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[Metallic Films for Electronic, Optical and Magnetic Applications](#) - Katayun Barmak 2014-02-13

Metallic films play an important role in modern technologies such as integrated circuits, information storage, displays, sensors, and coatings. *Metallic Films for Electronic, Optical and Magnetic Applications* reviews the structure, processing and properties of metallic films. Part one explores the structure of metallic films using characterization methods such as x-ray diffraction and transmission electron microscopy. This part also encompasses the processing of metallic films, including structure formation during deposition and post-deposition reactions and phase transformations. Chapters in part two focus on the properties of metallic films, including mechanical, electrical, magnetic, optical, and thermal properties. *Metallic Films for Electronic, Optical and Magnetic Applications* is a technical resource for electronics components manufacturers, scientists, and engineers working in the semiconductor industry, product developers of sensors, displays, and other optoelectronic devices, and academics working in the field. Explores the structure of metallic films using characterization methods such as x-ray diffraction and transmission electron microscopy Discusses processing of metallic films, including structure formation during deposition and post-deposition reactions and phase transformations Focuses on the properties of metallic films, including mechanical, electrical, magnetic, optical, and thermal properties

Leveraging Information Technology for Optimal Aircraft Maintenance, Repair and Overhaul (MRO) - Anant Sahay 2012-10-09

Aircraft maintenance, repair and overhaul (MRO) requires unique information technology to meet the challenges set by today's aviation industry. How do IT services relate to aircraft MRO, and how may IT be leveraged in the future? *Leveraging Information Technology for Optimal Aircraft Maintenance, Repair and Overhaul (MRO)* responds to these questions, and describes the background of current trends in the industry, where airlines are tending to retain aircraft longer on the one hand, and rapidly introducing new genres of aircraft such as the A380 and B787, on the other. This book provides industry professionals and students of aviation MRO with the necessary principles, approaches and tools to respond effectively and efficiently to the constant development of new technologies, both in general and within the aviation MRO profession. This book is designed as a primer on IT services for aircraft engineering professionals and a handbook for IT professionals servicing this niche industry, highlighting the unique information requirements for aviation MRO and delving into detailed aspects of information needs from within the industry. Provides practical and realistic solutions to real-world problems Presents a global perspective of the industry and its relationship with dynamic information technology Written by a highly knowledgeable and hands on practitioner in this niche field of Aircraft Maintenance

[Vehicle/Tire/Road Dynamics](#) - Tan Li 2022-11-24

Vehicle/Tire/Road Dynamics: Handling, Ride, and NVH presents the connection between NVH and conventional vehicle dynamics where both tire and road play a key role. In this book, there is a chapter for handling dynamics that provides an introduction to ride dynamics and a chapter for ride dynamics that provides an introduction to NVH, presenting better coherence and synergy between these major areas of

vehicle/tire dynamics. Accompanying the fundamental theories, case studies are given to facilitate comprehension. In addition to the experimental implementations, the state-of-the-art approaches to simulating vehicle/tire dynamics are presented from the viewpoint of both industry and academia. This new book bridges the gap for experts in tire or pavement NVH (also tire-pavement interaction noise) and those who are experts in vehicle dynamics. Conventional vehicle dynamics (e.g., handling/braking/cornering) is focused on low-frequency performance while NVH (noise/vibration/harshness) is focused on high-frequency performance. There is also another area called "ride" (comfort/stability) which focuses on mid-frequency. Presents a closed loop system for vehicle dynamics, covering handling, ride and NVH. Provides insights into how intelligent tires will enhance autonomous vehicle control and optimize multiple performances, especially for electric vehicles. Demonstrates how pavement characteristics could greatly influence vehicle handling/ride/NVH and improve/balance these performances.

[Modern Spacecraft Guidance, Navigation, and Control](#) - Vincenzo Pesce 2022-11-13

Modern Spacecraft Guidance, Navigation, and Control: From System Modeling to AI and Innovative Applications provides a comprehensive foundation of theory and applications of spacecraft GNC, from fundamentals to advanced concepts, including modern AI-based architectures with focus on hardware and software practical applications. Divided into four parts, this book begins with an introduction to spacecraft GNC, before discussing the basic tools for GNC applications. These include an overview of the main reference systems and planetary models, a description of the space environment, an introduction to orbital and attitude dynamics, and a survey on spacecraft sensors and actuators, with details of their modeling principles. Part 2 covers guidance, navigation, and control, including both on-board and ground-based methods. It also discusses classical and novel control techniques, failure detection isolation and recovery (FDIR) methodologies, GNC verification, validation, and on-board implementation. The final part 3 discusses AI and modern applications featuring different applicative scenarios, with particular attention on artificial intelligence and the possible benefits when applied to spacecraft GNC. In this part, GNC for small satellites and CubeSats is also discussed. *Modern Spacecraft Guidance, Navigation, and Control: From System Modeling to AI and Innovative Applications* is a valuable resource for aerospace engineers, GNC/AOCS engineers, avionic developers, and AIV/AIT technicians. Provides an overview of classical and modern GNC techniques, covering practical system modeling aspects and applicative cases Presents the most important artificial intelligence algorithms applied to present and future spacecraft GNC Describes classical and advanced techniques for GNC hardware and software verification and validation and GNC failure detection isolation and recovery (FDIR)

[Semiconductor Lasers](#) - Alexei Baranov 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

Ultrasonic Transducers - K Nakamura 2012-08-23

Ultrasonic transducers are key components in sensors for distance, flow and level measurement as well as in power, biomedical and other applications of ultrasound. Ultrasonic transducers reviews recent research in the design and application of this important technology. Part one provides an overview of materials and design of ultrasonic transducers. Piezoelectricity and basic configurations are explored in depth, along with electromagnetic acoustic transducers, and the use of ceramics, thin film and single crystals in ultrasonic transducers. Part two goes on to investigate modelling and characterisation, with performance modelling, electrical evaluation, laser Doppler vibrometry and optical visualisation all considered in detail.

Applications of ultrasonic transducers are the focus of part three, beginning with a review of surface acoustic wave devices and air-borne ultrasound transducers, and going on to consider ultrasonic transducers for use at high temperature and in flaw detection systems, power, biomedical and micro-scale ultrasonics, therapeutic ultrasound devices, piezoelectric and fibre optic hydrophones, and ultrasonic motors are also described. With its distinguished editor and expert team of international contributors, Ultrasonic transducers is an authoritative review of key developments for engineers and materials scientists involved in this area of technology as well as in its applications in sectors as diverse as electronics, wireless communication and medical diagnostics. Reviews recent research in the design and application of ultrasonic transducers Provides an overview of the materials and design of ultrasonic transducers, with an in-depth exploration of piezoelectricity and basic configurations Investigates modelling and characterisation, applications of ultrasonic transducers, and ultrasonic transducers for use at high temperature and in flaw detection systems

Sensors for Automotive and Aerospace Applications - Shantanu Bhattacharya 2018-11-01

This volume covers the various sensors related to automotive and aerospace sectors, discussing their properties as well as how they are realized, calibrated and deployed. Written by experts in the field, it provides a ready reference to product developers, researchers and students working on sensor design and fabrication, and provides perspective on both current and future research.

Smart Sensors and MEMS - S Nihtianov 2018-03-09

Smart Sensors and MEMS: Intelligent Devices and Microsystems for Industrial Applications, Second Edition highlights new, important developments in the field, including the latest on magnetic sensors, temperature sensors and microreaction chambers. The book outlines the industrial applications for smart sensors, covering direct interface circuits for sensors, capacitive sensors for displacement measurement in the sub-nanometer range, integrated inductive displacement sensors for harsh industrial environments, advanced silicon radiation detectors in the vacuum ultraviolet (VUV) and extreme ultraviolet (EUV) spectral range, among other topics. New sections include discussions on magnetic and temperature sensors and the industrial applications of smart micro-electro-mechanical systems (MEMS). The book is an invaluable reference for academics, materials scientists and electrical engineers working in the microelectronics,

sensors and micromechanics industry. In addition, engineers looking for industrial sensing, monitoring and automation solutions will find this a comprehensive source of information. Contains new chapters that address key applications, such as magnetic sensors, microreaction chambers and temperature sensors Provides an in-depth information on a wide array of industrial applications for smart sensors and smart MEMS Presents the only book to discuss both smart sensors and MEMS for industrial applications
Handbook of Terahertz Technology for Imaging, Sensing and Communications - D Saeedkia 2013-01-16

The recent development of easy-to-use sources and detectors of terahertz radiation has enabled growth in applications of terahertz (Thz) imaging and sensing. This vastly adaptable technology offers great potential across a wide range of areas, and the Handbook of terahertz technology for imaging, sensing and communications explores the fundamental principles, important developments and key applications emerging in this exciting field. Part one provides an authoritative introduction to the fundamentals of terahertz technology for imaging, sensing and communications. The generation, detection and emission of waves are discussed alongside fundamental aspects of surface plasmon polaritons, terahertz near-field imaging and sensing, room temperature terahertz detectors and terahertz wireless communications. Part two goes on to discuss recent progress and such novel techniques in terahertz technology as terahertz bio-sensing, array imagers, and resonant field enhancement of terahertz waves. Fiber-coupled time-domain spectroscopy systems (THz-TDS), terahertz photomixer systems, terahertz nanotechnology, frequency metrology and semiconductor material development for terahertz applications are all reviewed. Finally, applications of terahertz technology are explored in part three, including applications in tomographic imaging and material spectroscopy, art conservation, and the aerospace, wood products, semiconductor and pharmaceutical industries. With its distinguished editor and international team of expert contributors, the Handbook of terahertz technology for imaging, sensing and communications is an authoritative guide to the field for laser engineers, manufacturers of sensing devices and imaging equipment, security companies, the military, professionals working in process monitoring, and academics interested in this field. Examines techniques for the generation and detection of terahertz waves Discusses material development for terahertz applications Explores applications in tomographic imaging, art conservation and the pharmaceutical and aerospace industries

Handbook of Organic Materials for Optical and (Opto)Electronic Devices - Oksana Ostroverkhova 2013-08-31

Small molecules and conjugated polymers, the two main types of organic materials used for optoelectronic and photonic devices, can be used in a number of applications including organic light-emitting diodes, photovoltaic devices, photorefractive devices and waveguides. Organic materials are attractive due to their low cost, the possibility of their deposition from solution onto large-area substrates, and the ability to tailor their properties. The Handbook of organic materials for optical and (opto)electronic devices provides an overview of the properties of organic optoelectronic and nonlinear optical materials, and explains how these materials can be used across a range of applications. Parts one and two explore the materials used for organic optoelectronics and nonlinear optics, their properties, and methods of their characterization illustrated by physical studies. Part three moves on to discuss the applications of optoelectronic and nonlinear optical organic materials in devices and includes chapters on organic solar cells, electronic memory devices, and electronic chemical sensors, electro-optic devices. The Handbook of organic materials for optical and (opto)electronic devices is a technical resource for physicists, chemists, electrical engineers and materials scientists involved in research and development of organic semiconductor and nonlinear optical materials and devices. Comprehensively examines the properties of organic optoelectronic and nonlinear optical materials Discusses their applications in different devices including solar cells, LEDs and electronic memory devices An essential technical resource for physicists, chemists, electrical engineers and materials scientists

Perspectives in Dynamical Systems II - Jan Awrejcewicz 2021

This volume is part of collection of contributions devoted to analytical and experimental techniques of dynamical systems, presented at the 15th International Conference "Dynamical Systems: Theory and Applications", held in Łódź, Poland on December 2-5, 2019. The wide selection of material has been divided

into three volumes, each focusing on a different field of applications of dynamical systems. The broadly outlined focus of both the conference and these books includes bifurcations and chaos in dynamical systems, asymptotic methods in nonlinear dynamics, dynamics in life sciences and bioengineering, original numerical methods of vibration analysis, control in dynamical systems, optimization problems in applied sciences, stability of dynamical systems, experimental and industrial studies, vibrations of lumped and continuous systems, non-smooth systems, engineering systems and differential equations, mathematical approaches to dynamical systems, and mechatronics.

Technological and Industrial Applications Associated with Intelligent Logistics - Alberto Ochoa-Zezzatti 2021-09-08

This book helps the reader to identify how different organizations in the context of diverse societies deploy their resources and leverage their capabilities to achieve better performance of its various labor skills, marketing, social responsibility and management capacity. Intelligent Logistics is a complex phenomenon that has become critical for companies to reach their development locally and internationally. On the one hand, macro-factors and market structure influence in business competitiveness, but also in a regional or sector context. The internal aspects and the use of various business tools contribute to the ability to create value in an organization. It is of utmost importance to understand the relevance of crucial aspects in the technological future that should be known and implemented by the Z generation of its incidence in the use of organizational models linked to artificial intelligence. Every innovative aspect in the use of new technologies for the distribution of goods and services will be crucial in a globalized world. An avant-garde society will require improved decision-making regarding Logistics 4.0 and its implementation in our lives respecting the environment and being sustainable together with invaluable principles of generating tacit knowledge for future generations.

Subsea Optics and Imaging - John Watson 2013-10-31

The use of optical methodology, instrumentation and photonics devices for imaging, vision and optical sensing is of increasing importance in understanding our marine environment. Subsea optics can make an important contribution to the protection and sustainable management of ocean resources and contribute to monitoring the response of marine systems to climate change. This important book provides an authoritative review of key principles, technologies and their applications. The book is divided into three parts. The first part provides a general introduction to the key concepts in subsea optics and imaging, imaging technologies and the development of ocean optics and colour analysis. Part two reviews the use of subsea optics in environmental analysis. An introduction to the concepts of underwater light fields is followed by an overview of coloured dissolved organic matter (CDOM) and an assessment of nutrients in the water column. This section concludes with discussions of the properties of subsea bioluminescence, harmful algal blooms and their impact and finally an outline of optical techniques for studying suspended sediments, turbulence and mixing in the marine environment. Part three reviews subsea optical systems technologies. A general overview of imaging and visualisation using conventional photography and video leads onto advanced techniques like digital holography, laser line-scanning and range-gated imaging as well as their use in controlled observation platforms or global observation networks. This section also outlines techniques like Raman spectroscopy, hyperspectral sensing and imaging, laser Doppler anemometry (LDA) and particle image velocimetry (PIV), optical fibre sensing and LIDAR systems. Finally, a chapter on fluorescence methodologies brings the volume to a close. With its distinguished editor and international team of contributors, Subsea optics and imaging is a standard reference for those researching, developing and using subsea optical technologies as well as environmental scientists and agencies concerned with monitoring the marine environment. Provides an authoritative review of key principles, technologies and their applications Outlines the key concepts in subsea optics and imaging, imaging technologies and the development of ocean optics and colour analysis Reviews the properties of subsea bioluminescence, harmful algal blooms and their impact

Handbook of Solid-State Lasers - B Denker 2013-02-20

Solid-state lasers which offer multiple desirable qualities, including enhanced reliability, robustness, efficiency and wavelength diversity, are absolutely indispensable for many applications. The Handbook of solid-state lasers reviews the key materials, processes and applications of solid-state lasers across a wide

range of fields. Part one begins by reviewing solid-state laser materials. Fluoride laser crystals, oxide laser ceramics, crystals and fluoride laser ceramics doped by rare earth and transition metal ions are discussed alongside neodymium, erbium and ytterbium laser glasses, and nonlinear crystals for solid-state lasers. Part two then goes on to explore solid-state laser systems and their applications, beginning with a discussion of the principles, powering and operation regimes for solid-state lasers. The use of neodymium-doped materials is considered, followed by system sizing issues with diode-pumped quasi-three level materials, erbium glass lasers, and microchip, fiber, Raman and cryogenic lasers. Laser mid-infrared systems, laser induced breakdown spectroscopy and the clinical applications of surgical solid-state lasers are also explored. The use of solid-state lasers in defense programs is then reviewed, before the book concludes by presenting some environmental applications of solid-state lasers. With its distinguished editors and international team of expert contributors, the Handbook of solid-state lasers is an authoritative guide for all those involved in the design and application of this technology, including laser and materials scientists and engineers, medical and military professionals, environmental researchers, and academics working in this field. Reviews the materials used in solid-state lasers Explores the principles of solid-state laser systems and their applications Considers defence and environmental applications

Optical Thin Films and Coatings - Angela Piegari 2013-08-31

Optical coatings, including mirrors, anti-reflection coatings, beam splitters, and filters, are an integral part of most modern optical systems. Optical thin films and coatings provides an overview of thin film materials, the properties, design and manufacture of optical coatings and their use across a variety of application areas. Part one explores the design and manufacture of optical coatings. Part two highlights unconventional features of optical thin films including scattering properties of random structures in thin films, optical properties of thin film materials at short wavelengths, thermal properties and colour effects. Part three focusses on novel materials for optical thin films and coatings and includes chapters on organic optical coatings, surface multiplasmonics and optical thin films containing quantum dots. Finally, applications of optical coatings, including laser components, solar cells, displays and lighting, and architectural and automotive glass, are reviewed in part four. Optical thin films and coatings is a technical resource for researchers and engineers working with optical thin films and coatings, professionals in the security, automotive, space and other industries requiring an understanding of these topics, and academics interested in the field. An overview of the materials, properties, design and manufacture of thin films Special attention is given to the unconventional features and novel materials of optical thin films Reviews applications of optical coatings including laser components, solar cells, glazing, displays and lighting

Quantum Information Processing with Diamond - Steven Prawer 2014-05-12

Diamond nitrogen vacancy (NV) color centers can transform quantum information science into practical quantum information technology, including fast, safe computing. Quantum Information Processing with Diamond looks at the principles of quantum information science, diamond materials, and their applications. Part one provides an introduction to quantum information processing using diamond, as well as its principles and fabrication techniques. Part two outlines experimental demonstrations of quantum information processing using diamond, and the emerging applications of diamond for quantum information science. It contains chapters on quantum key distribution, quantum microscopy, the hybridization of quantum systems, and building quantum optical devices. Part three outlines promising directions and future trends in diamond technologies for quantum information processing and sensing. Quantum Information Processing with Diamond is a key reference for R&D managers in industrial sectors such as conventional electronics, communication engineering, computer science, biotechnology, quantum optics, quantum mechanics, quantum computing, quantum cryptology, and nanotechnology, as well as academics in physics, chemistry, biology, and engineering. Brings together the topics of diamond and quantum information processing Looks at applications such as quantum computing, neural circuits, and in vivo monitoring of processes at the molecular scale

Nanostructured Semiconductor Oxides for the Next Generation of Electronics and Functional Devices - Serge Zhuiykov 2014-02-14

Nanostructured Semiconductor Oxides for the Next Generation of Electronics and Functional Devices focuses on the development of semiconductor nanocrystals, their technologies and applications, including

energy harvesting, solar cells, solid oxide fuel cells, and chemical sensors. Semiconductor oxides are used in electronics, optics, catalysts, sensors, and other functional devices. In their 2D form, the reduction in size confers exceptional properties, useful for creating faster electronics and more efficient catalysts. After explaining the physics affecting the conductivity and electron arrangement of nanostructured semiconductors, the book addresses the structural and chemical modification of semiconductor nanocrystals during material growth. It then covers their use in nanoscale functional devices, particularly in electronic devices and carbon nanotubes. It explores the impact of 2D nanocrystals, such as graphene, chalcogenides, and oxide nanostructures, on research and technology, leading to a discussion of incorporating graphene and semiconductor nanostructures into composites for use in energy storage. The final three chapters focus on the applications of these functional materials in photovoltaic cells, solid oxide fuel cells, and in environmental sensors including pH, dissolved oxygen, dissolved organic carbon, and dissolved metal ion sensors. Nanostructured Semiconductor Oxides for the Next Generation of Electronics and Functional Devices is a crucial resource for scientists, applied researchers, and production engineers working in the fabrication, design, testing, characterization, and analysis of new semiconductor materials. This book is a valuable reference for those working in the analysis and characterization of new nanomaterials, and for those who develop technologies for practical devices fabrication. Focuses on the development of semiconductor nanocrystals, their technologies and applications, including energy harvesting, solar cells, solid oxide fuel cells, and chemical sensors Reviews fundamental physics of conductivity and electron arrangement before proceeding to practical applications A vital resource for applied researchers and production engineers working with new semiconductor materials

Laser Growth and Processing of Photonic Devices - Nikolaos A Vainos 2012-07-10

The use of lasers in the processing of electronic and photonic material is becoming increasingly widespread, with technological advances reducing costs and increasing both the quality and range of novel devices which can be produced. Laser growth and processing of photonic devices is the first book to review this increasingly important field. Part one investigates laser-induced growth of materials and surface structures, with pulsed laser deposition techniques, the formation of nanocones and the fabrication of periodic photonic microstructures explored in detail. Laser-induced three-dimensional micro- and nano-structuring are the focus of part two. Exploration of multiphoton lithography, processing and fabrication is followed by consideration of laser-based micro- and nano-fabrication, laser-induced soft matter organization and microstructuring, and laser-assisted polymer joining methods. The book concludes in part three with an investigation into laser fabrication and manipulation of photonic structures and devices. Laser seeding and thermal processing of glass with nanoscale resolution, laser-induced refractive index manipulation, and the thermal writing of photonic devices in glass and polymers are all considered. With its distinguished editor and international team of expert contributors, Laser growth and processing of photonic devices is an essential tool for all materials scientists, engineers and researchers in the microelectronics industry. The first book to review the increasingly important field of laser growth and processing of photonic devices Investigates laser-induced growth of materials and surface structures, pulsed laser deposition techniques, the formation of nanocones and the fabrication of periodic photonic microstructures Examines laser-induced three-dimensional micro- and nano-structuring and concludes with an investigation into laser fabrication and manipulation of photonic structures and devices

Quantum Optics with Semiconductor Nanostructures - Frank Jahnke 2012-07-16

An understanding of the interaction between light and matter on a quantum level is of fundamental interest and has many applications in optical technologies. The quantum nature of the interaction has recently attracted great attention for applications of semiconductor nanostructures in quantum information processing. Quantum optics with semiconductor nanostructures is a key guide to the theory, experimental realisation, and future potential of semiconductor nanostructures in the exploration of quantum optics. Part one provides a comprehensive overview of single quantum dot systems, beginning with a look at resonance fluorescence emission. Quantum optics with single quantum dots in photonic crystal and micro cavities are explored in detail, before part two goes on to review nanolasers with quantum dot emitters. Light-matter interaction in semiconductor nanostructures, including photon statistics and photoluminescence, is the focus of part three, whilst part four explores all-solid-state quantum optics, crystal nanobeam cavities and

quantum-dot microcavity systems. Finally, part five investigates ultrafast phenomena, including femtosecond quantum optics and coherent optoelectronics with quantum dots. With its distinguished editor and international team of expert contributors, Quantum optics with semiconductor nanostructures is an essential guide for all those involved with the research, development, manufacture and use of semiconductor nanodevices, lasers and optical components, as well as scientists, researchers and students. A key guide to the theory, experimental realisation, and future potential of semiconductor nanostructures in the exploration of quantum optics Chapters provide a comprehensive overview of single quantum dot systems, nanolasers with quantum dot emitters, and light-matter interaction in semiconductor nanostructures Explores all-solid-state quantum optics, crystal nanobeam cavities and quantum-dot microcavity systems, and investigates ultrafast phenomena

Biomimetic Technologies - Trung Dung Ngo 2015-07-24

Biomimetic engineering takes the principles of biological organisms and copies, mimics or adapts these in the design and development of new materials and technologies. Biomimetic Technologies reviews the key materials and processes involved in this groundbreaking field, supporting theoretical background by outlining a range of applications. Beginning with an overview of the key principles and materials associated with biomimetic technologies in Part One, the book goes on to explore biomimetic sensors in more detail in Part Two, with bio-inspired tactile, hair-based, gas-sensing and sonar systems all reviewed. Biomimetic actuators are then the focus of Part Three, with vision systems, tissue growth and muscles all discussed. Finally, a wide range of applications are investigated in Part Four, where biomimetic technology and artificial intelligence are reviewed for such uses as bio-inspired climbing robots and multi-robot systems, microrobots with CMOS IC neural networks locomotion control, central pattern generators (CPG's) and biologically inspired antenna arrays. Includes a solid overview of modern artificial intelligence as background to the principles of biomimetic engineering Reviews a selection of key bio-inspired materials and sensors, highlighting their current strengths and future potential Features cutting-edge examples of biomimetic technologies employed for a broad range of applications

Mems for Automotive and Aerospace Applications - Michael Kraft 2013-01-02

MEMS for automotive and aerospace applications reviews the use of Micro-Electro-Mechanical-Systems (MEMS) in developing solutions to the unique challenges presented by the automotive and aerospace industries. Part one explores MEMS for a variety of automotive applications. The role of MEMS in passenger safety and comfort, sensors for automotive vehicle stability control applications and automotive tire pressure monitoring systems are considered, along with pressure and flow sensors for engine management, and RF MEMS for automotive radar sensors. Part two then goes on to explore MEMS for aerospace applications, including devices for active drag reduction in aerospace applications, inertial navigation and structural health monitoring systems, and thrusters for nano- and pico-satellites. A selection of case studies are used to explore MEMS for harsh environment sensors in aerospace applications, before the book concludes by considering the use of MEMS in space exploration and exploitation. With its distinguished editors and international team of expert contributors, MEMS for automotive and aerospace applications is a key tool for MEMS manufacturers and all scientists, engineers and academics working on MEMS and intelligent systems for transportation. Chapters consider the role of MEMS in a number of automotive applications, including passenger safety and comfort, vehicle stability and control MEMS for aerospace applications are also discussed, including active drag reduction, inertial navigation and structural health monitoring systems Presents a number of case studies exploring MEMS for harsh environment sensors in aerospace

Sensor Technologies for Civil Infrastructures - Ming L. Wang 2014-05-19

Sensors are used for civil infrastructure performance assessment and health monitoring, and have evolved significantly through developments in materials and methodologies. Sensor Technologies for Civil Infrastructure Volume II provides an overview of sensor data analysis and case studies in assessing and monitoring civil infrastructures. Part one focuses on sensor data interrogation and decision making, with chapters on data management technologies, data analysis, techniques for damage detection and structural damage detection. Part two is made up of case studies in assessing and monitoring specific structures such as bridges, towers, buildings, dams, tunnels, pipelines, and roads. Sensor Technologies for Civil

Infrastructure provides a standard reference for structural and civil engineers, electronics engineers, and academics with an interest in the field. Provides an in-depth examination of sensor data management and analytical techniques for fault detection and localization, looking at prognosis and life-cycle assessment. Includes case studies in assessing structures such as bridges, buildings, super-tall towers, dams, tunnels, wind turbines, railroad tracks, nuclear power plants, offshore structures, levees, and pipelines

Morphing Wing Technologies - Sergio Ricci 2017-10-27

Morphing Wings Technologies: Large Commercial Aircraft and Civil Helicopters offers a fresh look at current research on morphing aircraft, including industry design, real manufactured prototypes and certification. This is an invaluable reference for students in the aeronautics and aerospace fields who need an introduction to the morphing discipline, as well as senior professionals seeking exposure to morphing potentialities. Practical applications of morphing devices are presented—from the challenge of conceptual design incorporating both structural and aerodynamic studies, to the most promising and potentially flyable solutions aimed at improving the performance of commercial aircraft and UAVs. Morphing aircraft are multi-role aircraft that change their external shape substantially to adapt to a changing mission environment during flight. The book consists of eight sections as well as an appendix which contains both updates on main systems evolution (skin, structure, actuator, sensor, and control systems) and a survey on the most significant achievements of integrated systems for large commercial aircraft. Provides current worldwide status of morphing technologies, the industrial development expectations, and what is already available in terms of flying systems. Offers new perspectives on wing structure design and a new approach to general structural design. Discusses hot topics such as multifunctional materials and auxetic materials. Presents practical applications of morphing devices

Lasers for Medical Applications - Helena Jelínková 2013-09-30

Lasers have a wide and growing range of applications in medicine. Lasers for Medical Applications summarises the wealth of recent research on the principles, technologies and application of lasers in diagnostics, therapy and surgery. Part one gives an overview of the use of lasers in medicine, key principles of lasers and radiation interactions with tissue. To understand the wide diversity and therefore the large possible choice of these devices for a specific diagnosis or treatment, the respective types of the laser (solid state, gas, dye, and semiconductor) are reviewed in part two. Part three describes diagnostic laser methods, for example optical coherence tomography, spectroscopy, optical biopsy, and time-resolved fluorescence polarization spectroscopy. Those methods help doctors to refine the scope of involvement of the particular body part or, for example, to specify the extent of a tumor. Part four concentrates on the therapeutic applications of laser radiation in particular branches of medicine, including ophthalmology, dermatology, cardiology, urology, gynecology, otorhinolaryngology (ORL), neurology, dentistry, orthopaedic surgery and cancer therapy, as well as laser coatings of implants. The final chapter includes the safety precautions with which the staff working with laser instruments must be familiar. With its distinguished editor and international team of contributors, this important book summarizes international achievements in the field of laser applications in medicine in the past 50 years. It provides a valuable contribution to laser medicine by outstanding experts in medicine and engineering. Describes the interaction of laser light with tissue. Reviews every type of laser used in medicine: solid state, gas, dye and semiconductor. Describes the use of lasers for diagnostics

Spacecraft Thermal Control - J Meseguer 2012-08-06

Thermal control systems are an essential element of spacecraft design, ensuring that all parts of the spacecraft remain within acceptable temperature ranges at all times. Spacecraft thermal control describes the fundamentals of thermal control design and reviews current thermal control technologies. The book begins with an overview of space missions and a description of the space environment, followed by coverage of the heat transfer processes relevant to the field. In the third part of the book, current thermal control technologies are described, and in the final part, design, analysis and testing techniques are reviewed. Provides background on the fundamentals of heat transfer which gives the reader a better understanding of the phenomenon and the way Space Thermal Control Systems work. Merges the experience of the authors in teaching aerospace engineering topics with the experience as compilers of the 'Spacecraft Thermal Control Design Data Handbook' of the European Space Agency and the development of

in orbit thermal control systems for Spanish and ESA Missions. The engineering approach is enhanced with a full section on Thermal Control Design, Analysis and Testing

MEMS Product Development - Alissa M. Fitzgerald 2021-03-16

Drawing on their experiences in successfully executing hundreds of MEMS development projects, the authors present the first practical guide to navigating the technical and business challenges of MEMS product development, from the initial concept stage all the way to commercialization. The strategies and tactics presented, when practiced diligently, can shorten development timelines, help avoid common pitfalls, and improve the odds of success, especially when resources are limited. MEMS Product Development illuminates what it really takes to develop a novel MEMS product so that innovators, designers, entrepreneurs, product managers, investors, and executives may properly prepare their companies to succeed.

Structural Health Monitoring (SHM) in Aerospace Structures - Fuh-Gwo Yuan 2016-03-01

Structural Health Monitoring (SHM) in Aerospace Structures provides readers with the spectacular progress that has taken place over the last twenty years with respect to the area of Structural Health Monitoring (SHM). The widespread adoption of SHM could both significantly improve safety and reduce maintenance and repair expenses that are estimated to be about a quarter of an aircraft fleet's operating costs. The SHM field encompasses transdisciplinary areas, including smart materials, sensors and actuators, damage diagnosis and prognosis, signal and image processing algorithms, wireless intelligent sensing, data fusion, and energy harvesting. This book focuses on how SHM techniques are applied to aircraft structures with particular emphasis on composite materials, and is divided into four main parts. Part One provides an overview of SHM technologies for damage detection, diagnosis, and prognosis in aerospace structures. Part Two moves on to analyze smart materials for SHM in aerospace structures, such as piezoelectric materials, optical fibers, and flexoelectricity. In addition, this also includes two vibration-based energy harvesting techniques for powering wireless sensors based on piezoelectric electromechanical coupling and diamagnetic levitation. Part Three explores innovative SHM technologies for damage diagnosis in aerospace structures. Chapters within this section include sparse array imaging techniques and phase array techniques for damage detection. The final section of the volume details innovative SHM technologies for damage prognosis in aerospace structures. This book serves as a key reference for researchers working within this industry, academic, and government research agencies developing new systems for the SHM of aerospace structures and materials scientists. Provides key information on the potential of SHM in reducing maintenance and repair costs. Analyzes current SHM technologies and sensing systems, highlighting the innovation in each area. Encompasses chapters on smart materials such as electroactive polymers and optical fibers

Wireless Networks: Characteristics and Applications - MDPI 2019-10-18

Wireless technology has become extremely important for human life and nearly everyone carries at least one cell/mobile phone. Voice communication affects our daily lives and we are influenced by day-to-day routine. Wireless systems are being explored for numerous applications in addition to their current communication function. One can only imagine the possible innovations from an area that is expanding at an unprecedented rate and offers significant future potentials. This volume is a carefully selected collection of papers that characterizes the technology and establishes its use.

Nitride Semiconductor Light-Emitting Diodes (LEDs) - Jian-Jang Huang 2014-02-14

The development of nitride-based light-emitting diodes (LEDs) has led to advancements in high-brightness LED technology for solid-state lighting, handheld electronics, and advanced bioengineering applications. Nitride Semiconductor Light-Emitting Diodes (LEDs) reviews the fabrication, performance, and applications of this technology that encompass the state-of-the-art material and device development, and practical nitride-based LED design considerations. Part one reviews the fabrication of nitride semiconductor LEDs. Chapters cover molecular beam epitaxy (MBE) growth of nitride semiconductors, modern metalorganic chemical vapor deposition (MOCVD) techniques and the growth of nitride-based materials, and gallium nitride (GaN)-on-sapphire and GaN-on-silicon technologies for LEDs. Nanostructured, non-polar and semi-polar nitride-based LEDs, as well as phosphor-coated nitride LEDs, are also discussed. Part two covers the performance of nitride LEDs, including photonic crystal LEDs, surface plasmon enhanced LEDs, color

tuneable LEDs, and LEDs based on quantum wells and quantum dots. Further chapters discuss the development of LED encapsulation technology and the fundamental efficiency droop issues in gallium indium nitride (GaInN) LEDs. Finally, part three highlights applications of nitride LEDs, including liquid crystal display (LCD) backlighting, infrared emitters, and automotive lighting. Nitride Semiconductor Light-Emitting Diodes (LEDs) is a technical resource for academics, physicists, materials scientists, electrical engineers, and those working in the lighting, consumer electronics, automotive, aviation, and communications sectors. Reviews fabrication, performance, and applications of this technology that encompass the state-of-the-art material and device development, and practical nitride-based LED design considerations. Covers the performance of nitride LEDs, including photonic crystal LEDs, surface plasmon enhanced LEDs, color tuneable LEDs, and LEDs based on quantum wells and quantum dots. Highlights applications of nitride LEDs, including liquid crystal display (LCD) backlighting, infra-red emitters, and automotive lighting

Semiconductor Gas Sensors - Raivo Jaaniso 2013-08-31

Semiconductor gas sensors have a wide range of applications in safety, process control, environmental monitoring, indoor or cabin air quality and medical diagnosis. This important book summarises recent research on basic principles, new materials and emerging technologies in this essential field. The first part of the book reviews the underlying principles and sensing mechanisms for n- and p-type oxide semiconductors, introduces the theory for nanosize materials and describes the role of electrode-semiconductor interfaces. The second part of the book describes recent developments in silicon carbide- and graphene-based gas sensors, wide bandgap semiconductor gas sensors and micromachined and direct thermoelectric gas sensors. Part 3 discusses the use of nanomaterials for gas sensing, including metal oxide nanostructures, quantum dots, single-walled carbon nanotubes and porous silicon. The final part of the book surveys key applications in environmental monitoring, detecting chemical warfare agents and monitoring gases such as carbon dioxide. Semiconductor gas sensors is a valuable reference work for all those involved in gas monitoring, including those in the building industry, environmental engineers, defence and security specialists and researchers in this field. Provides an overview of resistor and non-resistor sensors. Reviews developments in gas sensors and sensing methods, including graphene based sensors and direct thermoelectric sensors. Discusses the use of nanomaterials in gas sensing

Handbook of MemS for Wireless and Mobile Applications - Deepak Uttamchandani 2013-08-31

The increasing demand for mobile and wireless sensing necessitates the use of highly integrated technology featuring small size, low weight, high performance and low cost: micro-electro-mechanical systems (MEMS) can meet this need. The Handbook of MEMS for wireless and mobile applications provides a comprehensive overview of radio frequency (RF) MEMS technologies and explores the use of these technologies over a wide range of application areas. Part one provides an introduction to the use of RF MEMS as an enabling technology for wireless applications. Chapters review RF MEMS technology and applications as a whole before moving on to describe specific technologies for wireless applications including passive components, phase shifters and antennas. Packaging and reliability of RF MEMS is also discussed. Chapters in part two focus on wireless techniques and applications of wireless MEMS including biomedical applications, such as implantable MEMS, intraocular pressure sensors and wireless drug delivery. Further chapters highlight the use of RF MEMS for automotive radar, the monitoring of telecommunications reliability using wireless MEMS and the use of optical MEMS displays in portable electronics. With its distinguished editor and international team of expert authors, the Handbook of MEMS for wireless and mobile applications is a technical resource for MEMS manufacturers, the electronics industry, and scientists, engineers and academics working on MEMS and wireless systems. Reviews the use of radio frequency (RF) MEMS as an enabling technology for wireless applications. Discusses wireless techniques and applications of wireless MEMS, including biomedical applications. Describes monitoring structures and the environment with wireless MEMS

Carbon Nanotubes and Graphene for Photonic Applications - Shinji Yamashita 2013-08-31

The optical properties of carbon nanotubes and graphene make them potentially suitable for a variety of photonic applications. Carbon nanotubes and graphene for photonic applications explores the properties of these exciting materials and their use across a variety of applications. Part one introduces the fundamental

optical properties of carbon nanotubes and graphene before exploring how carbon nanotubes and graphene are synthesised. A further chapter focusses on nonlinearity enhancement and novel preparation approaches for carbon nanotube and graphene photonic devices. Chapters in part two discuss carbon nanotubes and graphene for laser applications and highlight optical gain and lasing in carbon nanotubes, carbon nanotube and graphene-based fiber lasers, carbon-nanotube-based bulk solid-state lasers, electromagnetic nonlinearities in graphene, and carbon nanotube-based nonlinear photonic devices. Finally, part three focusses on carbon-based optoelectronics and includes chapters on carbon nanotube solar cells, a carbon nanotube-based optical platform for biomolecular detection, hybrid carbon nanotube-liquid crystal nanophotonic devices, and quantum light sources based on individual carbon nanotubes. Carbon nanotubes and graphene for photonic applications is a technical resource for materials scientists, electrical engineers working in the photonics and optoelectronics industry and academics and researchers interested in the field. Covers the properties and fabrication of carbon nanotubes and graphene for photonic applications. Considers the uses of carbon nanotubes and graphene for laser applications. Explores numerous carbon-based light emitters and detectors

MEMS for Automotive and Aerospace Applications - Michael Kraft 2013

Micro Electro Mechanical Systems (MEMS) are miniature devices or machines which integrate elements such as actuators, sensors and a processor to form microsystems. The automotive sector is currently the biggest consumer of MEMS and this market, driven by safety legislation, is expected to grow. Emerging applications in the aerospace field will face unique challenges related to harsh environmental conditions and reliability requirements. Chapters in the first half cover MEMS for a variety of automotive applications, including the role of MEMS in passenger safety and comfort, sensors for automotive vehicle stability control applications and automotive tire pressure monitoring systems, pressure and flow sensors for engine management and RF MEMS for automotive radar sensors. The second half describes MEMS for aerospace applications and covers devices for active drag reduction in aerospace applications, inertial navigation and structural health monitoring systems, and thrusters for nano- and pico-satellites. The contributions also include a selection of case studies which explore MEMS for harsh environment sensors in aerospace applications. The book concludes by considering the use of MEMS in space exploration and exploitation, including navigation systems, devices for health monitoring, drag reduction and MEMS thrusters for nano and pico satellites.

Fundamentals and Applications of Nanophotonics - Joseph W. Haus 2016-01-09

Fundamentals and Applications of Nanophotonics includes a comprehensive discussion of the field of nanophotonics, including key enabling technologies that have the potential to drive economic growth and impact numerous application domains such as ICT, the environment, healthcare, military, transport, manufacturing, and energy. This book gives readers the theoretical underpinnings needed to understand the latest advances in the field. After an introduction to the area, chapters two and three cover the essential topics of electrodynamics, quantum mechanics, and computation as they relate to nanophotonics. Subsequent chapters explore materials for nanophotonics, including nanoparticles, photonic crystals, nanosilicon, nanocarbon, III-V, and II-VI semiconductors. In addition, fabrication and characterization techniques are addressed, along with the importance of plasmonics, and the applications of nanophotonics in devices such as lasers, LEDs, and photodetectors. Covers electrodynamics, quantum mechanics and computation as these relate to nanophotonics. Reviews materials, fabrication and characterization techniques for nanophotonics. Describes applications of the technology such as lasers, LEDs and photodetectors

Nanolithography - M Feldman 2014-02-13

Integrated circuits, and devices fabricated using the techniques developed for integrated circuits, have steadily gotten smaller, more complex, and more powerful. The rate of shrinking is astonishing – some components are now just a few dozen atoms wide. This book attempts to answer the questions, “What comes next?” and “How do we get there?” Nanolithography outlines the present state of the art in lithographic techniques, including optical projection in both deep and extreme ultraviolet, electron and ion beams, and imprinting. Special attention is paid to related issues, such as the resists used in lithography, the masks (or lack thereof), the metrology needed for nano-features, modeling, and the limitations caused

by feature edge roughness. In addition emerging technologies are described, including the directed assembly of wafer features, nanostructures and devices, nano-photonics, and nano-fluidics. This book is intended as a guide to the researcher new to this field, reading related journals or facing the complexities of a technical conference. Its goal is to give enough background information to enable such a researcher to understand, and appreciate, new developments in nanolithography, and to go on to make advances of his/her own. Outlines the current state of the art in alternative nanolithography technologies in order to cope with the future reduction in size of semiconductor chips to nanoscale dimensions Covers lithographic techniques, including optical projection, extreme ultraviolet (EUV), nanoimprint, electron beam and ion beam lithography Describes the emerging applications of nanolithography in nanoelectronics, nanophotonics and microfluidics

Self-Piercing Riveting - A Chrysanthou 2014-02-14

Due to its speed, low energy requirements, and the fact that it does not require a pre-drilled hole, the technique of self-piercing riveting (SPR) has been increasingly adopted by many industries as a high-speed mechanical fastening technique for the joining of sheet material components. Self-piercing riveting comprehensively reviews the process, equipment, and corrosion behaviour of self-piercing riveting, and also describes the process of evaluation and modelling of strength of self-piercing riveted joints, quality control methods and non-destructive testing. Part one provides an extensive overview of the properties of self-piercing riveting. Chapters in this section review the mechanical strength, fatigue, and corrosion behaviour of self-piercing riveted joints. The second part of the book outlines the processing and applications of SPRs, and describes the dynamic strength evaluation/crashworthiness of SPRs, and the modelling of strength of self-piercing riveted joints, before going on to discuss the assessment of the suitability of materials for self-piercing riveting. The concluding chapters describe the quality control and non-destructive testing of self-piercing riveted joints, optimization of the strength of self-piercing rivets, and provides an overview of self-piercing rivets in the automotive industry and the applications of self-piercing riveting in automated vehicle construction. Self-piercing riveting is a standard reference for engineers and designers in the aerospace, materials, welding, joining, automotive and white goods industries, as well as manufacturers of metal components for the automotive, aerospace, white goods and building industries. Comprehensively reviews the process, equipment, and corrosion behaviour of self-piercing riveting Describes the process of evaluation and modelling of strength of self-piercing riveted joints, quality control methods and non-destructive testing Provides an overview of quality, optimization, applications and strength evaluations of self-piercing riveting

Micromanipulation - Nicola Pio Belfiore 2019-01-10

This book is a printed edition of the Special Issue "Micromanipulation" that was published in Actuators

Applications of ATILA FEM Software to Smart Materials - Kenji Uchino 2012-11-27

ATILA Finite Element Method (FEM) software facilitates the modelling and analysis of applications using piezoelectric, magnetostrictor and shape memory materials. It allows entire designs to be constructed, refined and optimized before production begins. Through a range of instructive case studies, Applications of ATILA FEM software to smart materials provides an indispensable guide to the use of this software in the design of effective products. Part one provides an introduction to ATILA FEM software, beginning with an overview of the software code. New capabilities and loss integration are discussed, before part two goes on to present case studies of finite element modelling using ATILA. The use of ATILA in finite element analysis, piezoelectric polarization, time domain analysis of piezoelectric devices and the design of ultrasonic motors is considered, before piezo-composite and photonic crystal applications are reviewed. The behaviour of piezoelectric single crystals for sonar and thermal analysis in piezoelectric and magnetostrictive materials is also discussed, before a final reflection on the use of ATILA in modelling the damping of piezoelectric structures and the behaviour of single crystal devices. With its distinguished editors and international team

of expert contributors, Applications of ATILA FEM software to smart materials is a key reference work for all those involved in the research, design, development and application of smart materials, including electrical and mechanical engineers, academics and scientists working in piezoelectrics, magnetostrictors and shape memory materials. Provides an indispensable guide to the use of ATILA FEM software in the design of effective products Discusses new capabilities and loss integration of the software code, before presenting case studies of finite element modelling using ATILA Discusses the behaviour of piezoelectric single crystals for sonar and thermal analysis in piezoelectric and magnetostrictive materials, before a reflection on the use of ATILA in modelling the damping of piezoelectric structures

Chalcogenide Glasses - J-L Adam 2014-02-14

The unique properties and functionalities of chalcogenide glasses make them promising materials for photonic applications. Chalcogenide glasses are transparent from the visible to the near infrared region and can be moulded into lenses or drawn into fibres. They have useful commercial applications as components for lenses for infrared cameras, and chalcogenide glass fibres and optical components are used in waveguides for use with lasers, for optical switching, chemical and temperature sensing and phase change memories. Chalcogenide glasses comprehensively reviews the latest technological advances in this field and the industrial applications of the technology. Part one outlines the preparation methods and properties of chalcogenide glasses, including the thermal properties, structure, and optical properties, before going on to discuss mean coordination and topological constraints in chalcogenide network glasses, and the photo-induced phenomena in chalcogenide glasses. This section also covers the ionic conductivity and physical aging of chalcogenide glasses, deposition techniques for chalcogenide thin films, and transparent chalcogenide glass-ceramics. Part two explores the applications of chalcogenide glasses. Topics discussed include rare-earth-doped chalcogenide glass for lasers and amplifiers, the applications of chalcogenide glasses for infrared sensing, microstructured optical fibres for infrared applications, and chalcogenide glass waveguide devices for all-optical signal processing. This section also discusses the control of light on the nanoscale with chalcogenide thin films, chalcogenide glass resists for lithography, and chalcogenide for phase change optical and electrical memories. The book concludes with an overview of chalcogenide glasses as electrolytes for batteries. Chalcogenide glasses comprehensively reviews the latest technological advances and applications of chalcogenide glasses, and is an essential text for academics, materials scientists and electrical engineers working in the photonics and optoelectronics industry. Outlines preparation methods and properties, and explores applications of chalcogenide glasses. Covers the ionic conductivity and physical aging of chalcogenide glasses, deposition techniques for chalcogenide thin films, and transparent chalcogenide glass-ceramics Discusses the control of light on the nanoscale with chalcogenide thin films, chalcogenide glass resists for lithography, and chalcogenide for phase change optical and electrical memories

Photodetectors - Bahram Nabet 2015-10-24

Photodetectors: Materials, Devices and Applications discusses the devices that convert light to electrical signals, key components in communication, computation, and imaging systems. In recent years, there has been significant improvement in photodetector performance, and this important book reviews some of the key advances in the field. Part one covers materials, detector types, and devices, and includes discussion of silicon photonics, detectors based on reduced dimensional charge systems, carbon nanotubes, graphene, nanowires, low-temperature grown gallium arsenide, plasmonic, Si photomultiplier tubes, and organic photodetectors, while part two focuses on important applications of photodetectors, including microwave photonics, communications, high-speed single photon detection, THz detection, resonant cavity enhanced photodetection, photo-capacitors and imaging. Reviews materials, detector types and devices Addresses fabrication techniques, and the advantages and limitations and different types of photodetector Considers a range of application for this important technology Includes discussions of silicon photonics, detectors based on reduced dimensional charge systems, carbon nanotubes, graphene, nanowires, and more