Atomistic Simulation of Quantum Transport in Nanoelectronic Devices
Nanoelectronic Devices for Hardware and Software Security
Non-Linear Transport Properties of Hybrid Nanoelectronic Devices
Nanoelectronics for Quantum Conduction
2D Materials for Nanoelectronics
Atomic-Scale Electronics Beyond CMOS
Introduction to Nanoelectronics
Emerging Nanoelectronic Devices
and Materials Development
Electrical Atomic Force Microscopy for Nanoelectronics
Fundamentals of Nanoelectronics
Electronic Conduction
Nanoelectronics and Nanosystems
Introduction to Nanoelectronic Single-Electron Circuit Design
Nanoelectronics and Information Technology
Microelectronics to Nanoelectronics
Bionanoelectronics
Nanoelectronics Nanotechnology
Field Effect Transistors, A Comprehensive Overview
Principles of Production of New Devices for Micro- and Nanoelectronics on the Base of Materials with Ion Tracks
Quantum Nanoelectronics
Superlattice to Nanoelectronics
Nanotechnology: Principles and Practices
Nanotechnology Communication Shock Nanoelectronic Device Applications Handbook
Nanoelectronic Devices
First Principles Simulations of Nanoelectronic Devices
Introductory Nanoelectronics
Nanoelectronics Nanoelectronics Nanoelectronics and Photonics
Quantum Computing Devices
Nanotechnology Basic Principles of Nanotechnology
Nanoelectronic Materials
Vacuum Nanoelectronic Devices
Nanotechnology and Nanoelectronics

**Atomistic Simulation of Quantum Transport in Nanoelectronic Devices**

Introducing up-to-date coverage of research in electron field emission from nanostructures, Vacuum Nanoelectronic Devices outlines the physics of quantum nanostructures, basic principles of electron field emission, and vacuum nanoelectronic devices operation, and offers as insight state-of-the-art and future researches and developments.
This book also evaluates the results of research and development of novel quantum electron sources that will determine the future development of vacuum nanoelectronics. Further to this, the influence of quantum mechanical effects on high frequency vacuum nanoelectronic devices is also assessed. Key features: • In-depth description and analysis of the fundamentals of Quantum Electron effects in novel electron sources. • Comprehensive and up-to-date summary of the physics and technologies for THz sources for students of physical and engineering specialties and electronics engineers. • Unique coverage of quantum physical results for electron-field emission and novel electron sources with quantum effects, relevant for many applications such as electron microscopy, electron lithography, imaging and communication systems and signal processing. • New approaches for realization of electron sources with required and optimal parameters in electronic devices such as vacuum micro and nanoelectronics. This is an essential reference for researchers working in terahertz technology wanting to expand their knowledge of electron beam generation in vacuum and electron source quantum concepts. It is also valuable to advanced students in electronics engineering and physics who want to deepen their understanding of this topic. Ultimately, the progress of the quantum nanostructure theory and technology will promote the progress and development of electron sources as main part of vacuum macro-, micro- and nanoelectronics.

**Nanoelectronic Devices for Hardware and Software Security**

Nanoelectronics and Photonics provides a fundamental description of the core elements and problems of advanced and future information technology. The authoritative book collects a series of tutorial chapters from leaders in the field covering fundamental topics from materials to devices and system architecture, and bridges the fundamental laws of physics and chemistry of materials at the atomic scale with device and circuit design and performance requirements.

**Non-Linear Transport Properties of Hybrid Nanoelectronic Devices**

Composed of contributions from top experts, Microelectronics
to Nanoelectronics: Materials, Devices and Manufacturability offers a detailed overview of important recent scientific and technological developments in the rapidly evolving nanoelectronics arena. Under the editorial guidance and technical expertise of noted materials scientist Anupama B. Kaul of California Institute of Technology’s Jet Propulsion Lab, this book captures the ascent of microelectronics into the nanoscale realm. It addresses a wide variety of important scientific and technological issues in nanoelectronics research and development. The book also showcases some key application areas of micro-electro-mechanical-systems (MEMS) that have reached the commercial realm. Capitalizing on Dr. Kaul’s considerable technical experience with micro- and nanotechnologies and her extensive research in prestigious academic and industrial labs, the book offers a fresh perspective on application-driven research in micro- and nanoelectronics, including MEMS. Chapters explore how rapid developments in this area are transitioning from the lab to the market, where new and exciting materials, devices, and manufacturing technologies are revolutionizing the electronics industry. Although many micro- and nanotechnologies still face major scientific and technological challenges and remain within the realm of academic research labs, rapid advances in this area have led to the recent emergence of new applications and markets. This handbook encapsulates that exciting recent progress by providing high-quality content contributed by international experts from academia, leading industrial institutions—such as Hewlett-Packard—and government laboratories including the U.S. Department of Energy’s Sandia National Laboratory. Offering something for everyone, from students to scientists to entrepreneurs, this book showcases the broad spectrum of cutting-edge technologies that show significant promise for electronics and related applications in which nanotechnology plays a key role.

Nanoelectronics

Offering first-hand insights by top scientists and industry experts at the forefront of R&D into nanoelectronics, this book neatly links the underlying technological principles with present and future applications. A brief introduction is followed by an overview of present and emerging logic devices, memories and power technologies. Specific chapters are dedicated to the enabling factors, such as new
Introduction to Nanoelectronics

Split a human hair thirty thousand times, and you have the equivalent of a nanometer. The aim of this work is to provide an introduction into nanotechnology for the scientifically interested. However, such an enterprise requires a balance between comprehensibility and scientific accuracy. In case of doubt, preference is given to the latter. Much more than in microtechnology – whose fundamentals we assume to be known – a certain range of engineering and natural sciences are interwoven in nanotechnology. For instance, newly developed tools from mechanical engineering are essential in the production of nanoelectronic structures. Vice versa, -chanical shifts in the nanometer range demand piezoelectric-operated actuators. Therefore, special attention is given to a comprehensive presentation of the matter. In our time, it is no longer sufficient to simply explain how an electronic device operates; the materials and procedures used for its production and the measuring instruments used for its characterization are equally important. The main chapters as well as several important sections in this book end in an evaluation of future prospects. Unfortunately, this way of separating coherent -scription from reflection and speculation could not be strictly maintained. So- times, the complete description of a device calls for discussion of its inherent -tential; the hasty reader in search of the general perspective is therefore advised to study this work’s technical chapters as well.
2D Materials for Nanoelectronics

Nanotechnology: An Introduction, Second Edition, is ideal for the newcomer to nanotechnology, someone who also brings a strong background in one of the traditional disciplines, such as physics, mechanical or electrical engineering, or chemistry or biology, or someone who has experience working in microelectromechanical systems (MEMS) technology. This book brings together the principles, theory, and practice of nanotechnology, giving a broad, yet authoritative, introduction to the possibilities and limitations of this exciting and rapidly developing field. The book's author, Prof Ramsden, also discusses design, manufacture, and applications and their impact on a wide range of nanotechnology areas. Provides an overview of the rapidly growing and developing field of nanotechnology. Focuses on key essentials, and structured around a robust anatomy of the subject. Brings together the principles, theory, and practice of nanotechnology, giving a broad, yet authoritative, introduction to the possibilities and limitations of this exciting and rapidly developing field.

Atomic-Scale Electronics Beyond CMOS

Today, the concepts of single-electron tunneling (SET) are used to understand and model single-atom and single-molecule nanoelectronics. The characteristics of nanoelectronic devices, especially SET transistors, can be understood on the basis of the physics of nanoelectronic devices and circuit models. A circuit theory approach is necessary for considering possible integration with current microelectronic circuitry. To explain the properties and possibilities of SET devices, this book follows an approach to modeling these devices using electronic circuit theory. All models and equivalent circuits are derived from the first principles of circuit theory. Based on energy conservation, the circuit model of SET is an impulsive current source, and modeling distinguishes between bounded and unbounded currents. The Coulomb blockade is explained as a property of a single junction. In addition, this edition differs from the previous one by elaborating on the section on spice simulations and providing a spice simulation on the SET electron box circuit, including the spice netlist. Also, a complete, new proof of the two-capacitor problem in
Introduction to Nanoelectronics

This book discusses modern-day Metal Oxide Semiconductor Field Effect Transistors (MOSFETs) and future trends of transistor devices. This book provides an overview of Field Effect Transistors (FETs) by discussing the basic principles of FETs and exploring the latest technological developments in the field. It covers and connects a wide spectrum of topics related to semiconductor device physics, physics of transistors, and advanced transistor concepts. This book contains six chapters. Chapter 1 discusses electronic materials and charge. Chapter 2 examines junctions, discusses contacts under thermal-equilibrium, metal-semiconductor contacts, and metal-insulator-semiconductor systems. Chapter 3 covers traditional planar Metal Oxide Semiconductor Field Effect Transistors (MOSFETs). Chapter 4 describes scaling-driving technological variations and novel dimensions of MOSFETs. Chapter 5 analyzes Heterojunction Field Effect Transistors (FETs) and also discusses the challenges and rewards of heteroepitaxy. Finally, Chapter 6 examines FETs at molecular scales. Links the discussion of contemporary transistor devices to physical processes. Material has been class-tested in undergraduate and graduate courses on the design of integrated circuit components taught by the author. Contains examples and end-of-chapter problems Field Effect Transistors, A Comprehensive Overview: From Basic Concepts to Novel Technologies is a reference for senior undergraduate / graduate students and professional engineers needing insight into physics of operation of modern FETs. Pouya Valizadeh is Associate Professor in the Department of Electrical and Computer Engineering at
Emerging Nanoelectronic Devices

This newly revised edition of the popular Artech House book, Nanoelectronics: Principles and Devices, provides a current, unified treatment of the research, technology, and applications fueling the rapid growth of nanoelectronics. It brings together the solid-state physics, quantum mechanics, biology, and electronics now converging to blaze exciting new trails in both the development of nanoscale devices and in our understanding of physical properties and phenomena never before seen at larger scale.

Nanoelectronics and Materials Development

Provides the treatment of the research, technology, and applications that are fueling the growth of nanoelectronics. This book provides engineers and researchers with a foundation for the understanding, design, and simulation of nanoelectronic devices.

Electrical Atomic Force Microscopy for Nanoelectronics

Fundamentals of Nanoelectronics

In the spirit of Alvin Toffler’s acclaimed works peering into the future of the technological society, Communication Shock is a concise history of communication technologies and an exploration of the possible social and human impacts of nanotechnology on the ecology of human communication. As we become increasingly more networked with communication technologies, we must come to understand and confront the
Read Free Nanoelectronics Principles And Devices The Artech House Nanoscale Science And Engineering

Social impact of these changes. More importantly, we must wisely choose in embracing or rejecting these technologies and exploring how we might do both by striking an appropriate balance. Grounded in communication theory and praxis, Communication Shock brings some objectivity to the discussion of technology, maps its development, and encourages a rational conversation about its potential problems and promise. It challenges readers to reach their own conclusions – about the future, imagined and unimaginable, about the fundamental values in conflict, and how one might choose to embrace or contest them to maintain individual autonomy in the face of increasingly ubiquitous marketing and technological change. Present and emerging communications technologies hold the promise for a bold new future, but they also have their inherent risks and drawbacks. Communication shock is the human response, conscious or unconscious, wherein the individual chooses to resist the growing pervasiveness of technology in his or her life by seeking ways to reduce or redirect new technologies or to reject the addition of such technologies altogether. Here is a framework for understanding the potential of the evolving technologies, determining which are essential and which are distractions from the life that one believes to be meaningful, and making informed choices for the life one wishes to live.

Electronic Conduction

For undergraduate courses in nanoelectronics. This is the first actual nanoelectronics textbook for undergraduate engineering and applied sciences students. It provides an introduction to nanoelectronics, as well as a self-contained overview of the necessary physical concepts – taking a fairly gentle but serious approach to a field that will be extremely important in the near future.

Nanoelectronics and Nanosystems

This book provides readers with the knowledge in fundamentals of nanoelectronic devices. The authors build the principles of nanoelectronic devices based on those of microelectronic devices wherever possible and introduce the inherently nanoelectronic principles gradually. They briefly review quantum mechanics and solid-state physics that can
Introduction to Nanoelectronic Single-Electron Circuit Design

One of the first books to thoroughly examine the subject, Quantum Computing Devices: Principles, Designs, and Analysis covers the essential components in the design of a "real" quantum computer. It explores contemporary and important aspects of quantum computation, particularly focusing on the role of quantum electronic devices as quantum gates.

Nanoelectronics and Information Technology

Major developments in the semiconductor industry are on the horizon through the use of two-dimensional (2D) materials, such as graphene and transition metal dichalcogenides, for integrated circuits (ICs). 2D Materials for Nanoelectronics is the first comprehensive treatment of these materials and their applications in nanoelectronic devices. Comprised of chapters authored by internationally recognised researchers, this book: Discusses the use of graphene for high-frequency analog circuits Explores logic and photonic applications of molybdenum disulfide (MoS2) Addresses novel 2D materials including silicene, germanene, stanene, and phosphorene Considers the use of 2D materials for both field-effect transistors (FETs) and logic circuits Provides background on the simulation of structural, electronic, and transport properties from first principles 2D Materials for Nanoelectronics presents extensive, state-of-the-art coverage of the fundamental and applied aspects of this exciting field.

Microelectronics to Nanoelectronics

The subject of this thesis is the study of hybrid nanoelectronic components involving superconductors or excitonic systems. The behavior of such electronic devices is relevant both for the miniaturization of electronics as well as for possible future on-chip quantum computation. In order to characterise them the cumulant generating function of charge transfer is calculated. First, quantum point contacts between (conventional and unconventional) superconductors, ferromagnets and semiconductors are
The focus of interest are transport processes involving non-trivial correlated electronic states such as Cooper pairs, excitons or Majorana fermions. In the second part quantum impurities are included and the effects of onsite Coulomb and electron-phonon interaction are discussed. Using these results the possibility to witness entanglement in superconducting beamsplitters is demonstrated. The results are compared both to different theoretical approaches and experimental data.

**Bionanoelectronics**

This book provides readers with the knowledge in fundamentals of nanoelectronic devices. The authors build the principles of nanoelectronic devices based on those of microelectronic devices wherever possible and introduce the inherently nanoelectronic principles gradually. They briefly review quantum mechanics and solid-state physics that can form the basis of semiconductor device physics. The book also covers the basics of electron transport and p-n junctions, develops the operations of MOS capacitors and MOSFETs, and introduces some basic CMOS circuits. The last chapter is devoted to the nano-biotechnology application of field-effect transistors.

**Nanoelectronics**

This book presents the achievements in bionanoelectronics in a coherent manner. It deals with nanodevices applied to biostructures, molecular motors, molecular pumps, molecular nanoactuators and electronic biodevices, including nanodevices for sensing and imaging biomolecules. The book describes bionanoelectronics, detection of biomolecules and targets various biological applications such as detection and sequencing of DNA and early detection of various diseases and nanomedicine. Further important topics of the book are biomimetics and bioinspired electronics. The book also deals with biomolecules as building blocks of nanodevices for nanoelectronics or future computing architecture. The application of scanning probe techniques to biological samples is described.

**Nanotechnology**
Read Free Nanoelectronics Principles And Devices The Artech House Nanoscale Science And Engineering

Written by one of the founders of this field, this book provides a historical overview of the invention of superlattice, one of the most important devices of the second half of the twentieth century. In addition to describing the fundamental concepts, this completely revised and updated edition provides new insights in the field of man-made solids. Written by one of the founders of this field Delivers over 20% new material, including new research and new technological applications Provides a basic understanding of the physics involved from first principles, while adding new depth, using basic mathematics and an explanation of the background essentials

Field Effect Transistors, A Comprehensive Overview

The book allows the reader to have a basic understanding of the structure and properties of nanoscale materials routinely used in nanotechnology-based research and industries. To add, the book describes the operation of nanoscale transistors and the processes used to fabricate the devices. Additionally, it presents research involving the use of carbon nanotubes, graphene, and molecules to create non-silicon based electronic devices. It aims to provide an understanding of the operation of the most frequently used fabrication and characterization procedures, such as scanning electron microscopy, atomic force microscopy, etch, e-beam lithography, and photolithography.

Principles of Production of New Devices for Micro- and Nanoelectronics on the Base of Materials with Ion Tracks

Given the rapid advances in the field, this book offers an up-to-date introduction to nanomaterials and nanotechnology. Though condensed into a relatively small volume, it spans the whole range of multidisciplinary topics related to nanotechnology. Starting with the basic concepts of quantum mechanics and solid state physics, it presents both physical and chemical synthetic methods, as well as analytical techniques for studying nanostructures. The size-specific properties of nanomaterials, such as their thermal, mechanical, optical and magnetic characteristics, are
discussed in detail. The book goes on to illustrate the various applications of nanomaterials in electronics, optoelectronics, cosmetics, energy, textiles and the medical field and discusses the environmental impact of these technologies. Many new areas, materials and effects are then introduced, including spintronics, soft lithography, metamaterials, the lotus effect, the Gecko effect and graphene. The book also explains the functional principles of essential techniques, such as scanning tunneling microscopy (STM), atomic force microscopy (AFM), scanning near field optical microscopy (SNOM), Raman spectroscopy and photoelectron microscopy. In closing, Chapter 14, ‘Practicals’, provides a helpful guide to setting up and conducting inexpensive nanotechnology experiments in teaching laboratories.

Quantum Nanoelectronics

This book explores emerging topics in atomic- and nano-scale electronics after the era of Moore’s Law, covering both the physical principles behind, and technological implementations for many devices that are now expected to become key elements of the future of nanoelectronics beyond traditional complementary metal-oxide semiconductors (CMOS). Moore’s law is not a physical law itself, but rather a visionary prediction that has worked well for more than 50 years but is rapidly coming to its end as the gate length of CMOS transistors approaches the length-scale of only a few atoms. Thus, the key question here is: “What is the future for nanoelectronics beyond CMOS?” The possible answers are found in this book. Introducing novel quantum devices such as atomic-scale electronic devices, ballistic devices, memristors, superconducting devices, this book also presents the reader with the physical principles underlying new ways of computing, as well as their practical implementation. Topics such as quantum computing, neuromorphic computing are highlighted here as some of the most promising candidates for ushering in a new era of atomic-scale electronics beyond CMOS.

Nanoelectronic Devices

This introductory text develops the reader’s fundamental understanding of core principles and experimental aspects
underlying the operation of nanoelectronic devices. The author makes a thorough and systematic presentation of electron transport in quantum-confined systems such as quantum dots, quantum wires, and quantum wells together with Landauer-Büttiker formalism and non-equilibrium Green’s function approach. The coverage encompasses nanofabrication techniques and characterization tools followed by a comprehensive exposition of nanoelectronic devices including resonant tunneling diodes, nanoscale MOSFETs, carbon nanotube FETs, high-electron-mobility transistors, single-electron transistors, and heterostructure optoelectronic devices. The writing throughout is simple and straightforward, with clearly drawn illustrations and extensive self-study exercises for each chapter. Introduces the basic concepts underlying the operation of nanoelectronic devices. Offers a broad overview of the field, including state-of-the-art developments. Covers the relevant quantum and solid-state physics and nanoelectronic device principles. Written in lucid language with accessible mathematical treatment. Includes extensive end-of-chapter exercises and many insightful diagrams.

Superlattice to Nanoelectronics

The current edited book presents some of the most advanced research findings in the field of nanotechnology and its application in materials development in a very concise form. The main focus of the book is dragged toward those materials where electronic properties are manipulated for development of advanced materials. We have discussed about the extensive usage of nanotechnology and its impact on various facets of the chip-making practice from materials to devices such as basic memory, quantum dots, nanotubes, nanowires, graphene-like 2D materials, and CIGS thin-film solar cells as energy-harvesting devices. Researchers as well as students can gain valuable insights into the different processing of nanomaterials, characterization procedures of the materials in nanoscale, and their different functional properties and applications.

Nanotechnology: Principles and Practices

The tremendous impact of electronic devices on our lives is the result of continuous improvements of the billions of
nanelectronic components inside integrated circuits (ICs). However, ultra-scaled semiconductor devices require nanometer control of the many parameters essential for their fabrication. Through the years, this created a strong alliance between microscopy techniques and IC manufacturing. This book reviews the latest progress in IC devices, with emphasis on the impact of electrical atomic force microscopy (AFM) techniques for their development. The operation principles of many techniques are introduced, and the associated metrology challenges described. Blending the expertise of industrial specialists and academic researchers, the chapters are dedicated to various AFM methods and their impact on the development of emerging nanoelectronic devices. The goal is to introduce the major electrical AFM methods, following the journey that has seen our lives changed by the advent of ubiquitous nanoelectronics devices, and has extended our capability to sense matter on a scale previously inaccessible.

**Nanotechnology**

A tutorial coverage of electronic technology, starting from the basics of condensed matter and quantum physics. Experienced author Ed Wolf presents established and novel devices like Field Effect and Single Electron Transistors, and leads the reader up to applications in data storage, quantum computing, and energy harvesting. Intended to be self-contained for students with two years of calculus-based college physics, with corresponding fundamental knowledge in mathematics, computing and chemistry.

**Communication Shock**

This book presents synthesis techniques for the preparation of low-dimensional nanomaterials including 0D (quantum dots), 1D (nanowires, nanotubes) and 2D (thin films, few layers), as well as their potential applications in nanoelectronic systems. It focuses on the size effects involved in the transition from bulk materials to nanomaterials; the electronic properties of nanoscale devices; and different classes of nanomaterials from microelectronics to nanoelectronics, to molecular electronics. Furthermore, it demonstrates the structural stability, physical, chemical, magnetic, optical,
electrical, thermal, electronic and mechanical properties of the nanomaterials. Subsequent chapters address their characterization, fabrication techniques from lab-scale to mass production, and functionality. In turn, the book considers the environmental impact of nanotechnology and novel applications in the mechanical industries, energy harvesting, clean energy, manufacturing materials, electronics, transistors, health and medical therapy. In closing, it addresses the combination of biological systems with nanoelectronics and highlights examples of nanoelectronic-cell interfaces and other advanced medical applications. The book answers the following questions: • What is different at the nanoscale? • What is new about nanoscience? • What are nanomaterials (NMs)? • What are the fundamental issues in nanomaterials? • Where are nanomaterials found? • What nanomaterials exist in nature? • What is the importance of NMs in our lives? • Why so much interest in nanomaterials? • What is at nanoscale in nanomaterials? • What is graphene? • Are pure low-dimensional systems interesting and worth pursuing? • Are nanotechnology products currently available? • What are sensors? • How can Artificial Intelligence (AI) and nanotechnology work together? • What are the recent advances in nanoelectronic materials? • What are the latest applications of NMs?

Nanoelectronic Device Applications Handbook

This book has comprehensive coverage of the principles, basic concepts, structure, modelling, practices, and circuit applications of nanoelectronics in hardware/software security. It will also cover the future research directions in this domain. In this evolving era nanotechnology is converting semiconductor devices dimensions from micron technology to nanotechnology. Nanoelectronics would be the key enabler for innovation in nanoscale devices, circuits and systems. The motive of this research book is to provide relevant theoretical frameworks that include device physics, modeling, circuit design and the latest developments in the experimental fabrication in the field of nanotechnology for hardware/software security. There are numerous challenges in development of models for nanoscale devices (e.g. FinFET, Gate-All-around devices, TFET etc.), Short Channel Effects, Fringing Effects, High leakage current and power dissipation, etc. This book will help in identifying areas
where we are facing many challenges and applying many nano devices and circuits techniques to address hardware/software security aspects.

**Nanoelectronic Devices**

Electronic Conduction: Classical and Quantum Theory to Nanoelectronic Devices provides a concise, complete introduction to the fundamental principles of electronic conduction in microelectronic and nanoelectronic devices, with an emphasis on integrating the quantum aspects of conduction. The chapter coverage begins by presenting the classical theory of conduction, including introductory chapters on quantum mechanics and the solid state, then moving to a complete presentation of essential theory for understanding modern electronic devices. The author’s unique approach is applicable to microscale and nanoscale device simulation, which is particularly timely given the explosion in the nanoelectronics field. Features Self-contained Gives a complete account of classical and quantum aspects of conduction in nanometer scale devices Emphasises core principles, the book can be useful to electrical engineers and material scientists, and no prior course in semiconductors is necessary Highlights the bridge to modern electronics, first presenting the physics, and then the engineering complications related to quantum behaviour Includes many clear, illustrative diagrams and chapter problem sets Gives an account of post-Silicon devices such as the GaAs MOSFET, the CNT-FET and the vacuum transistor Showcases why quantum mechanics is necessary with modern devices due to their size and corresponding electron transport properties Discusses all the issues that will enable readers to conduct their own research

**First Principles Simulations of Nanoelectronic Devices**

**Introductory Nanoelectronics**

Increasing miniaturization of devices, components, and integrated systems requires developments in the capacity to measure, organize, and manipulate matter at the nanoscale. This textbook, first published in 2007, is a comprehensive,
Interdisciplinary account of the technology and science that underpin nanoelectronics, covering the underlying physics, nanostructures, nanomaterials, and nanodevices. Without assuming prior knowledge of quantum physics, this book provides a unifying framework for the basic ideas needed to understand the recent developments in the field. Numerous illustrations, homework problems and interactive Java applets help the student to appreciate the basic principles of nanotechnology, and to apply them to real problems. Written in a clear yet rigorous and interdisciplinary manner, this textbook is suitable for advanced undergraduate and graduate students in electrical and electronic engineering, nanoscience, materials, bioengineering, and chemical engineering.

**Nanoelectronics**

This book gives a summary of the rapidly growing field of nanotechnology and includes materials and technologies that help in developing particles of various sizes, which can be utilized in different areas of research. It discusses the role of nanotechnology in different aspects, such as healthcare, especially in target-specific drug therapy for managing a number of medical disorders; agriculture, for developing smart field systems; and food industry, for improving and stabilizing the quality, healthiness, and shelf life of food. Being multidisciplinary, this book brings together the principles, theory, practices, and applications of not only nanotechnology but also those of nanobiotechnology, pharmaceuticals, food packaging, biosensors, and electronic devices. The book will be an exhilarating read for advanced undergraduate- and graduate-level students, general readers interested in nanotechnology, and researchers in chemistry, biology, and engineering. The scope of the book extends from basic research in physics, chemistry, and biology, including computational work and simulations, through to the development of new devices and technologies for applications in a wide range of industrial sectors (including information technology, medicine, manufacturing, high-performance materials, and energy and environmental technologies). It covers organic, inorganic, and hybrid materials and is an interdisciplinary book.
Nanoelectronic Device Applications Handbook gives a comprehensive snapshot of the state of the art in nanodevices for nanoelectronics applications. Combining breadth and depth, the book includes 68 chapters on topics that range from nano-scaled complementary metal-oxide-semiconductor (CMOS) devices through recent developments in nano capacitors and AlGaAs/GaAs devices. The contributors are world-renowned experts from academia and industry from around the globe. The handbook explores current research into potentially disruptive technologies for a post-CMOS world. These include: Nanoscale advances in current MOSFET/CMOS technology Nano capacitors for applications such as electronics packaging and humidity sensors Single electron transistors and other electron tunneling devices Quantum cellular automata and nanomagnetic logic Memristors as switching devices and for memory Graphene preparation, properties, and devices Carbon nanotubes (CNTs), both single CNT and random network Other CNT applications such as terahertz, sensors, interconnects, and capacitors Nano system architectures for reliability Nanowire device fabrication and applications Nanowire transistors Nanodevices for spintronics The book closes with a call for a new generation of simulation tools to handle nanoscale mechanisms in realistic nanodevice geometries. This timely handbook offers a wealth of insights into the application of nanoelectronics. It is an invaluable reference and source of ideas for anyone working in the rapidly expanding field of nanoelectronics.

Quantum Computing Devices

Emerging Nanoelectronic Devices focuses on the future direction of semiconductor and emerging nanoscale device technology. As the dimensional scaling of CMOS approaches its limits, alternate information processing devices and microarchitectures are being explored to sustain increasing functionality at decreasing cost into the indefinite future. This is driving new paradigms of information processing enabled by innovative new devices, circuits, and architectures, necessary to support an increasingly interconnected world through a rapidly evolving internet. This original title provides a fresh perspective on emerging
research devices in 26 up to date chapters written by the leading researchers in their respective areas. It supplements and extends the work performed by the Emerging Research Devices working group of the International Technology Roadmap for Semiconductors (ITRS). Key features: • Serves as an authoritative tutorial on innovative devices and architectures that populate the dynamic world of “Beyond CMOS” technologies. • Provides a realistic assessment of the strengths, weaknesses and key unknowns associated with each technology. • Suggests guidelines for the directions of future development of each technology. • Emphasizes physical concepts over mathematical development. • Provides an essential resource for students, researchers and practicing engineers.

Nanotechnology

An accessible introduction for electronic engineers, computer scientists and physicists. The overview covers all aspects from underlying technologies to circuits and systems. The challenge of nanoelectronics is not only to manufacture minute structures but also to develop innovative systems for effective integration of the billions of devices. On the system level, various architectures are presented and important features of systems, such as design strategies, processing power, and reliability are discussed. Many specific technologies are presented, including molecular devices, quantum electronic devices, resonant tunnelling devices, single electron devices, superconducting devices, and even devices for DNA and quantum computing. The book also compares these devices with current silicon technologies and discusses limits of electronics and the future of nanosystems.

Basic Principles of Nanotechnology

Computational nanoelectronics is an emerging multi-disciplinary field covering condensed matter physics, applied mathematics, computer science, and electronic engineering. In recent decades, a few state-of-the-art software packages have been developed to carry out first-principle atomistic device simulations. Nevertheless those packages are either black boxes (commercial codes) or accessible only to very limited users (private research...
Read Free Nanoelectronics Principles And Devices The Artech House Nanoscale Science And Engineering

codes). The purpose of this book is to open one of the commercial black boxes, and to demonstrate the complete procedure from theoretical derivation, to numerical implementation, all the way to device simulation. Meanwhile the affiliated source code constitutes an open platform for new researchers. This is the first book of its kind. We hope the book will make a modest contribution to the field of computational nanoelectronics. Contents:

Introduction
The NECPA Theory
The NECPA-LMTO Method
NanoDsim: The Package Design
NanoDsim: Bulk Systems
NanoDsim: Two-Probe Systems
Optimization and Parallelization
Kaleidoscope of the Physics in Disordered Systems
Appendix

Readership: Post-graduate students or professional researchers who are interested in computational physics, device physics, quantum transport, disorder systems, and overlap of the above.

Nanoelectronic Materials

Nanotechnology has the potential to revolutionize the agricultural and food industry with new tools for the molecular treatment of diseases, rapid disease detection, enhancing the ability of plants to absorb nutrients etc. Nanotechnology combines solid state physics, chemistry, electrical engineering, chemical engineering, biochemistry and biophysics, and materials science. It is a highly interdisciplinary area meaning that it involves ideas integrated from many traditional discipline. Nanotechnology (NT) is the production and use of materials with purposely engineered features close to the atomic or molecular scale. NT deals with putting things together atom by atom and with structures so small they are invisible to the naked eye. It provides the ability to create materials, devices and systems with fundamentally new functions and properties. The promise of NT is enormous. It has implications for almost every type of manufacturing process and product. Nanomaterials have extremely small size which having at least one dimension 100 nm or less. Nanomaterials can be nanoscale in one dimension (e.g. surface films), two dimensions (e.g. strands or fibres), or three dimensions (e.g. particles). They can exist in single, fused, aggregated or agglomerated forms with spherical, tubular, and irregular shapes. Common types of nanomaterials include nanotubes, dendrimers, quantum dots and fullerenes. Nanoparticle research is currently an area of intense...
scientific research, due to a wide variety of potential applications in biomedical, optical, and electronic fields. Nanoparticles are of great scientific interest as they are effectively a bridge between bulk materials and atomic or molecular structures. A bulk material should have constant physical properties regardless of its size, but at the nano-scale this is often not the case. This book introduces the reader to the world of nanotechnology by giving them in-depth details of different aspects of the field.

**Vacuum Nanoelectronic Devices**

This outstanding textbook provides an introduction to electronic materials and device concepts for the major areas of current and future information technology. On about 1,000 pages, it collects the fundamental concepts and key technologies related to advanced electronic materials and devices. The obvious strength of the book is its encyclopedic character, providing adequate background material instead of just reviewing current trends. It focuses on the underlying principles which are illustrated by contemporary examples. The third edition now holds 47 chapters grouped into eight sections. The first two sections are devoted to principles, materials processing and characterization methods. Following sections hold contributions to relevant materials and various devices, computational concepts, storage systems, data transmission, imaging systems and displays. Each subject area is opened by a tutorial introduction, written by the editor and giving a rich list of references. The following chapters provide a concise yet in-depth description in a given topic. Primarily aimed at graduate students of physics, electrical engineering and information technology as well as material science, this book is equally of interest to professionals looking for a broader overview. Experts might appreciate the book for having quick access to principles as well as a source for getting insight into related fields.

**Nanotechnology and Nanoelectronics**

Textbook presenting the fundamentals of nanoscience and nanotechnology with a view to nanoelectronics. Covers the underlying physics; nanostructures, including nanoobjects; methods for growth, fabrication and characterization of
Read Free Nanoelectronics Principles And Devices The Artech House Nanoscale Science And Engineering

nanomaterials, and nanodevices. Provides a unifying framework for the basic ideas needed to understand the recent developments in the field. Includes numerous illustrations, homework problems and a number of interactive Java applets. For advanced undergraduate and graduate students in electrical and electronic engineering, nanoscience, materials, bioengineering and chemical engineering. Instructor solutions and Java applets available from www.cambridge.org/9780521881722.

Copyright code : 86502ac52327997ce72429f2f097ea81