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KEY=SPIN - KANE HOPE

Spin Current

OUP Oxford Since the discovery of the giant magnetoresistance (GMR) effect in magnetic multilayers in 1988, a new branch of physics and technology, called spin-electronics or spintronics, has emerged, where the flow of electrical charge as well as the flow of electron spin, the so-called "spin current", are manipulated and controlled together. Recent progress in the physics of magnetism and the application of spin current has progressed in tandem with the nanofabrication technology of magnets and the engineering of interfaces and thin films. This book is intended to provide an introduction and guide to the new physics and applications of spin current. The emphasis is placed on the interaction between spin and charge currents in magnetic nanostructures.

Spintronics

Materials, Devices, and Applications

John Wiley & Sons Discover the latest advances in spintronic materials, devices, and applications In Spintronics: Materials, Devices and Applications, a team of distinguished researchers delivers a holistic introduction to spintronic effects within cutting-edge materials and applications. Containing the perfect balance of academic research and practical application, the book discusses the potential—and the key limitations and challenges—of spintronic devices. The latest title in the Wiley Series in Materials for Electronic and Optoelectronic Applications, Spintronics: Materials, Devices and Applications explores giant magneto-resistance (GMR) and tunneling magnetic resistance (TMR) materials, spin-transfer torque and spin-orbit torque materials, spin oscillators, and spin materials for use in artificial neural networks. Applications in multi-ferroelectric and antiferromagnetic materials are presented as well. This book also includes: A thorough introduction to recent research developments in the fields of spintronic materials, devices, and applications Comprehensive explorations of skymions, magnetic semiconductors, and antiferromagnetic materials Practical discussions of spin-transfer torque materials and devices for magnetic random-access memory In-depth examinations of giant magneto-resistance materials and devices for magnetic sensors Perfect for advanced students and researchers in materials science, physics, electronics, and computer science, Spintronics: Materials, Devices and Applications will also earn a place in the libraries of professionals working in the manufacture of optics, photonics, and nanometrology equipment.

The Next Era in Hardware Security

A Perspective on Emerging Technologies for Secure Electronics

Springer Nature

Spintronic 2D Materials

Fundamentals and Applications

Elsevier Spintronic 2D Materials: Fundamentals and Applications provides an overview of the fundamental theory of 2D electronic systems that includes a selection of the most intensively investigated 2D materials. The book tells the story of 2D spintronics in a systematic and comprehensive way, providing the growing community of spintronics researchers with a key reference. Part One addresses the fundamental theoretical aspects of 2D materials and spin transport, while Parts Two through Four explore 2D material systems, including graphene, topological insulators, and transition metal dichalcogenides. Each section discusses properties, key issues and recent developments. In addition, the material growth method (from lab to mass production), device fabrication and characterization techniques are included throughout the book. Discusses the fundamentals and applications of spintronics of 2D materials, such as graphene, topological insulators and transition metal dichalcogenides Includes an in-depth look at each materials system, from material growth, device fabrication and characterization techniques Presents the latest solutions on key challenges, such

as the spin lifetime of 2D materials, spin-injection efficiency, the potential proximity effects, and much more

Recent Advances in Topological Ferroics and their Dynamics

Academic Press Recent Advances in Topological Ferroics and Their Dynamics, Volume 70 in the Solid State Physics series, provides the latest information on the branch of physics that is primarily devoted to the study of matter in its solid phase, especially at the atomic level. This prestigious serial presents timely and state-of-the-art reviews pertaining to all aspects of solid state physics. Contains contributions from leading authorities in the study of solid state physics, especially at the atomic level Informs and updates on all the latest developments in the field Presents timely, state-of-the-art reviews pertaining to all aspects of solid state physics

Brain-Inspired Computing: From Neuroscience to Neuromorphic Electronics driving new forms of Artificial Intelligence

Frontiers Media SA

Spin Physics in Semiconductors

Springer Science & Business Media The purpose of this collective book is to present a non-exhaustive survey of sp- related phenomena in semiconductors with a focus on recent research. In some sense it may be regarded as an updated version of theOpticalOrientation book, which was entirely devoted to spin physics in bulk semiconductors. During the 24 years that have elapsed, we have witnessed, on the one hand, an extraordinary development in the wonderful semiconductor physics in two dim- sions with the accompanying revolutionary applications. On the other hand, during the last maybe 15 years there was a strong revival in the interest in spin phen- ena, in particular in low-dimensional semiconductor structures. While in the 1970s and 1980s the entire world population of researchers in the ?eld never exceeded 20 persons, now it can be counted by the hundreds and the number of publications by the thousands. This explosive growth is stimulated, to a large extent, by the hopes that the electron and/or nuclear spins in a semiconductor will help to accomplish the dream of factorizing large numbers by quantum computing and eventually to develop a new spin-based electronics, or "spintronics". Whether any of this will happen or not, still remains to be seen. Anyway, these ideas have resulted in a large body of interesting and exciting research, which is a good thing by itself. The ?eld of spin physics in semiconductors is extremely rich and interesting with many spectacular effects in optics and transport.

Magnetic Multilayers

World Scientific This book focuses on an increasingly important area of materials science and technology, namely, the fabrication and properties of artificial materials where slabs of magnetized materials are sandwiched between slabs of nonmagnetized materials. It includes reviews by experts on the theory and descriptions of the various experimental techniques such as those using nuclear or electron spin probes, as well as optical, X-ray or neutron probes. It also reviews potential applications such as the giant magnetoresistance, and one specialized preparation technique, the electrodeposition. The various chapters are tutorial in nature, making the subject accessible to nonspecialists, as well as useful to researchers in the field. Contents: Application of Magnetic Multilayers (M Pardavi-Horvath)Magnetic Coupling in Metallic Multilayers (Y Yafet)First-Principles Calculations of Magnetic Interfaces and Multilayers (M Weinert ' S Blügel)Influence of Imperfections on the Magnetic Properties of Fe/Ag Films and Multilayers (J Pirnay et al.)NMR Studies on Magnetic Multilayers (H A M de Gronckel ' W J M de Jonge)Conversion Electron Mössbauer Spectroscopy of Magnetic Multilayers (Ch Sauer ' W Zinn)Resonance in Coupled Ferromagnetic Layer Structures (P E Wigen)Magnetic Circular X-Ray Dichroism (F Baudelet et al.)Magneto-Optical Spectra in Multilayers (K Sato)Neutron and X-Ray Diffraction Studies of Magnetic Multilayers (C F Majkrzak et al.)Giant Magnetoresistance (GMR) in Multilayers (M Pardavi-Horvath)Electrodeposited Magnetic Multilayers (M P Dariel et al.) Readership: Graduate students, professional researchers and well-educated others (eg. contract officers). keywords:Magnetic Multilayers;Circular Dichroism;Giant Magnetoresistance;Magnetic Interfaces;Magnetic Multilayers: Effect of Imperfections;Conversion Electron Mossbauer Spectroscopy;Multilayer Magnetic Coupling;Magneto-Optical Spectroscopy;Neutron Diffraction;Magnetic Xray Diffraction;Magnetic Multilayer Fabrication;Supermirrors;Magnetic Recording;RKKY Coupling;Nuclear Magnetic Resonance;Ferromagnetic Resonance

Engineering Physics Quick Study Guide & Workbook Trivia Questions Bank, Worksheets to Review Homeschool Notes with Answer Key

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Spintronics-based Computing

Springer This book provides a comprehensive introduction to spintronics-based computing for the next generation of ultra-low power/highly reliable logic. It will cover aspects from device to system-level, including magnetic memory cells, device modeling, hybrid circuit structure, design methodology, CAD tools, and technological integration methods. This book is accessible to a variety of readers and little or no background in magnetism and spin electronics are required to understand its content. The multidisciplinary team of expert authors from circuits, devices, computer architecture, CAD and system design reveal to readers the potential of spintronics nanodevices to reduce power consumption, improve reliability and enable new functionality.

Spin Dynamics and Damping in Ferromagnetic Thin Films and Nanostructures

Springer This book provides a comprehensive overview of the latest developments in the field of spin dynamics and magnetic damping. It discusses the various ways to tune damping, specifically, dynamic and static control in a ferromagnetic layer/heavy metal layer. In addition, it addresses all optical detection techniques for the investigation of modulation of damping, for example, the time-resolved magneto-optical Kerr effect technique.

Oxford Handbook of Nanoscience and Technology Volume 2: Materials: Structures, Properties and Characterization Techniques

Oxford University Press These three volumes are intended to shape the field of nanoscience and technology and will serve as an essential point of reference for cutting-edge research in the field.

Orbital Mechanics for Engineering Students

Elsevier Orbital Mechanics for Engineering Students, Second Edition, provides an introduction to the basic concepts of space mechanics. These include vector kinematics in three dimensions; Newton's laws of motion and gravitation; relative motion; the vector-based solution of the classical two-body problem; derivation of Kepler's equations; orbits in three dimensions; preliminary orbit determination; and orbital maneuvers. The book also covers relative motion and the two-impulse rendezvous problem; interplanetary mission design using patched conics; rigid-body dynamics used to characterize the attitude of a space vehicle; satellite attitude dynamics; and the characteristics and design of multi-stage launch vehicles. Each chapter begins with an outline of key concepts and concludes with problems that are based on the material covered. This text is written for undergraduates who are studying orbital mechanics for the first time and have completed courses in physics, dynamics, and mathematics, including differential equations and applied linear algebra. Graduate students, researchers, and experienced practitioners will also find useful review materials in the book. NEW: Reorganized and improved discusions of coordinate systems, new discussion on perturbations and quarternions NEW: Increased coverage of attitude dynamics, including new Matlab algorithms and examples in chapter 10 New examples and homework problems

Spintronics

Theory, Modelling, Devices

Walter de Gruyter GmbH & Co KG Starting from quantum mechanical and condensed matter foundations, this book introduces into the necessary theory behind spin electronics (Spintronics). Equations of spin diffusion, -evolution and -tunelling are provided before an overview is given of simulation of spin transport at the atomic scale. Furthermore, applications are discussed with a focus on elementary spintronics devices such as spin valves, memory cells and hard disk heads.

Spintronics Handbook, Second Edition: Spin Transport and Magnetism

Volume One: Metallic Spintronics

CRC Press Spintronics Handbook, Second Edition offers an update on the single most comprehensive survey of the two intertwined fields of spintronics and magnetism, covering the diverse array of materials and structures, including silicon, organic semiconductors, carbon nanotubes, graphene, and engineered nanostructures. It focuses on seminal pioneering work, together with the latest in cutting-edge advances, notably extended discussion of two-dimensional materials beyond graphene, topological insulators, skyrmions, and molecular spintronics. The main sections cover physical phenomena, spin-dependent tunneling, control of spin and magnetism in semiconductors, and spin-based applications.

Magnetic Memory Technology

Spin-transfer-Torque MRAM and Beyond

John Wiley & Sons STAY UP TO DATE ON THE STATE OF MRAM TECHNOLOGY AND ITS APPLICATIONS WITH THIS COMPREHENSIVE RESOURCE Magnetic Memory Technology: Spin-Transfer-Torque MRAM and Beyond delivers a combination of foundational and advanced treatments of the subjects necessary for students and professionals to fully understand MRAM and other non-volatile memories, like PCM, and ReRAM. The authors offer readers a thorough introduction to the fundamentals of magnetism and electron spin, as well as a comprehensive analysis of the physics of magnetic tunnel junction (MTJ) devices as it relates to memory applications. This book explores MRAM's unique ability to provide memory without requiring the atoms inside the device to move when switching states. The resulting power savings and reliability are what give MRAM its extraordinary potential. The authors describe the current state of academic research in MRAM technology, which focuses on the reduction of the amount of energy needed to reorient magnetization. Among other topics, readers will benefit from the book's discussions of: An introduction to basic electromagnetism, including the fundamentals of magnetic force and other concepts An thorough description of magnetism and magnetic materials, including the classification and properties of magnetic thin film properties and their material preparation and characterization A comprehensive description of Giant magnetoresistance (GMR) and tunneling magnetoresistance (TMR) devices and their equivalent electrical model Spin current and spin dynamics, including the properties of spin current, the Ordinary Hall Effect, the Anomalous Hall Effect, and the spin Hall effect Different categories of magnetic random-access memory, including field-write mode MRAM, Spin-Torque-Transfer (STT) MRAM, Spin-Orbit Torque (SOT) MRAM, and others Perfect for senior undergraduate and graduate students studying electrical engineering, similar programs, or courses on topics like spintronics, Magnetic Memory Technology: Spin-Transfer-Torque MRAM and Beyond also belongs on the bookshelves of engineers and other professionals involved in the design, development, and manufacture of MRAM technologies.

Engineering Physics MCQs

Multiple Choice Questions and Answers (Quiz & Practice Tests with Answer Key)

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Practice Equilibrium, Indeterminate Structures MCQ with answers PDF book, test 9 to solve MCQ questions bank: Center of gravity, density of selected materials of engineering interest, elasticity, equilibrium, indeterminate structures, ultimate and yield strength of selected materials of engineering interest, and Young's modulus of selected materials of engineering interest. Practice Finding Electric Field MCQ with answers PDF book, test 10 to solve MCQ questions bank: Electric field, electric field due to continuous charge distribution, electric field lines, flux, and Gauss law. 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Practice Longitudinal Waves MCQ with answers PDF book, test 18 to solve MCQ questions bank: Doppler Effect, shock wave, sound waves, and speed of sound. Practice Magnetic Force MCQ with answers PDF book, test 19 to solve MCQ questions bank: Charged particle circulating in a magnetic field, Hall Effect, magnetic dipole moment, magnetic field, magnetic field lines, magnetic force on current carrying wire, some appropriate magnetic fields, and torque on current carrying coil. Practice Models of Magnetism MCQ with answers PDF book, test 20 to solve MCQ questions bank: Diamagnetism, earth's magnetic field, ferromagnetism, gauss's law for magnetic fields, indexes of refractions, Maxwell's extension of ampere's law, Maxwell's rainbow, orbital magnetic dipole moment, Para magnetism, polarization, reflection and refraction, and spin magnetic dipole moment. Practice Newton's Law of Motion MCQ with answers PDF book, test 21 to solve MCQ questions bank: Newton's first law, Newton's second law, Newtonian mechanics, normal force, and tension. Practice Newtonian Gravitation MCQ with answers PDF book, test 22 to solve MCQ questions bank: Escape speed, gravitation near earth's surface, gravitational system body masses, gravitational system body radii, Kepler's law of periods for solar system, newton's law of gravitation, planet and satellites: Kepler's law, satellites: orbits and energy, and semi major axis 'a' of planets. Practice Ohm's Law MCQ with answers PDF book, test 23 to solve MCQ questions bank: Current density, direction of current, electric current, electrical properties of copper and silicon, Ohm's law, resistance and resistivity, resistivity of typical insulators, resistivity of typical metals, resistivity of typical semiconductors, and superconductors. Practice Optical Diffraction MCQ with answers PDF book, test 24 to solve MCQ questions bank: Circular aperture diffraction, diffraction, diffraction by a single slit, gratings: dispersion and resolving power, and x-ray diffraction. Practice Optical Interference MCQ with answers PDF book, test 25 to solve MCQ questions bank: Coherence, light as a wave, and Michelson interferometer. Practice Physics and Measurement MCQ with answers PDF book, test 26 to solve MCQ questions bank: Applied physics introduction, changing units, international system of units, length and time, mass, physics history, SI derived units, SI supplementary units, and SI temperature derived units. Practice Properties of Common Elements MCQ with answers PDF book, test 27 to solve MCQ questions bank: Aluminum, antimony, argon, atomic number of common elements, boiling points, boron, calcium, copper, gallium, germanium, gold, hydrogen, melting points, and zinc. Practice Rotational Motion MCQ with answers PDF book, test 28 to solve MCQ questions bank: Angular momentum, angular momentum of a rigid body, conservation of angular momentum, forces of rolling, kinetic energy of rotation, newton's second law in angular form, newton's second law of rotation, precession of a gyroscope, relating linear and angular variables, relationship with constant angular acceleration, rolling as translation and rotation combined, rotational inertia of different objects, rotational variables, torque, work and rotational kinetic energy, and yo-yo. Practice Second Law of Thermodynamics MCQ with answers PDF book, test 29 to solve MCQ questions bank: Entropy in real world, introduction to second law of thermodynamics, refrigerators, and Sterling engine. Practice Simple Harmonic Motion MCQ with answers PDF book, test 30 to solve MCQ questions bank: Angular simple harmonic oscillator, damped simple harmonic motion, energy in simple harmonic oscillators, forced oscillations and resonance, harmonic motion, pendulums, and uniform circular motion. Practice Special Relativity MCQ with answers PDF book, test 31 to solve MCQ questions bank: Mass energy, postulates, relativity of light, and time dilation. Practice Straight Line Motion MCQ with answers PDF book, test 32 to solve MCQ questions bank: Acceleration, average velocity, instantaneous velocity, and motion. Practice Transverse Waves MCQ with answers PDF book, test 33 to solve MCQ questions bank: Interference of waves, phasors, speed of traveling wave, standing waves, transverse and longitudinal waves, types of waves, wave power, wave speed on a stretched string, wavelength, and frequency. Practice Two and Three Dimensional Motion MCQ with answers PDF book, test 34 to solve MCQ questions bank: Projectile motion, projectile range, and uniform circular motion. Practice Vector Quantities MCQ with answers PDF book, test 35 to solve MCQ questions bank: Components of vector, multiplying vectors, unit vector, vectors, and scalars. Practice Work-Kinetic Energy Theorem MCQ with answers PDF book, test 36 to solve MCQ questions bank: Energy, kinetic energy, power, and work.

Magnetization Oscillations and Waves

CRC Press Written by two well-known researchers in the field, this useful reference takes an applied approach to high frequency processes including oscillations and waves in ferromagnets, antiferromagnets, and ferrimagnets. Problems evaluated include ferromagnetic and antiferromagnetic resonances, spin waves, nonlinear processes, and high frequency manifestations of interactions between the magnetic system and other systems of magnetically ordered substances as elastic waves and charge carriers. Unlike previous monographs on this subject, which are highly theoretical and written for very advanced readers, this book requires only an average college background in mathematics and experimental physics. It will be a valuable addition to the library of engineers and scientists in research and development for communications applications, and scientists interested in nonlinear magnetic phenomena. It also serves as an excellent introduction to the topic for newcomers in the field. Magnetization Oscillations and Waves not only presents results but also shows readers how to obtain them; most formulas are derived with so many details that readers can reproduce them. The book includes many summaries and tables and detailed references to significant work in the area by European researchers.

Topological Insulators

Fundamentals and Perspectives

John Wiley & Sons There are only few discoveries and new technologies in physical sciences that have the potential to dramatically alter and revolutionize our electronic world. Topological insulators are one of them. The present book for the first time provides a full overview and in-depth knowledge about this hot topic in materials science and condensed matter physics. Techniques such as angle-resolved photoemission spectrometry (ARPES), advanced solid-state Nuclear Magnetic Resonance (NMR) or scanning-tunnel microscopy (STM) together with key principles of topological insulators such as spin-locked electronic states, the Dirac point, quantum Hall effects and Majorana fermions are illuminated in individual chapters and are described in a clear and logical form. Written by an international team of experts, many of them directly involved in the very first discovery of topological insulators, the book provides the readers with the knowledge they need to understand the electronic behavior of these unique materials. Being more than a reference work, this book is essential for newcomers and advanced researchers working in the field of topological insulators.

Physics at Surfaces

Cambridge University Press Physics at Surfaces is a unique graduate-level introduction to the physics and chemical physics of solid surfaces, and atoms and molecules that interact with solid surfaces. A subject of keen scientific inquiry since the last century, surface physics emerged as an independent discipline only in the late 1960s as a result of the development of ultra-high vacuum technology and high speed digital computers. With these tools, reliable experimental measurements and theoretical calculations could at last be compared. Progress in the last decade has been truly striking. This volume provides a synthesis of the entire field of surface physics from the perspective of a modern condensed matter physicist with a healthy interest in chemical physics. The exposition intertwines experiment and theory whenever possible, although there is little detailed discussion of technique. This much-needed text will be invaluable to graduate students and researchers in condensed matter physics, physical chemistry and materials science working in, or taking graduate courses in, surface science.

Magnetic Heterostructures

Advances and Perspectives in Spinstructures and Spintransport

Springer Heterostructures consist of combinations of different materials, which are in contact through at least one interface. Magnetic heterostructures combine different physical properties which do not exist in nature. This book provides the first comprehensive overview of an exciting and fast developing field of research, which has already resulted in numerous applications and is the basis for future spintronic devices.

Spacecraft Dynamics and Control

A Practical Engineering Approach

Cambridge University Press Satellites are used increasingly in telecommunications, scientific research, surveillance, and meteorology, and these satellites rely heavily on the effectiveness of complex onboard control systems. This 1997 book explains the basic theory of spacecraft dynamics and control and the practical aspects of controlling a satellite. The emphasis throughout is on analyzing and solving real-world engineering problems. For example, the author discusses orbital and rotational dynamics of spacecraft under a variety of environmental conditions, along with the realistic constraints imposed by available hardware. Among the topics covered are orbital dynamics, attitude dynamics, gravity gradient stabilization, single and dual spin stabilization, attitude maneuvers, attitude stabilization, and structural dynamics and liquid sloshing.

Introduction to the Physics of Nanoelectronics

Elsevier This book provides an introduction to the physics of nanoelectronics, with a focus on the theoretical aspects of nanoscale devices. The book begins with an overview of the mathematics and quantum mechanics pertaining to nanoscale electronics, to facilitate the understanding of subsequent chapters. It goes on to encompass quantum electronics, spintronics, Hall effects, carbon and graphene electronics, and topological physics in nanoscale devices. Theoretical methodology is developed using quantum mechanical and non-equilibrium Green's function (NEGF) techniques to calculate electronic currents and elucidate their transport properties at the atomic scale. The spin Hall effect is explained and its application to the emerging field of spintronics – where an electron's spin as well as its charge is utilised – is discussed. Topological dynamics and gauge potential are introduced with the relevant mathematics, and their application in nanoelectronic systems is explained. Graphene, one of the most promising carbon-based nanostructures for nanoelectronics, is also explored. Begins with an overview of the mathematics and quantum mechanics pertaining to nanoscale electronics Encompasses quantum electronics, spintronics, Hall effects, carbon and graphene electronics, and topological physics in nanoscale devices Comprehensively introduces topological dynamics and gauge potential with the relevant mathematics, and extensively discusses their application in nanoelectronic systems

Attitude Stabilization for CubeSat

Concepts and Technology

Cambridge Scholars Publishing This book explores CubeSat technology, and develops a nonlinear mathematical model of a spacecraft with the assumption that the satellite is a rigid body. It places emphasis on the CubeSat subsystem, orbit dynamics and perturbations, the satellite attitude dynamic and modeling, and components of attitude determination and the control subsystem. The book focuses on the attitude stabilization methods of spacecraft, and presents gravity gradient stabilization, aerodynamic stabilization, and permanent magnets stabilization as passive stabilization methods, and spin stabilization and three axis stabilization as active stabilization methods. It also discusses the need to develop a control system design, and describes the design of three controller configurations, namely the Proportional–Integral–Derivative Controller (PID), the Linear Quadratic Regulator (LQR), and the Fuzzy Logic Controller (FLC) and how they can be used to design the attitude control of CubeSat three-axis stabilization. Furthermore, it presents the design of a suitable attitude stabilization system by combining gravity gradient stabilization with magnetic torquing, and the design of magnetic coils which can be added in order to improve the accuracy of attitude stabilization. The book then investigates, simulates, and compares possible controller configurations that can be used to control the currents of magnetic coils when magnetic coils behave as the actuator of the system.

Topological Insulators

The Physics of Spin Helicity in Quantum Transport

CRC Press This book is the result of dynamic developments that have occurred in condensed matter physics after the recent discovery of a new class of electronic materials: topological insulators. A topological insulator is a material that behaves as a band insulator in its interior, while acting as a metallic conductor at its surface. The surface current carriers in these systems have Dirac-like nature and are protected by an intrinsic topological order, which is of great interest for both fundamental research and emerging technologies, especially in the fields of electronics, spintronics, and quantum information. The realization of the application potential of topological insulators requires a comprehensive and deep understanding of transport processes in these novel materials. This book explores the origin of the protected Dirac-like states in topological insulators and gives an insight into some of their representative transport properties. These include the quantum spin–Hall effect, nonlocal edge transport, backscattering of helical edge and surface states, weak antilocalization, unconventional triplet p-wave superconductivity, topological bound states, and emergent Majorana fermions in Josephson junctions as well as superconducting Klein tunneling.

Satellite Orbits

Models, Methods and Applications

Springer Science & Business Media This modern presentation guides readers through the theory and practice of satellite orbit prediction and determination. Starting from the basic principles of orbital mechanics, it covers elaborate force models as well as precise methods of satellite tracking. The accompanying CD-ROM includes source code in C++ and relevant data files for applications. The result is a powerful and unique spaceflight dynamics library, which allows users to easily create software extensions. An extensive collection of frequently updated Internet resources is provided through WWW hyperlinks.

Spin Dynamics in Confined Magnetic Structures III

Springer The third volume of this book addresses central aspects of spin-dynamic phenomena on a tutorial level. This volume concentrates on new experimental techniques such as ferromagnetic-resonance-force microscopy and two-photon photoemission. There is a chapter devoted to the hot subject of spin-transfer torque. The comprehensive presentation makes this a timely and valuable resource for every researcher working in the field of magnetism.

The Physics of Quantum Mechanics

Oxford University Press "First published by Cappella Archive in 2008."

Spin Electronics

Springer Science & Business Media The history of scientific research and technological development is replete with examples of breakthroughs that have advanced the frontiers of knowledge, but seldom does it record events that constitute paradigm shifts in broad areas of intellectual pursuit. One notable exception, however, is that of spin electronics (also called spintronics, magnetoelectronics or magnetronics), wherein information is carried by electron spin in addition to, or in place of, electron charge. It is now well established in scientific and engineering communities that Moore's Law, having been an excellent predictor of integrated circuit density and computer performance since the 1970s, now faces great challenges as the scale of electronic devices has been reduced to the level where quantum effects become significant factors in device operation. Electron spin is one such effect that offers the opportunity to continue the gains predicted by Moore's Law, by taking advantage of the confluence of magnetics and

semiconductor electronics in the newly emerging discipline of spin electronics. From a fundamental viewpoine, spin-polarization transport in a material occurs when there is an imbalance of spin populations at the Fermi energy. In ferromagnetic metals this imbalance results from a shift in the energy states available to spin-up and spin-down electrons. In practical applications, a ferromagnetic metal may be used as a source of spin-polarized electronics to be injected into a semiconductor, a superconductor or a normal metal, or to tunnel through an insulating barrier.

Handbook of Spintronics

Springer Over two volumes and 1500 pages, the Handbook of Spintronics will cover all aspects of spintronics science and technology, including fundamental physics, materials properties and processing, established and emerging device technology and applications. Comprising 60 chapters from a large international team of leading researchers across academia and industry, the Handbook provides readers with an up-to-date and comprehensive review of this dynamic field of research. The opening chapters focus on the fundamental physical principles of spintronics in metals and semiconductors, including an introduction to spin quantum computing. Materials systems are then considered, with sections on metallic thin films and multilayers, magnetic tunnelling structures, hybrids, magnetic semiconductors and molecular spintronic materials. A separate section reviews the various characterisation methods appropriate to spintronics materials, including STM, spin-polarised photoemission, x-ray diffraction techniques and spin-polarised SEM. The third part of the Handbook contains chapters on the state of the art in device technology and applications, including spin valves, GMR and MTJ devices, MRAM technology, spin transistors and spin logic devices, spin torque devices, spin pumping and spin dynamics and other topics such as spin caloritronics. Each chapter considers the challenges faced by researchers in that area and contains some indications of the direction that future work in the field is likely to take. This reference work will be an essential and long-standing resource for the spintronics community.

Spacecraft Attitude Determination and Control

Springer Science & Business Media Roger D. Werking Head, Attitude Determination and Control Section National Aeronautics and Space Administration/ Goddard Space Flight Center Extensiye work has been done for many years in the areas of attitude determination, attitude prediction, and attitude control. During this time, it has been difficult to obtain reference material that provided a comprehensive overview of attitude support activities. This lack of reference material has made it difficult for those not intimately involved in attitude functions to become acquainted with the ideas and activities which are essential to understanding the various aspects of spacecraft attitude support. As a result, I felt the need for a document which could be used by a variety of persons to obtain an understanding of the work which has been done in support of spacecraft attitude objectives. It is believed that this book, prepared by the Computer Sciences Corporation under the able direction of Dr. James Wertz, provides this type of reference. This book can serve as a reference for individuals involved in mission planning, attitude determination, and attitude dynamics; an introductory textbook for stu dents and professionals starting in this field; an information source for experimen ters or others involved in spacecraft-related work who need information on spacecraft orientation and how it is determined, but who have neither the time nor the resources to pursue the varied literature on this subject; and a tool for encouraging those who could expand this discipline to do so, because much remains to be done to satisfy future needs.

Spacecraft Dynamics and Control

An Introduction

John Wiley & Sons Provides the basics of spacecraft orbital dynamics plusattitude dynamics and control, using vectrix notation Spacecraft Dynamics and Control: An Introductionpresents the fundamentals of classical control in the context ofspacecraft attitude control. This approach is particularlybeneficial for the training of students in both of the subjects ofclassical control as well as its application to spacecraft attitudecontrol. By using a physical system (a spacecraft) that the readercan visualize (rather than arbitrary transfer functions), it iseasier to grasp the motivation for why topics in control theory areimportant, as well as the theory behind them. The entiretreatment of both orbital and attitude dynamics makes use ofvectrix notation, which is a tool that allows the user to writedown any vector equation of motion without consideration of areference frame. This is particularly suited to the treatment ofmultiple reference frames. Vectrix notation also makes a very cleardistinction between a physical vector and its coordinaterepresentation in a reference frame. This is very important inspacecraft dynamics and control problems, where often multiplecoordinate representations are used (in different reference frames)for the same physical vector. Provides an accessible, practical aid for teaching andself-study with a layout enabling a fundamental understanding ofthe subject Fills a gap in the existing literature by providing ananalytical toolbox offering the reader a lasting, rigorousmethodology for approaching vector mechanics, a key element vitalto new graduates and practicing engineers alike Delivers an outstanding resource for aerospace engineeringstudents, and all those involved in the technical aspects of designand engineering in the space sector Contains numerous illustrations to accompany the written text.Problems are included to apply and extend the material in eachchapter Essential reading for graduate level aerospace engineeringstudents, aerospace professionals, researchers and engineers.

Classical Mechanics

World Scientific Publishing Company This is the fifth edition of a well-established textbook. It is intended to provide a thorough coverage of the fundamental principles and techniques of classical mechanics, an old subject that is at the base of all of physics, but in which there has also in recent years been rapid development. The book is aimed at undergraduate students of physics and applied mathematics. It emphasizes the basic principles, and aims to progress rapidly to the point of being able to handle physically and

mathematically interesting problems, without getting bogged down in excessive formalism. Lagrangian methods are introduced at a relatively early stage, to get students to appreciate their use in simple contexts. Later chapters use Lagrangian and Hamiltonian methods extensively, but in a way that aims to be accessible to undergraduates, while including modern developments at the appropriate level of detail. The subject has been developed considerably recently while retaining a truly central role for all students of physics and applied mathematics. This edition retains all the main features of the fourth edition, including the two chapters on geometry of dynamical systems and on order and chaos, and the new appendices on conics and on dynamical systems near a critical point. The material has been somewhat expanded, in particular to contrast continuous and discrete behaviours. A further appendix has been added on routes to chaos (period-doubling) and related discrete maps. The new edition has also been revised to give more emphasis to specific examples worked out in detail. Classical Mechanics is written for undergraduate students of physics or applied mathematics. It assumes some basic prior knowledge of the fundamental concepts and reasonable familiarity with elementary differential and integral calculus. Contents: Linear MotionEnergy and Angular MomentumCentral Conservative ForcesRotating FramesPotential TheoryThe Two-Body ProblemMany-Body SystemsRigid BodiesLagrangian MechanicsSmall Oscillations and Normal ModesHamiltonian MechanicsDynamical Systems and Their GeometryOrder and Chaos in Hamiltonian SystemsAppendices:VectorsConicsPhase Plane Analysis Near Critical PointsDiscrete Dynamical Systems — Maps Readership: Undergraduates in physics and applied mathematics.

MoS2

Materials, Physics, and Devices

Springer Science & Business Media This book reviews the structure and electronic, magnetic, and other properties of various MoS2 (Molybdenum disulfide) nanostructures, with coverage of synthesis, Valley polarization, spin physics, and other topics. MoS2 is an important, graphene-like layered nano-material that substantially extends the range of possible nanostructures and devices for nanofabrication. These materials have been widely researched in recent years, and have become an attractive topic for applications such as catalytic materials and devices based on field-effect transistors (FETs) and semiconductors. Chapters from leading scientists worldwide create a bridge between MoS2 nanomaterials and fundamental physics in order to stimulate readers' interest in the potential of these novel materials for device applications. Since MoS2 nanostructures are expected to be increasingly important for future developments in energy and other electronic device applications, this book can be recommended for Physics and Materials Science and Engineering departments and as reference for researchers in the field.

Atomistic Spin Dynamics

Foundations and Applications

Oxford University Press The purpose of this book is to provide a theoretical foundation and an understanding of atomistic spin-dynamics (ASD), and to give examples of where the atomistic Landau-Lifshitz-Gilbert equation can and should be used. As argued in the text, a description of magnetism in an atomistic way is very natural and allows for an interpretation of experimental results in a clear and deep way. This description also allows for calculations, from first principles, of all parameters needed to perform the spin-dynamics simulations, without using experimental results as input to the simulations. As shown in the book, we are now at a very exciting situation, where it is possible to perform accurate and efficient atomistic simulations on a length- and time-scale which is balancing on the edge of what is experimentally possible. In this way, ASD simulations can both validate and be validated by state-of-the art experiments, and ASD simulations also have the possibility to act as a predictive tool that is able to explain the magnetization dynamics in experimentally inaccessible situations. The purpose of this book has been to communicate technically relevant concepts. An even larger motivation is to communicate an inspiration to magnetism and magnetization dynamics, and the emerging technological fields that one may foresee, e.g. in magnonics, solitonics and skyrmionics.

Cohesion in Metals

Transition Metal Alloys

North Holland - Complete collection of phase diagrams; - Up-to-date experimental information and bibliography on thermochemical data; - Formation enthalpies as predicted by the Miedema model for binary solid and liquid solutions and compounds. The first volume in this series presents a complete collection of heat of formation data on binary intermetallic compounds that contain at least one transition metal. Both solid compounds and liquid alloys are considered. A complete table of model predictions is given for systems which lack this experimental information and the origin of the model and the accuracy of the predictions are discussed extensively. Furthermore, the authors demonstrate the applicability of the atomic model in predicting energy effects in metal science in general. When surface energies and vacancy-formation energies of pure metals and model values for enthalpies of alloying are available, one can deal with a large variety of problems. Examples include the heat of reaction in metal chemistry, formation of ternary hydrides, stability of solid-solution phases, interfacial energies, surfaces and interfacial segregation, and the heat of absorption for metallic adsorbates and substrates. Examples relevant to basic physics include core-level shifts in alloys, Mössbauer isomer shift and charge transfer in binary metallic systems.

Twisted Photons

Applications of Light with Orbital Angular Momentum

John Wiley & Sons This book deals with applications in several areas of science and technology that make use of light which carries orbital angular momentum. In most practical scenarios, the angular momentum can be decomposed into two independent contributions: the spin angular momentum and the orbital angular momentum. The orbital contribution affords a fundamentally new degree of freedom, with fascinating and wide-spread applications. Unlike spin angular momentum, which is associated with the polarization of light, the orbital angular momentum arises as a consequence of the spatial distribution of the intensity and phase of an optical field, even down to the single photon limit. Researchers have begun to appreciate its implications for our understanding of the ways in which light and matter can interact, and its practical potential in different areas of science and technology.

Spin Waves

Theory and Applications

Springer Science & Business Media This book begins by introducing magnetism and discusses magnetic properties of materials, magnetic moments of atoms and ions, and the elements important to magnetism. It covers magnetic susceptibilities and electromagnetic waves in anisotropic dispersive media among other topics. There are problems at the end of each chapter, many of which serve to expand or explain the material in the text. The bibliographies for each chapter give an entry to the research literature.

Problems and Solutions on Atomic, Nuclear and Particle Physics

World Scientific Publishing Company This book, part of the seven-volume series Major American Universities PhD Qualifying Questions and Solutions contains detailed solutions to 483 questions/problems on atomic, molecular, nuclear and particle physics, as well as experimental methodology. The problems are of a standard appropriate to advanced undergraduate and graduate syllabi, and blend together two objectives — understanding of physical principles and practical application. The volume is an invaluable supplement to textbooks.

Spin Dynamics in Two-Dimensional Quantum Materials

A Theoretical Study

Springer Nature This thesis focuses on the exploration of nontrivial spin dynamics in graphene-based devices and topological materials, using realistic theoretical models and state-of-the-art quantum transport methodologies. The main outcomes of this work are: (i) the analysis of the crossover from diffusive to ballistic spin transport regimes in ultraclean graphene nonlocal devices, and (ii) investigation of spin transport and spin dynamics phenomena (such as the (quantum) spin Hall effect) in novel topological materials, such as monolayer Weyl semimetals WeTe2 and MoTe2. Indeed, the ballistic spin transport results are key for further interpretation of ultraclean spintronic devices, and will enable extracting precise values of spin diffusion lengths in diffusive transport and guide experiments in the (quasi)ballistic regime. Furthermore, the thesis provides an in-depth theoretical interpretation of puzzling huge measured efficiencies of the spin Hall effect in MoTe2, as well as a prediction of a novel canted quantum spin Hall effect in WTe2 with spins pointing in the yz plane.