used in nightsights) and blue diode lasers. It presents various techniques for examining different types of semiconductor material and suggests future potential commercial applications for different semiconductor devices. Written by experts in their fields and focusing on metallic semiconductors (Cadmium Telluride and related compounds), this comprehensive overview of recent developments is an essential reference for those working in the semiconductor industry and provides a concise and comprehensive introduction to those new to the field.

Special Features *Computer-based exercises and homework problems -- unique to this text and comprising 25% of the total number of problems -- encourage students to address realistic and challenging problems, experiment with what if scenarios, and easily obtain graphical outputs. Problems are designed to progressively enhance MATLAB-use proficiency, so students need not be familiar with MATLAB at the start of your course. Program scripts that are answers to exercises in the text are available at no charge in electronic form (see Teaching Resources below). *Supplement and Review Mini-Chapters after each of the text's three parts contain an extensive review list of terms, test-like problem sets with answers, and detailed suggestions on supplemental reading to reinforce students' learning and help them prepare for exams. *Read-Only Chapters, strategically placed to provide a change of pace during the course, provide informative, yet enjoyable reading for students. *Measurement Details and Results samples offer students a realistic perspective on the seldom-perfect nature

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of device characteristics, contrary to the way they are often represented in introductory texts. Content Highlig

The awaited revision of *Semiconductor Devices: Physics and Technology* offers more than 50% new or revised material that reflects a multitude of important discoveries and advances in device physics and integrated circuit processing. Offering a basic introduction to physical principles of modern semiconductor devices and their advanced fabrication technology, the third edition presents students with theoretical and practical aspects of every step in device characterizations and fabrication, with an emphasis on integrated circuits. Divided into three parts, this text covers the basic properties of semiconductor materials, emphasizing silicon and gallium arsenide; the physics and characteristics of semiconductor devices bipolar, unipolar special microwave and photonic devices; and the latest processing technologies, from crystal growth to lithographic pattern transfer.

This textbook provides a theoretical background for contemporary trends in solid-state theory and semiconductor device physics. It discusses advanced methods of quantum mechanics and field theory and is therefore primarily intended for graduate students in theoretical and experimental physics who have already studied electrodynamics, statistical physics, and quantum mechanics. It also relates solid-state physics fundamentals to semiconductor device applications and includes auxiliary results from mathematics and quantum mechanics, making the book useful also for graduate

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students in electrical engineering and material science. Key Features: Explores concepts common in textbooks on semiconductors, in addition to topics not included in similar books currently available on the market, such as the topology of Hilbert space in crystals Contains the latest research and developments in the field Written in an accessible yet rigorous manner

A definitive and up-to-date handbook of semiconductor devices Semiconductor devices, the basic components of integrated circuits, are responsible for the rapid growth of the electronics industry over the past fifty years. Because there is a growing need for faster and more complex systems for the information age, existing semiconductor devices are constantly being studied for improvement, and new ones are being continually invented. As a result, a large number of types and variations of devices are available in the literature. The Second Edition of this unique engineering guide continues to be the only available complete collection of semiconductor devices, identifying 74 major devices and more than 200 variations of these devices. As in the First Edition, the value of this text lies in its comprehensive, yet highly readable presentation and its easy-to-use format, making it suitable for a wide range of audiences. Essential information is presented for a quick, balanced overview Each chapter is designed to cover only one specific device, for easy and focused reference Each device is discussed in detail, always including its history, its structure, its characteristics, and its applications The Second Edition has been significantly updated with eight new chapters, and the

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material rearranged to reflect recent developments in the field. As such, it remains an ideal reference source for graduate students who want a quick survey of the field, as well as for practitioners and researchers who need quick access to basic information, and a valuable pragmatic handbook for salespeople, lawyers, and anyone associated with the semiconductor industry.

Describing space-charge effects in semiconductors, this text moves from basic principles to advanced application in semiconducting devices. It uses detailed analyses of the transport, Poisson, and continuity equations to show the behavior of solution curves.

This book deals mainly with physical device models which are developed from the carrier transport physics and device geometry considerations. The text concentrates on silicon and gallium arsenide devices and includes models of silicon bipolar junction transistors, junction field effect transistors (JFETs), MESFETs, silicon and GaAs MESFETs, transferred electron devices, pn junction diodes and Schottky varactor diodes. The modelling techniques of more recent devices such as the heterojunction bipolar transistors (HBT) and the high electron mobility transistors are discussed. This book contains details of models for both equilibrium and non-equilibrium transport conditions. The modelling Technique of Small-scale devices is discussed and techniques applicable to submicron-dimensioned devices are included. A section on modern quantum transport analysis techniques is included. Details of essential

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numerical schemes are given and a variety of device models are used to illustrate the application of these techniques in various fields.

The basic semiconductor devices are explored at two levels: (1) a mathematically rigorous but simple model for each device is developed and then; (2) the motivations of modern devices which are more complex are provided. By discussing silicon, gallium arsenide and other semiconductor based devices, the text provides a state-of-the-art discussion of modern electronic devices. Most subsections end with a solved example so that the reader develops a feel of real numbers and the importance of device design.

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