Quantum Dissipative Systems 4th Edition

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Quantum Thermodynamics - Jochen Gemmer 2004-12-14
This extended tutorial essay views thermodynamics as an incomplete description of quantum systems with many degrees of freedom. The main goal is to show that the approach to equilibrium - with equilibrium characterized by maximum ignorance about the open system of interest - neither requires that many particles nor is it a precise way of partitioning relevant for the salient features of equilibrium and equilibration. Moreover it is indeed quantum effects that are at work in bringing about universal thermodynamic behaviour of modestly sized open systems. Von Neumann`s concept of entropy thus proves to be much more widely useful than something to be feared, and far beyond truly macroscopic systems in equilibrium.
Contemporary Nonlinear Optics - Robert Boyd 2012-12-02
Contemporary Nonlinear Optics discusses the different activities in the field of nonlinear optics. The book is comprised of 10 chapters. Chapter 1 presents a description of the field of nonlinear guided-wave optics. Chapter 2 surveys a new branch of nonlinear optics under the heading optical solitons. Chapter 3 reviews recent progress in the field of optical phase conjugation. Chapter 4 discusses ultrafast nonlinear optics, a field that is growing rapidly with the ability of generating and controlling femtosecond optical pulses. Chapter 5 examines a branch of nonlinear optics that may be termed nonlinear quantum optics. Chapter 6 reviews the new field of photorefractive adaptive neural networks. Chapter 7 presents a discussion of recent successes in the development of nonlinear optical media based on organic materials. Chapter 8 reviews the field of nonlinear optics in quantum confined structures. Chapter 9 reviews the field of nonlinear laser spectroscopy, with emphasis on advances made during the 1980s. Finally, Chapter 10 reviews the field of nonlinear optical dynamics by considering nonlinear optical systems that exhibit temporal, spatial, or spatio-temporal instabilities. This book is a valuable source for physicists and other scientists interested in optical systems and neural networks.
Ideas of Quantum Chemistry - Lucjan Piela 2006-11-28
Ideas of Quantum Chemistry shows how quantum mechanics is applied to chemistry to give it a theoretical foundation. The structure of the book (a TREE-form) emphasizes the logical relationships between various topics, facts and methods. It shows the reader which parts of the text are needed for understanding specific aspects of the subject matter. Interspersed throughout the text are short biographies of key scientists and their contributions to the development of the field. Ideas of Quantum Chemistry has both textbook and reference work aspects. Like a textbook, the material is organized into digestable sections with each chapter following the same structure. It answers frequently asked questions and highlights the most important conclusions and the essential mathematical formulae in the text. In its reference aspects, it has a broader range than traditional quantum chemistry books and reviews virtually all of the pertinent literature. It is useful both for beginners as well as specialists in advanced topics of quantum chemistry. The book is supplemented by an appendix on the Internet. * Presents the widest range of quantum chemical problems covered in one book * Unique structure allows material to be tailored to the specific needs of the reader * Informal language facilitates the understanding of difficult topics
Quantum Dissipative Systems (Third Edition) - Weiss Ulrich 2008-03-04
Major advances in the quantum theory of macroscopic systems, in combination with stunning experimental achievements, have brightened the field and brought it to the attention of the general community in natural sciences. Today, working knowledge of dissipative quantum mechanics is an essential tool for many physicists. This book — originally published in 1990 and republished in 1999 as an enlarged second edition — delves much deeper than ever before into the fundamental concepts, methods, and applications of quantum dissipative systems, including the most recent developments.In this third edition, 26 chapters from the second edition contain additional material and several chapters are completely rewritten. It deals with the phenomena and theory of decoherence, relaxation, and dissipation in quantum mechanics that arise from the interaction with the environment. In so doing, a general path integral description of equilibrium thermodynamics and nonequilibrium dynamics is developed.
Dissipative Phenomena in Condensed Matter - Sushanta Dattagupta 2013-03-09
A reference and text, Dissipative Phenomena treats the broadly applicable area of nonequilibrium statistical physics and concentrates the modelling and characterization of dissipative phenomena. A variety of examples from diverse disciplines, such as condensed matter physics, materials science, metallurgy, chemical physics, are discussed. Dattagupta employs a broad framework of stochastic processes and master equation techniques to obtain models for a range of experimentally relevant phenomena such as classical and quantum Brownian motion, spin dynamics, kinetics of phase ordering, relaxation in glasses, and dissipative tunnelling. This book will serve as a graduate/research level textbook since it offers considerable utility to experimentalists, computational physicists and theorists.
Quantum Signatures of Chaos - Fritz Haake 2019-02-18
This classic text provides an excellent introduction to a new and rapidly developing field of research. Now well established as a textbook in this rapidly developing field of research, the new edition is much enlarged and covers a host of new results.
Quantum Dissipative Systems - Ulrich Weiss 2012
Starting from first principles, this book introduces the fundamental concepts and methods of dissipative quantum mechanics and explores related phenomena in condensed matter systems. Major experimental achievements in cooperation with theoretical advances have brightened the field and brought it to the attention of the general community in natural sciences. Nowadays, working knowledge of dissipative quantum mechanics is an essential tool for many physicists. This book — originally published in 1990 and republished in 1999 and and 2008 as enlarged second and third editions — delves significantly deeper than ever before into the fundamental concepts, methods and applications of quantum dissipative systems.This fourth edition provides a self-contained and updated account of the quantum mechanics of open systems and offers important new material including the most recent developments. The subject matter has been expanded by about fifteen percent. Many chapters have been completely rewritten to better cater to both the needs of newcomers to the field and the requests of the advanced readership. Two chapters have been added that account for recent progress in the field. This book should be accessible to all graduate students in physics. Researchers will find this a rich and stimulating source.
Quantum Tunneling of Magnetization — QTM '94 - Leon Gunther 2012-12-06
The first NATO Advanced Workshop on Quantum Tunneling of Magnetization (QTM) was organized and co-directed by Bernard Barbara, Leon Gunther, Nicolas Garcia, and Anthony Leggett and was held from June, 27 through July 1, 1994 in Grenoble and Chichilianne, France. These Proceedings include twenty-nine articles that represent the contributions of the participants in the Workshop. Quantum Tunneling of Magnetization is not only interesting for purely academic reasons. It was pointed out in the review article by L. Gunther in the December, 1990 issue of Physics World, that QTM may be destined to play a significant role within the next two decades in limiting the density of information storage in magnetic systems. Recent advances have indicated that this limitation may well be reached even earlier than first predicted. Furthermore, the number of people who have entered the field of study of QTM during these past few years has increased many fi)ld. The time was therefore opportune to hold a Workshop to bring together

for the first time the leading researchers of QTM, both theoretical and experimental, so as to discuss the current status of the field. The most controversial issue at the time of the Workshop was how to establish r.eliable criteria for determining whether experimental results do indeed reveal manifestations of QTM. We believe that much progress was made at the Workshop on this issue.

Reaction-Transport Systems - Vicenc Mendez 2010-06-10

This book is an introduction to the dynamics of reaction-diffusion systems, with a focus on fronts and stationary spatial patterns. Emphasis is on systems that are non-standard in the sense that either the transport is not simply classical diffusion (Brownian motion) or the system is not homogeneous. A important feature is the derivation of the basic phenomenological equations from the mesoscopic system properties. Topics addressed include transport with inertia, described by persistent random walks and hyperbolic reaction-transport equations and transport by anomalous diffusion, in particular subdiffusion, where the mean square displacement grows sublinearly with time. In particular reaction-diffusion systems are studied where the medium is in turn either spatially inhomogeneous, compositionally heterogeneous or spatially discrete. Applications span a vast range of interdisciplinary fields and the systems considered can be as different as human or animal groups migrating under external influences, population ecology and evolution, complex chemical reactions, or networks of biological cells. Several chapters treat these applications in detail.

Quantum Measurements and Decoherence - M. Mensky 2013-04-17

Quantum measurement (Le., a measurement which is sufficiently precise for quantum effects to be essential) was always one of the most impor tant points in quantum mechanics because it most evidently revealed the difference between quantum and classical physics. Now quantum measure ment is again under active investigation, first of all because of the practical necessity of dealing with highly precise and complicated measurements. The nature of quantum measurement has become understood much bet ter during this new period of activity, the understanding being expressed by the concept of decoherence. This term means a physical process lead ing from a pure quantum state (wave function) of the system prior to the measurement to its state after the measurement which includes classical elements. More concretely, decoherence occurs as a result of the entangle ment of the measured system with its environment and results in the loss of phase relations between components of the wave function of the measured system. Decoherence is essentially nothing else than quantum measurement, but considered from the point of view of its physical mechanism and resolved in time. The present book is devoted to the two concepts of quantum measure ment and decoherence and to their interrelation, especially in the context of continuous quantum measurement.

Path Integrals in Quantum Mechanics, Statistics, Polymer Physics, and Financial Markets - Hagen Kleinert 2006-07-19

This is the fourth, expanded edition of the comprehensive textbook published in 1990 on the theory and applications of path integrals. It is the first book to explicitly solve path integrals of a wide variety of nontrivial quantum-mechanical systems, in particular the hydrogen atom. The solutions have become possible by two major advances. The first is a new euclidean path integral formula which increases the restricted range of applicability of Feynman's famous formula to include singular attractive 1/r and 1/r2 potentials. The second is a simple quantum equivalence principle governing the transformation of euclidean path integrals to spaces with curvature and torsion, which leads to time-sliced path integrals that are manifestly invariant under coordinate transformations. In addition to the time-sliced definition, the author gives a perturbative definition of path integrals which makes them invariant under coordinate transformations. A consistent implementation of this property leads to an extension of the theory of generalized functions by defining uniquely integrals over products of distributions. The powerful Feynman–Kleinert variational approach is explained and developed systematically into a variational perturbation theory which, in contrast to ordinary perturbation theory, produces convergent expansions. The convergence is uniform from weak to strong couplings, opening a way to precise approximate evaluations of analytically unsolvable path integrals. Tunneling processes are treated in detail. The results are used to determine the lifetime of supercurrents, the stability of metastable thermodynamic phases, and the large-order behavior of perturbation expansions. A new variational treatment extends the range of validity of previous tunneling theories from large to small barriers. A corresponding extension of large-order perturbation theory also applies now to small orders. Special attention is devoted to path integrals with topological restrictions. These are relevant to the understanding of the statistical properties of elementary particles and the entanglement phenomena in polymer physics and biophysics. The Chern–Simons theory of particles with fractional statistics (anyons) is introduced and applied to explain the fractional quantum Hall effect. The relevance of path integrals to financial markets is discussed, and improvements of the famous Black–Scholes formula for option prices are given which account for the fact that large market fluctuations occur much more frequently than in the commonly used Gaussian distributions. The author's other book on ‘Critical Properties of φ4 Theories’ gives a thorough introduction to the field of critical phenomena and develops new powerful resummation techniques for the extraction of physical results from the divergent perturbation expansions.

A Modern Course in Statistical Physics - L. E. Reichl 1980

Going beyond traditional textbook topics, 'A Modern Course in Statistical Physics' incorporates contemporary research in a basic course on statistical mechanics. From the universal nature of matter to the latest results in the spectral properties of decay processes, this book emphasizes the theoretical foundations derived from thermodynamics and probability theory underlying all concepts in statistical physics. This completely revised and updated third edition continues the comprehensive coverage of numerous core topics and special applications, allowing professors flexibility in designing individualized courses. The inclusion of advanced topics and extensive references makes this an invaluable resource for researchers as well as students -- a textbook that will be kept on the shelf long after the course is completed.

An Introduction To Inverse Problems In Physics - Mohsen Razavy 2020-05-21

This book is a compilation of different methods of formulating and solving inverse problems in physics from classical mechanics to the potentials and nucleus-nucleus scattering. Mathematical proofs are omitted since excellent monographs already exist dealing with these aspects of the inverse problems.The emphasis here is on finding numerical solutions to complicated equations. A detailed discussion is presented on the use of continued fractional expansion, its power and its limitation as applied to various physical problems. In particular, the inverse problem for discrete form of the wave equation is given a detailed exposition and applied to atomic and nuclear scattering, in the latter for elastic as well as inelastic collision. This technique is also used for inverse problem of geomagnetic induction and one-dimensional electrical conductivity. Among other topics covered are the inverse problem of torsional vibration, and also a chapter on the determination of the motion of a body with reflecting surface from its reflection coefficient.

Foundations of Quantum Mechanics in the Light of New Technology - Sadao Nakajima 1996

?I re-experience once again the stimulating atmosphere of each of the ISQMs: There were theoretical discussions in diverse frontier areas of physics as well as descriptions of beautiful new (or planned) experiments and technologies. From each of the Symposia I always came away with the exciting feeling of how wonderful physics is and how lucky it is to be a physicist in this era.?Chen Ning YangThis volume is selected from the First through Fourth International Symposia on Foundations of Quantum Mechanics. The International Symposia on Foundations of Quantum Mechanics in the Light of New Technology (ISQMs) provide a unique interdisciplinary forum where distinguished theorists and experimentalists of diverse fields of research gather to discuss basic problems in quantum mechanics in the light of new technology. This volume collects 51 papers selected from over 200 papers by many distinguished scientists. It includes articles by C N Yang, J A Wheeler, Y Nambu, L Esaki and M P A Fisher, to name just a few, and contains topics ranging from quantum measurements to quantum cosmology.

A Guide to Experiments in Quantum Optics - Hans-A. Bachor 1998-03-27

Some of the most interesting phenomena in optics are those where the quantum mechanical nature of light is apparent. In recent years, there has been a rapid expansion of experimental optics into this area. This book is intended as a guide through the many experiments that have been published. Although there have been many excellent books written on quantum optics, they have been written from a theoretical point of view. This new book differs in that it focuses on actual experiments and what can be learned from them. It explains the underlying physics and addresses questions such as the limitations of the equipment, what can be measured and what remains a goal for the future. To bridge the gap between theory and experiment, the book employs a succession of steps. First, the classical properties of light are summarised and then models

for the quantum properties of light are introduced. Next, the basic components of the experiments are introduced and their specific properties that have an influence on quantum optics experiments are discussed. A chapter on basic experiments forms the building blocks of all quantum optics experiments. The last part of the book deals with currently reported experiments in non-classical light and squeezing and with quantum non-demolition experiments and finishes off with a chapter on applications in communications, cryptography and gravity wave detectors.

Dissipative Phenomena in Condensed Matter - Sushanta Dattagupta 2004-02-20

A reference and text, Dissipative Phenomena treats the broadly applicable area of nonequilibrium statistical physics and concentrates the modelling and characterization of dissipative phenomena. A variety of examples from diverse disciplines, such as condensed matter physics, materials science, metallurgy, chemical physics, are discussed. Dattagupta employs a broad framework of stochastic processes and master equation techniques to obtain models for a range of experimentally relevant phenomena such as classical and quantum Brownian motion, spin dynamics, kinetics of phase ordering, relaxation in glasses, and dissipative tunnelling. This book will serve as a graduate/research level textbook since it offers considerable utility to experimentalists, computational physicists and theorists.

Classical And Quantum Dissipative Systems (Second Edition) - Razavy Mohsen 2017-02-27

Dissipative forces play an important role in problems of classical as well as quantum mechanics. Since these forces are not among the basic forces of nature, it is essential to consider whether they should be treated as phenomenological interactions used in the equations of motion, or they should be derived from other conservative forces. In this book we discuss both approaches in detail starting with the Stoke's law of motion in a viscous fluid and ending with a rather detailed review of the recent attempts to understand the nature of the drag forces originating from the motion of a plane or a sphere in vacuum caused by the variations in the zero-point energy. In the classical formulation, mathematical techniques for construction of Lagrangian and Hamiltonian for the variational formulation of non-conservative systems are discussed at length. Various physical systems of interest including the problem of radiating electron, theory of natural line width, spin-boson problem, scattering and trapping of heavy ions and optical potential models of nuclear reactions are considered and solved.

Information Complexity and Control in Quantum Physics - A. Blaquiere 2014-05-04

Quantum State Diffusion - Ian Percival 1998-12-10

The first book devoted to quantum state diffusion - suitable for graduate students and researchers.

Nonequilibrium Thermodynamics - Yasar Demirel 2018-11-24

Nonequilibrium Thermodynamics: Transport and Rate Processes in Physical, Chemical and Biological Systems, Fourth Edition emphasizes the unifying role of thermodynamics in analyzing natural phenomena. This updated edition expands on the third edition by focusing on the general balance equations for coupled processes of physical, chemical and biological systems. Updates include stochastic approaches, self-organization criticality, ecosystems, mesoscopic thermodynamics, constructual law, quantum thermodynamics, fluctuation theory, information theory, and modeling the coupled biochemical systems. The book also emphasizes nonequilibrium thermodynamics tools, such as fluctuation theories, mesoscopic thermodynamic analysis, information theories, and quantum thermodynamics in describing and designing small scale systems. Provides a useful text for seniors and graduate students from diverse engineering and science programs Highlights the fundamentals of equilibrium thermodynamics, transport processes and chemical reactions Expands the theory of nonequilibrium thermodynamics and its use in coupled transport processes and chemical reactions in physical, chemical and biological systems Presents a unified analysis for transport and rate processes in various time and space scales Discusses stochastic approaches in thermodynamic analysis, including fluctuation and information theories, mesoscopic nonequilibrium thermodynamics, constructal law and quantum thermodynamics

Operator Algebras and Applications - Richard V. Kadison 1982

Fourth International Conference on Squeezed States and Uncertainty Relations - Daesoo Han 1996

New Technical Books - New York Public Library 1979

Quantum Dynamics of Simple Systems - G.L Oppo 2020-12-18

The present level of experimental sophistication in quantum physics allows physicists to explore domains unimaginable just a decade ago and to test the most fundamental laws of quantum mechanics. This has led to renewed interest in devising new tests, experiments, and devices where it is possible to observe the interaction and localization of just a few atoms or photons. These techniques have been used to reveal new nonclassical effects, to question the limit of the principle of correspondence, and to force quantum behavior in semiconductors. With contributions from leading experts in quantum systems, Quantum Dynamics of Simple Systems provides an overview of the present range of quantum dynamics, exploring their use and exotic behaviors. It covers specific subjects of quantum dynamics in a competent and detailed way with emphasis on simple systems where few atoms or electrons are involved. This volume will prove to be a useful tool for graduate students as well as experienced physicists.

Strongly Interacting Quantum Systems out of Equilibrium - Thierry Giamarchi 2016-07-07

Over the last decade new experimental tools and theoretical concepts are providing new insights into collective nonequilibrium behavior of quantum systems. The exquisite control provided by laser trapping and cooling techniques allows us to observe the behavior of condensed bose and degenerate Fermi gases under nonequilibrium drive or after `quenches' in which a Hamiltonian parameter is suddenly or slowly changed. On the solid state front, high intensity short-time pulses and fast (femtosecond) probes allow solids to be put into highly excited states and probed before relaxation and dissipation occur. Experimental developments are matched by progress in theoretical techniques ranging from exact solutions of strongly interacting nonequilibrium models to new approaches to nonequilibrium numerics. The summer school `Strongly interacting quantum systems out of equilibrium' held at the Les Houches School of Physics as its XCIX session was designed to summarize this progress, lay out the open questions and define directions for future work. This books collects the lecture notes of the main courses given in this summer school.

Advances in Methods and Applications of Quantum Systems in Chemistry, Physics, and Biology - Alexander V. Glushkov 2021-06-29

This book reviews the most significant advances in concepts, methods, and applications of quantum systems in a broad variety of problems in modern chemistry, physics, and biology. In particular, it discusses atomic, molecular, and solid structure, dynamics and spectroscopy, relativistic and correlation effects in quantum chemistry, topics of computational chemistry, physics and biology, as well as applications of theoretical chemistry and physics in advanced molecular and nano-materials and biochemical systems. The book contains peer-reviewed contributions written by leading experts in the fields and based on the presentations given at the Twenty-Fourth International Workshop on Quantum Systems in Chemistry, Physics, and Biology held in Odessa, Ukraine, in August 2019. This book is aimed at advanced graduate students, academics, and researchers, both in university and corporation laboratories, interested in state-of-the-art and novel trends in quantum chemistry, physics, biology, and their applications.

Quantum Dissipative Systems - Ulrich Weiss 2012-03-05

Starting from first principles, this book introduces the fundamental concepts and methods of dissipative quantum mechanics and explores related phenomena in condensed matter systems. Major experimental achievements in cooperation with theoretical advances have brightened the field and brought it to the attention of the general community in natural sciences. Nowadays, working knowledge of dissipative quantum mechanics is an essential tool for many physicists. This book — originally published in 1990 and republished in 1999 and and 2008 as enlarged second and third editions — delves significantly deeper than ever before into the fundamental concepts, methods and applications of quantum dissipative systems. This fourth edition provides a self-contained and updated account of the quantum mechanics of open systems and offers important new material including the most recent developments. The subject matter has been expanded by about fifteen percent. Many chapters have been completely rewritten to better cater to both the needs of newcomers to the field and the requests of the advanced readership. Two chapters have been added that account for recent progress in the field. This book should be accessible to all graduate students in physics. Researchers will find this a rich and stimulating source. Contents:IntroductionGeneral Theory of Open Quantum

Systems:Diverse Limited Approaches: A Brief SurveySystem-Plus-Reservoir ModelsImaginary-Time Approach and Equilibrium DynamicsReal-Time Path Integrals and Nonequilibrium DynamicsMiscellaneous Applications:Damped Linear Quantum Mechanical OscillatorQuantum Brownian Free MotionThe Thermodynamic Variational ApproachSuppression of Quantum CoherenceQuantum Statistical Decay:IntroductionClassical Rate Theory: A Brief OverviewQuantum Rate Theory: Basic Methods Multidimensional Quantum Rate TheoryCrossover From Thermal to Quantum DecayThermally Activated DecayThe Crossover RegionDissipative Quantum TunnelingThe Dissipative Two-State System:IntroductionThermodynamicsElectron Transfer and Incoherent TunnelingTwo-State Dynamics: Basics and MethodsTwo-State Dynamics: Sundry TopicsThe Driven Two-State SystemThe Dissipative Multi-State System:Quantum Brownian Particle in a Washboard PotentialMulti-State DynamicsDuality SymmetryTwisted Partition Function and Nonlinear MobilityCharge Transport in Quantum Impurity SystemsQuantum Transport for Sub- and Super-Ohmic Friction Readership: Advanced undergraduate and graduate students; researchers in quantum statistical and condensed matter physics, in quantum/classical mechanics, in quantum information and quantum state engineering, in quantum optics, and in Bose-condensed systems. Keywords:Quantum System;Quantum Tunneling;Quantum Mechanics;Thermodynamics

Many-Body Quantum Theory in Condensed Matter Physics - Henrik Bruus 2004-09-02

The book is an introduction to quantum field theory applied to condensed matter physics. The topics cover modern applications in electron systems and electronic properties of mesoscopic systems and nanosystems. The textbook is developed for a graduate or advanced undergraduate course with exercises which aim at giving students the ability to confront real problems.

Quantum Dissipative Systems (Second Edition) - Weiss Ulrich 1999-10-27

Recent advances in the quantum theory of macroscopic systems have brightened up the field and brought it into the focus of a general community in natural sciences. The fundamental concepts, methods and applications including the most recent developments, previously covered for the most part only in the original literature, are presented here in a comprehensive treatment to an audience who is reasonably familiar with quantum-statistical mechanics and has had rudimentary contacts with the path integral formulation.This book deals with the phenomena and theory of decoherence and dissipation in quantum mechanics that arise from the interaction with the environment. A general path integral description of equilibrium thermodynamics and non-equilibrium dynamics is developed. The approach can deal with weak and strong dissipation, and with all kinds of memory effects. Applications to numerous phenomenological and microscopic systems are presented, where emphasis is put on condensed matter and chemical physics. The basic principles and methods of preparation functions, propagating functions, and time correlation functions are described. Special attention is focused on quantum tunneling and quantum coherence phenomena of macroscopic variables. Many illustrative realistic examples are discussed in some detail. The book attempts to provide a broad perspective and to open up this rapidly developing field to interested researchers normally working in different fields.In this enlarged second edition, the nineteen chapters of the first edition have been expanded by about one-third to better meet both the requests of newcomers to the field and of advanced readers, and seven new chapters have been added that review the most recent important developments.

Quantum Theory of the Optical and Electronic Properties of Semiconductors - Hartmut Haug 2004-02-24

This invaluable textbook presents the basic elements needed to understand and research into semiconductor physics. It deals with elementary excitations in bulk and low-dimensional semiconductors, including quantum wells, quantum wires and quantum dots. The basic principles underlying optical nonlinearities are developed, including excitonic and many-body plasma effects. Fundamentals of optical bistability, semiconductor lasers, femtosecond excitation, the optical Stark effect, the semiconductor photon echo, magneto-optic effects, as well as bulk and quantum-confined Franz–Keldysh effects, are covered. The material is presented in sufficient detail for graduate students and researchers with a general background in quantum mechanics.

Thinking in Complexity - Klaus Mainzer 2007-09-10

This new edition also treats smart materials and artificial life. A new chapter on information and computational dynamics takes up many recent discussions in the community.

Quantum Transport and Dissipation - T. Dittrich 1998-03-04

The increasing emphasis and importance of mesoscopic systems for tomorrow's high-tech electronics industry as well as a growing research interest in the subject has given rise to the need for a modern introductory text at the graduate level. This book aims to provide the necessary theory and tools to carry out research into the various aspects of the subject. It starts with a chapter on the theory of quantum transport giving a survey of the basic theory used in transport phenomena including scattering, linear response theory, weak localization, conductance fluctuations and the Landauer-B?ttiker formalism. Various aspects of chaos in quantum systems as well as dissipative quantum systems are discussed. Other topics of importance such as single electron tunneling, driven bistable systems, quantized transport and electron liquids are also covered in detail. Graduate students as well as newcomers to this exciting and expanding field will find this work useful to adopt the necessary theory and overview required to go deeper into the original literature and to carry out research.

Quantum Dissipative Systems (Fifth Edition) - Ulrich Weiss 2021-09-21

This comprehensive textbook provides the fundamental concepts and methods of dissipative quantum mechanics and related issues in condensed matter physics starting from first principles. It deals with the phenomena and theory of decoherence, relaxation and dissipation in quantum mechanics that arise from the random exchange of energy with the environment. Major theoretical advances in combination with stunning experimental achievements and the arising perspective for quantum computing have brightened the field and brought it to the attention of the general community in natural sciences. Expertise in dissipative quantum mechanics is by now beneficial in a broad sphere.This book — originally published in 1992 and republished as enlarged and updated second, third and fourth edition in 1999, 2008, and 2012 — dives even deeper into the fundamental concepts, methods and applications of quantum dissipation. The fifth edition provides a self-contained and updated account of the quantum mechanics and quantum statistics of open systems. The subject matter of the book has been thoroughly revised to better comply with the needs of newcomers and the demands of the advanced readership. Most of the chapters are rewritten to enhance clarity and topicality. Four new chapters covering recent developments in the field have been added. There are about 600 references. This book is intended for use by advanced undergraduate and graduate students in physics, and for researchers active in the field. They will find the monograph as a rich and stimulating source.

Quantum Field Theory of Many-Body Systems - Xiao-Gang Wen 2004-06-04

For most of the last century, condensed matter physics has been dominated by band theory and Landau's symmetry breaking theory. In the last twenty years, however, there has been the emergence of a new paradigm associated with fractionalisation, topological order, emergent gauge bosons and fermions, and string condensation. These new physical concepts are so fundamental that they may even influence our understanding of the origin of light and fermions in the universe. This book is a pedagogical and systematic introduction to the new concepts and quantum field theoretical methods (which have fuelled the rapid developments) in condensed matter physics. It discusses many basic notions in theoretical physics which underlie physical phenomena in nature. Topics covered are dissipative quantum systems, boson condensation, symmetry breaking and gapless excitations, phase transitions, Fermi liquids, spin density wave states, Fermi and fractional statistics, quantum Hall effects, topological and quantum order, spin liquids, and string condensation. Methods covered are the path integral, Green's functions, mean-field theory, effective theory, renormalization group, bosonization in one- and higher dimensions, non-linear sigma-model, quantum gauge theory, dualities, slave-boson theory, and exactly soluble models beyond one-dimension. This book is aimed at teaching graduate students and bringing them to the frontiers of research in condensed matter physics.

Condensed Matter Field Theory - Alexander Altland 2010-03-11

Modern experimental developments in condensed matter and ultracold atom physics present formidable challenges to theorists. This book provides a pedagogical introduction to quantum field theory in many-particle physics, emphasizing the applicability of the formalism to concrete problems. This second edition contains two new chapters developing path integral approaches to classical and quantum nonequilibrium phenomena. Other chapters cover a range of topics, from the introduction of many-body techniques and functional integration, to

renormalization group methods, the theory of response functions, and topology. Conceptual aspects and formal methodology are emphasized, but the discussion focuses on practical experimental applications drawn largely from condensed matter physics and neighboring fields. Extended and challenging problems with fully worked solutions provide a bridge between formal manipulations and research-oriented thinking. Aimed at elevating graduate students to a level where they can engage in independent research, this book complements graduate level courses on many-particle theory.

Essentials of Computational Chemistry - Christopher J. Cramer 2013-04-29

Essentials of Computational Chemistry provides a balanced introduction to this dynamic subject. Suitable for both experimentalists and theorists, a wide range of samples and applications are included drawn from all key areas. The book carefully leads the reader thorough the necessary equations providing information explanations and reasoning where necessary and firmly placing each equation in context.

The Nonlinear Workbook - Willi-Hans Steeb 2008-06-17

The study of nonlinear dynamical systems has advanced tremendously in the last 20 years, making a big impact on science and technology. This book provides all the techniques and methods used in nonlinear dynamics. The concepts and underlying mathematics are discussed in detail. The numerical and symbolic methods are implemented in C++, SymbolicC++ and Java. Object-oriented techniques are also applied. The book contains more than 150 ready-to-run programs. The text has also been designed for a one-year course at both the junior and senior levels in nonlinear dynamics. The topics discussed in the book are part of e-learning and distance learning courses conducted by the International School for Scientific Computing, University of Johannesburg.

Classical Mechanics With Applications - Johnson Porter W 2010-01-29

This textbook — appropriate for a one-semester course in classical mechanics at the late undergraduate or early graduate level — presents a fresh, modern approach to mechanics. About 150 exercises, covering a wide variety of topics and applications, have solutions roughly outlined for enhanced understanding. Unique to this text is the versatile application of programming language Mathematica™ throughout to analyze systems and generate results. Coverage is also devoted to the topic on one dimensional continuum systems. The extensive discussions on inverse problems of mechanical systems and the detailed analysis of stability of classical systems certainly make this an outstanding textbook.

A Modern Course in Statistical Physics - Linda E. Reichl 2016-10-19

A Modern Course in Statistical Physics is a textbook that illustrates the foundations of equilibrium and non-equilibrium statistical physics, and the universal nature of thermodynamic processes, from the point of view of contemporary research problems. The book treats such diverse topics as the microscopic theory of critical phenomena, superfluid dynamics, quantum conductance, light scattering, transport processes, and dissipative structures, all in the framework of the foundations of statistical physics and thermodynamics. It shows the quantum origins of problems in classical statistical physics. One focus of the book is fluctuations that occur due to the discrete nature of matter, a topic of growing importance for nanometer scale physics and biophysics. Another focus concerns classical and quantum phase transitions, in both monatomic and mixed particle systems. This fourth edition extends the range of topics considered to include, for example, entropic forces, electrochemical processes in biological systems and batteries, adsorption processes in biological systems, diamagnetism, the theory of Bose-Einstein condensation, memory effects in Brownian motion, the hydrodynamics of binary mixtures. A set of exercises and problems is to be found at the end of each chapter and, in addition, solutions to a subset of the problems is provided. The appendices cover Exact Differentials, Ergodicity, Number Representation, Scattering Theory, and also a short course on Probability.

Chinese Journal of Physics - 1998