

Solid State Theory An Introduction

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MANN CARNEY

Quantum Theory of the Solid State John Wiley & Sons

Introduction to Solid-State Theory is a textbook for graduate students of physics and materials science. It also provides the theoretical background needed by physicists doing research in pure solid-state physics and its applications to electrical engineering. The fundamentals of solid-state theory are based on a description by delocalized and localized states and - within the concept of delocalized states - by elementary excitations. The development of solid-state theory within the last ten years has shown that by a systematic introduction of these concepts, large parts of the theory can be described in a unified way. This form of description gives a "pictorial" formulation of many elementary processes in solids, which facilitates their understanding.

An Introduction to Theory and Applications of Quantum Mechanics Pearson Education India

Physics of Condensed Matter is designed for a two-semester graduate course on condensed matter physics for students in physics and materials science. While the book offers fundamental ideas and topic areas of condensed matter physics, it also includes many recent topics of interest on which graduate students may choose to do further research. The text can also be used as a one-semester course for advanced undergraduate majors in physics, materials science, solid state chemistry, and electrical engineering, because it offers a breadth of topics applicable to these majors. The book begins with a clear, coherent picture of simple models of solids and properties and progresses to more advanced properties and topics later in the book. It offers a comprehensive account of the modern topics in condensed matter physics by including introductory accounts of the areas of research in which intense research is underway. The book assumes a working knowledge of quantum mechanics, statistical mechanics, electricity and magnetism and Green's function formalism (for the second-semester curriculum). Covers many advanced topics and recent developments in condensed matter physics which are not included in other texts and are hot areas: Spintronics, Heavy fermions, Metallic nanoclusters, ZnO, Graphene and graphene-based electronic, Quantum hall effect, High temperature superconductivity, Nanotechnology Offers a diverse number of Experimental techniques clearly simplified Features end of chapter problems

Foundations of Nanomechanics Springer Science & Business Media

Comprehensive and accessible coverage from the basics to advanced topics in modern quantum condensed matter physics.

Condensed Matter Field Theory Cambridge University Press

Quantum Theory of the Solid State, Part B describes the concepts and methods of the central problems of the quantum theory of solids. This book discusses the developed machinery applied to impurities, disordered systems, effects of external fields, transport phenomena, and superconductivity. The representation theory, low field diamagnetic susceptibility, electron-phonon interaction, and Landau theory of fermi liquids are also deliberated. This text concludes with an introduction to many-body theory and some applications. This publication is a suitable textbook for students who have completed a one-year course in quantum mechanics and have some familiarity with the experimental facts of solid state physics.

Band Theory and Electronic Properties of Solids Springer Science & Business Media

Solid State Physics is a textbook for students of physics, material science, chemistry, and engineering. It is the state-of-the-art presentation of the theoretical foundations and application of the quantum structure of matter and materials. This second edition provides timely coverage of the most important scientific breakthroughs of the last decade (especially in low-dimensional systems and quantum transport). It helps build readers' understanding of the newest advances in condensed matter physics with rigorous yet clear mathematics. Examples are an integral part of the text, carefully designed to apply the fundamental principles illustrated in the text to currently active topics of research. Basic concepts and recent advances in the field are explained in tutorial style and organized in an intuitive manner. The book is a basic reference work for students, researchers, and lecturers in any area of solid-state physics. Features additional material on nanostructures, giving students and lecturers the most significant features of low-dimensional systems, with focus on carbon allotropes Offers detailed explanation of dissipative and nondissipative transport, and explains the essential aspects in a field, which is commonly overlooked in textbooks Additional material in the classical and quantum Hall effect offers further aspects on magnetotransport, with particular emphasis on the current profiles Gives a broad overview of the band structure of solids, as well as presenting the foundations of the electronic band structure. Also features reported with new and revised material, which leads to the latest research

Quantum Field Theory and Condensed Matter Cambridge University Press

Electron theory of metals textbook for advanced undergraduate students of condensed-matter physics and related disciplines.

Theory of Quantum Transport at Nanoscale Clarendon Press

Since the publication of the first edition over 50 years ago, Introduction to Solid State Physics has been the standard solid state physics text for physics students. The author's goal from the beginning has been to write a book that is accessible to undergraduates and consistently teachable. The emphasis in the book has always been on physics rather than formal mathematics. With each new edition, the author has attempted to add important new developments in the field without sacrificing the book's accessibility and teachability. * A very important chapter on nanophysics has been written by an active worker in the field. This field is the liveliest addition to solid state science during the past ten years * The text uses the simplifications made possible by the wide availability of computer technology. Searches using keywords on a search engine (such as Google) easily generate many fresh and useful references

Band Theory of Solids Springer Science & Business Media

This essential offers a compact introduction to the theory of Fermi liquid for physics students in their main studies. It forms the basis for an understanding of theoretical solid state physics and is part of every introductory lecture on this topic. After a brief overview of the Sommerfeld model of metals, the concept of the quasiparticle is introduced. Important calculations characterizing a Fermi liquid are derived in detailed calculations. The essential concludes with an overview of the microscopic theory of Fermi liquids. This Springer essential is a translation of the original German 1st edition essentials, Theorie der Fermiflüssigkeit in Metallen by Michael Kinza, published by Springer Fachmedien Wiesbaden GmbH, part of Springer Nature in 2018. The translation was done with the

help of artificial intelligence (machine translation by the service DeepL.com). A subsequent human revision was done primarily in terms of content, so that the book will read stylistically differently from a conventional translation. Springer Nature works continuously to further the development of tools for the production of books and on the related technologies to support the authors.

Problem Solving with Mathematica Cambridge University Press

This book distills the knowledge gained from research into atoms in molecules over the last 10 years into a unique, handy reference. Throughout, the authors address a wide audience, such that this volume may equally be used as a textbook without compromising its research-oriented character. Clearly structured, the text begins with advances in theory before moving on to theoretical studies of chemical bonding and reactivity. There follow separate sections on solid state and surfaces as well as experimental electron densities, before finishing with applications in biological sciences and drug-design. The result is a must-have for physicochemists, chemists, physicists, spectroscopists and materials scientists.

An Introduction Courier Corporation

Based on an established course and covering the fundamentals, central areas and contemporary topics of this diverse field, Fundamentals of Condensed Matter Physics is a much-needed textbook for graduate students. The book begins with an introduction to the modern conceptual models of a solid from the points of view of interacting atoms and elementary excitations. It then provides students with a thorough grounding in electronic structure and many-body interactions as a starting point to understand many properties of condensed matter systems - electronic, structural, vibrational, thermal, optical, transport, magnetic and superconducting - and methods to calculate them. Taking readers through the concepts and techniques, the text gives both theoretically and experimentally inclined students the knowledge needed for research and teaching careers in this field. It features 246 illustrations, 9 tables and 100 homework problems, as well as numerous worked examples, for students to test their understanding. Solutions to the problems for instructors are available at www.cambridge.org/cohenlouie.

Solid State Theory Springer Nature

This book is an introduction to a rapidly developing field of modern theoretical physics - the theory of quantum transport at nanoscale. The theoretical methods considered in the book are in the basis of our understanding of charge, spin and heat transport in nanostructures and nanostructured materials and are widely used in nanoelectronics, molecular electronics, spin-dependent electronics (spintronics) and bio-electronics. The book is based on lectures for graduate and post-graduate students at the University of Regensburg and the Technische Universität Dresden (TU Dresden). The first part is devoted to the basic concepts of quantum transport: Landauer-Büttiker method and matrix Green function formalism for coherent transport, Tunneling (Transfer) Hamiltonian and master equation methods for tunneling, Coulomb blockade, vibrons and polarons. The results in this part are obtained as possible without sophisticated techniques, such as nonequilibrium Green functions, which are considered in detail in the second part. A general introduction into the nonequilibrium Green function theory is given. The approach based on the equation-of-motion technique, as well as more sophisticated one based on the Dyson-Keldysh diagrammatic technique are presented. The main attention is paid to the theoretical methods able to describe the nonequilibrium (at finite voltage) electron transport through interacting nanosystems, specifically the correlation effects due to electron-electron and electron-vibron interactions.

Many-Body Quantum Theory in Condensed Matter Physics Courier Corporation

This book, an abridgment of Volumes I and II of the highly respected Group Theory in Physics, presents a carefully constructed introduction to group theory and its applications in physics. The book provides an introduction to and description of the most important basic ideas and the role that they play in physical problems. The clearly written text contains many pertinent examples that illustrate the topics, even for those with no background in group theory. This work presents important mathematical developments to theoretical physicists in a form that is easy to comprehend and appreciate. Finite groups, Lie groups, Lie algebras, semi-simple Lie algebras, crystallographic point groups and crystallographic space groups, electronic energy bands in solids, atomic physics, symmetry schemes for fundamental particles, and quantum mechanics are all covered in this compact new edition. Covers both group theory and the theory of Lie algebras Includes studies of solid state physics, atomic physics, and fundamental particle physics Contains a comprehensive index Provides extensive examples

Introduction to Solid-State Theory Springer Science & Business Media

Solid State Physics: An Introduction to Theory presents an intermediate quantum approach to the properties of solids. Through this lens, the text explores different properties, such as lattice, electronic, elastic, thermal, dielectric, magnetic, semiconducting, superconducting and optical and transport properties, along with the structure of crystalline solids. The work presents the general theory for most of the properties of crystalline solids, along with the results for one-, two- and three-dimensional solids in particular cases. It also includes a brief description of emerging topics, such as the quantum hall effect and high superconductivity. Building from fundamental principles and requiring only a minimal mathematical background, the book includes illustrative images and solved problems in all chapters to support student understanding. Provides an introduction to recent topics, such as the quantum hall effect, high-superconductivity and nanomaterials Utilizes the Dirac' notation to highlight the physics contained in the mathematics in an appropriate and succinct manner Includes many figures and solved problems throughout all chapters to provide a deeper understanding for students Offers topics of particular interest to engineering students, such as elasticity in solids, dislocations, polymers, point defects and nanomaterials

Modern Condensed Matter Physics Solid State TheoryAn Introduction

This text provides an introduction, at the level of an advanced student in engineering or physics, to the field of nanomechanics and nanomechanical devices. It provides a unified discussion of solid mechanics, transducer applications, and sources of noise and nonlinearity in such devices. Demonstrated applications of these devices, as well as an introduction to fabrication techniques, are also discussed. The text concludes with an overview of future technologies, including the potential use of carbon nanotubes and other molecular assemblies.

Solid State Physics Academic Press

"Solid-State Theory - An Introduction" is a textbook for graduate students of physics and material sciences. Whilst covering the traditional topics of older textbooks, it also takes up new developments in theoretical concepts and materials that are connected with such breakthroughs as

the quantum-Hall effects, the high-Tc superconductors, and the low-dimensional systems realized in solids. Thus besides providing the fundamental concepts to describe the physics of the electrons and ions comprising the solid, including their interactions, the book casts a bridge to the experimental facts and gives the reader an excellent insight into current research fields. A compilation of problems makes the book especially valuable to both students and teachers.

Theory of Fermi-liquids in Metals Cambridge University Press

This book provides course material in theoretical physics intended for undergraduate and graduate students specializing in condensed matter. The book derives from teaching activity, offering readable and mathematical treatments explained in sufficient detail to be followed easily. The main emphasis is always on the physical meaning and applicability of the results. Many examples are provided for illustration; these also serve as worked problems. Discussion extends to atomic physics, relativistic quantum mechanics, elementary QED, electron spectroscopy, nonlinear optics, and various aspects of the many-body problem. Methods such as group representation theory, Green's functions, the Keldysh formalism and recursion techniques were also imparted.

An Introduction Academic Press

Professor Ziman's classic textbook on the theory of solids was first published in 1964. This paperback edition is a reprint of the second edition, which was substantially revised and enlarged in 1972. The value and popularity of this textbook is well attested by reviewers' opinions and by the existence of several foreign language editions, including German, Italian, Spanish, Japanese, Polish and Russian. The book gives a clear exposition of the elements of the physics of perfect crystalline solids. In discussing the principles, the author aims to give students an appreciation of the conditions which are necessary for the appearance of the various phenomena. A self-contained mathematical account is given of the simplest model that will demonstrate each principle. A grounding in quantum mechanics and knowledge of elementary facts about solids is assumed. This is therefore a textbook for advanced undergraduates and is also appropriate for graduate courses.

Group Theory in Physics John Wiley & Sons

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.

Introduction to Solid-State Theory Springer Science & Business Media

here exists a gap in the present literature on quantum mechanics T and its application to solids. It has been difficult to find an introductory textbook which could take a student from the elementary quantum mechanical ideas of the single-particle Schrodinger equations, through the formalism and new physical concepts of many-body theory, to the level where the student would be equipped to read the scientific literature and specialized books on specific topics. The present book, which I

believe fills this gap, grew out of two courses which I have given for a number of years at the University of Cambridge: "Advanced Quantum Mechanics," covering the quantization of fields, representations, and creation and annihilation operators, and "Many Body Theory," on the application of quantum field theory to solids. The first course is a final-year undergraduate physics course while the second is a joint first and fourth-year undergraduate math year postgraduate physics course ematics course. In an American context this would closely correspond to a graduate course at the masters level. In writing this book I have tried to stress the physical aspects of the mathematics preferring where possible to introduce a technique by using a simple illustrative example rather than develop a purely formal treatment. In order to do this I have assumed a certain familiarity with solid state physics on the level of a normal undergraduate course, but the book should also be useful to those without such a background.

Solid State Physics Springer Science & Business Media

A must-have textbook for any undergraduate studying solid state physics. This successful brief course in solid state physics is now in its second edition. The clear and concise introduction not only describes all the basic phenomena and concepts, but also such advanced issues as magnetism and superconductivity. Each section starts with a gentle introduction, covering basic principles, progressing to a more advanced level in order to present a comprehensive overview of the subject. The book is providing qualitative discussions that help undergraduates understand concepts even if they can't follow all the mathematical detail. The revised edition has been carefully updated to present an up-to-date account of the essential topics and recent developments in this exciting field of physics. The coverage now includes ground-breaking materials with high relevance for applications in communication and energy, like graphene and topological insulators, as well as transparent conductors. The text assumes only basic mathematical knowledge on the part of the reader and includes more than 100 discussion questions and some 70 problems, with solutions free to lecturers from the Wiley-VCH website. The author's webpage provides Online Notes on x-ray scattering, elastic constants, the quantum Hall effect, tight binding model, atomic magnetism, and topological insulators. This new edition includes the following updates and new features: * Expanded coverage of mechanical properties of solids, including an improved discussion of the yield stress * Crystal structure, mechanical properties, and band structure of graphene * The coverage of electronic properties of metals is expanded by a section on the quantum hall effect including exercises. New topics include the tight-binding model and an expanded discussion on Bloch waves. * With respect to semiconductors, the discussion of solar cells has been extended and improved. * Revised coverage of magnetism, with additional material on atomic magnetism * More extensive treatment of finite solids and nanostructures, now including topological insulators * Recommendations for further reading have been updated and increased. * New exercises on Hall mobility, light penetrating metals, band structure