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Solid State Physics

Solid State Physics *Cengage Learning*

This book provides an introduction to the field of solid state physics for undergraduate students in physics, chemistry, engineering, and materials science.

Solid State Physics

This 35 chapter, revised edition of Ashcroft and Mermin's Solid State Physics (1976) maintains its predecessor's style whilst covering novel developments in the field of solid state physics. Regarding electronic structure, density functional theory's inclusion completes the description of the many-body electronic theory of crystals. The theory of harmonic crystal and superconductivity are similarly augmented. New chapters on semiconductor devices, piezoelectricity, applied magnetism, spintronics, and the Quantum Hall effect have been added. Various kinds of characterization methods of solids, including diffraction

methods, are introduced in the beginning and the end chapters of the book. This book inherits the merit of the first edition, and endeavors to serve better all readers who are interested in solid state physics and related fundamentals in the physical science of high technology.

The Oxford Solid State Basics *Oxford University Press*

This is a first undergraduate textbook in Solid State Physics or Condensed Matter Physics. While most textbooks on the subject are extremely dry, this book is written to be much more exciting, inspiring, and entertaining.

Advanced Solid State Physics *CRC*

Press

Solid state physics continues to be the most rapidly growing subdiscipline in physics. As a result, entering graduate students wishing to pursue research in this field face the daunting task of not only mastering the old topics but also gaining competence in the problems of current interest, such as the fractional quantum Hall effect, strongly correlated electron systems, and quantum phase transitions. This book is written to serve the needs of such students. I have attempted in this book to present some of the standard topics in a way that makes it possible to move smoothly to current material. Hence, all the interesting topics are

not presented at the end of the book. For example, immediately after the first 50 pages, Anderson's analysis of local magnetic moments is presented as an application of Hartree-Fock theory; this affords a discussion of the relationship with the Kondo model and how scaling ideas can be used to uncloak low-energy physics. As the key problems of current interest in solid state involve some aspects of electron-electron interactions or disorder or both, I have focused on the archetypal problems in which such physics is central. However, only those problems in which there is a consensus view are discussed extensively. In addition, I have placed the emphasis

on physics rather than on techniques. Consequently, I focus on a clear presentation of the phenomenology along with a pedagogical derivation of the relevant equations. A key goal of the detailed derivations is to make it possible for the students who have read this book to immediately comprehend research papers on related topics. A key omission in this book is magnetism beyond the Stoner criterion and local magnetic moments. This omission has arisen primarily because the topic is adequately treated in the book by Assa Auerbach.

Solid State Theory
Courier Corporation
 DIVThorough, modern

study of solid state physics; solid types and symmetry, electron states, electronic properties and cooperative phenomena. /div

Solid State Physics
Cambridge University Press

Updated to reflect recent work in the field, this book emphasizes crystalline solids, going from the crystal lattice to the ideas of reciprocal space and Brillouin zones, and develops these ideas for lattice vibrations, for the theory of metals, and for semiconductors. The theme of lattice periodicity and its varied consequences runs through eighty percent of the book. Other sections deal with major aspects of solid state physics

controlled by other phenomena: superconductivity, dielectric and magnetic properties, and magnetic resonance.

Solid State Physics

CRC Press

Solid State Physics opens with the adiabatic approximation to the many-body problem of a system of ions and valence electrons. After chapters on lattice symmetry, structure and dynamics, it then proceeds with four chapters devoted to the single-electron theory of the solid state. Semiconductors and dielectrics are covered in depth and chapters on m

Boojums All the Way Through *Cambridge University Press*

Boojums All the Way Through is a collection of essays that deals in a variety of ways with the problem of communicating modern physics to both physicists and non-physicists. The author is Professor David Mermin, a well-known theoretical physicist, who recently won the first Julius Edgar Lileinfeld prize of the American Physical Society 'for his remarkable clarity and wit as a lecturer to nonspecialists on difficult subjects'. David Mermin's wry humour is clearly apparent in most of these articles, but even those that are more serious are characterized by a liveliness and commitment to finding startlingly simple ways of presenting ideas

that are traditionally regarded as complex. This book will appeal to physicists at all levels, to mathematicians, scientists and engineers, and indeed to anyone who enjoys reading non-technical accounts of new ways of looking at modern science.

Band Theory and Electronic Properties of Solids *OUP Oxford*

This book provides an introduction to band theory and the electronic properties of materials at a level suitable for final-year undergraduates or first-year graduate students. It sets out to provide the vocabulary and quantum-mechanical training necessary to understand the electronic, optical and structural properties of

the materials met in science and technology and describes some of the experimental techniques which are used to study band structure today. In order to leave space for recent developments, the Drude model and the introduction of quantum statistics are treated synoptically. However, Bloch's theorem and two tractable limits, a very weak periodic potential and the tight-binding model, are developed rigorously and in three dimensions. Having introduced the ideas of bands, effective masses and holes, semiconductor and metals are treated in some detail, along with the newer ideas of artificial structures such as super-lattices and quantum wells,

layered organic substances and oxides. Some recent 'hot topics' in research are covered, e.g. the fractional Quantum Hall Effect and nano-devices, which can be understood using the techniques developed in the book. In illustrating examples of e.g. the de Haas-van Alphen effect, the book focuses on recent experimental data, showing that the field is a vibrant and exciting one. References to many recent review articles are provided, so that the student can conduct research into a chosen topic at a deeper level. Several appendices treating topics such as phonons and crystal structure make the book self-contained introduction to the fundamentals of

band theory and electronic properties in condensed matter physic today.

It's About Time
Princeton University Press

In *It's About Time*, N. David Mermin asserts that relativity ought to be an important part of everyone's education--after all, it is largely about time, a subject with which all are familiar. The book reveals that some of our most intuitive notions about time are shockingly wrong, and that the real nature of time discovered by Einstein can be rigorously explained without advanced mathematics. This readable exposition of the nature of time as addressed in Einstein's theory of relativity is accessible to anyone

who remembers a little high school algebra and elementary plane geometry. The book evolved as Mermin taught the subject to diverse groups of undergraduates at Cornell University, none of them science majors, over three and a half decades. Mermin's approach is imaginative, yet accurate and complete. Clear, lively, and informal, the book will appeal to intellectually curious readers of all kinds, including even professional physicists, who will be intrigued by its highly original approach.

Condensed Matter Physics *John Wiley & Sons*

Now updated—the leading single-volume introduction to solid state and soft

condensed matter physics. This Second Edition of the unified treatment of condensed matter physics keeps the best of the first, providing a basic foundation in the subject while addressing many recent discoveries. Comprehensive and authoritative, it consolidates the critical advances of the past fifty years, bringing together an exciting collection of new and classic topics, dozens of new figures, and new experimental data. This updated edition offers a thorough treatment of such basic topics as band theory, transport theory, and semiconductor physics, as well as more modern areas such as quasicrystals, dynamics of phase

separation, granular materials, quantum dots, Berry phases, the quantum Hall effect, and Luttinger liquids. In addition to careful study of electron dynamics, electronics, and superconductivity, there is much material drawn from soft matter physics, including liquid crystals, polymers, and fluid dynamics. Provides frequent comparison of theory and experiment, both when they agree and when problems are still unsolved. Incorporates many new images from experiments. Provides end-of-chapter problems including computational exercises. Includes more than fifty data tables and a detailed forty-page index. Offers a solutions manual for instructors. Featuring

370 figures and more than 1,000 recent and historically significant references, this volume serves as a valuable resource for graduate and undergraduate students in physics, physics professionals, engineers, applied mathematicians, materials scientists, and researchers in other fields who want to learn about the quantum and atomic underpinnings of materials science from a modern point of view.

Introduction to Solid State Physics

Principles of the Theory of Solids

Cambridge University 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.

Modern Condensed Matter Physics
Cambridge University Press

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

A Quantum Approach to Condensed Matter Physics
Cambridge University Press

Publisher Description

**Solid-State Physics
for Electronics** *John
Wiley & Sons*

Describing the fundamental physical properties of materials used in electronics, the thorough coverage of this book will facilitate an understanding of the technological processes used in the fabrication of electronic and photonic devices. The book opens with an introduction to the basic applied physics of simple electronic states and energy levels. Silicon and copper, the building blocks for many electronic devices, are used as examples. Next, more advanced theories are developed to better account for the electronic and optical behavior of ordered materials, such as diamond, and

disordered materials, such as amorphous silicon. Finally, the principal quasi-particles (phonons, polarons, excitons, plasmons, and polaritons) that are fundamental to explaining phenomena such as component aging (phonons) and optical performance in terms of yield (excitons) or communication speed (polarons) are discussed.

**Elementary Solid
State Physics** *Pearson Education
India*

**Physics of
Condensed Matter** *Academic Press*

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

Principles of Condensed Matter Physics *Cambridge University Press*

Now in paperback, this book provides an overview of the physics of condensed matter systems. Assuming a familiarity with the basics of quantum mechanics and statistical mechanics, the book establishes a general framework for describing condensed phases of matter, based on symmetries and conservation laws. It explores the role of spatial dimensionality and microscopic

interactions in determining the nature of phase transitions, as well as discussing the structure and properties of materials with different symmetries. Particular attention is given to critical phenomena and renormalization group methods. The properties of liquids, liquid crystals, quasicrystals, crystalline solids, magnetically ordered systems and amorphous solids are investigated in terms of their symmetry, generalised rigidity, hydrodynamics and topological defect structure. In addition to serving as a course text, this book is an essential reference for students and researchers in physics, applied physics, chemistry, materials

science and engineering, who are interested in modern condensed matter physics.

Fundamentals of Condensed Matter Physics *Cambridge University Press*

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.

**Introduction to the
Physics of Electrons
in Solids** *Cambridge
University Press*

In this upper-level text, Professor Tanner introduces the reader to the behavior of electrons in solids, starting with the simplest possible model. Unlike other solid state physics texts, this book does not begin with complex crystallography, but instead builds up from the simplest possible model of a free electron in a box and introduces higher levels of complexity only when the simple model is inadequate. The approach is to introduce the subject

through its historical development, and to show how quantum mechanics is necessary for an understanding of the properties of electrons in solids. The author also includes an examination of the consequences of collective behavior in the phenomena of magnetism and superconductivity. Examples and problems are included for practice.

**Advanced
Condensed Matter
Physics** *Cambridge
University Press*

An advanced textbook covering important modern developments in depth rather than attempting an encyclopaedic approach.

Concepts in Solids *World Scientific*

These lecture notes constitute a course on a number of central concepts of solid state physics : classification of solids, band theory, the developments in one-electron band theory in the presence of perturbation, effective Hamiltonian theory, elementary excitations and the various types of collective elementary excitation (excitons, spin waves and phonons), the Fermi liquid, ferromagnetic spin waves, antiferromagnetic spin waves and the theory of broken symmetry. The book can be used in conjunction with a survey course in solid state physics, or as the basis of a first graduate-level course. It can be read by anyone who has had

basic grounding in quantum mechanics.

Solid State Physics

Academic Press

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.

Solid State Properties *Springer*

This book fills a gap between many of the basic solid state physics and materials sciencebooks that are currently available. It is written for a mixed audience of

electrical engineering and applied physics students who have some knowledge of elementary undergraduate quantum mechanics and statistical mechanics. This book, based on a successful course taught at MIT, is divided pedagogically into three parts: (I) Electronic Structure, (II) Transport Properties, and (III) Optical Properties. Each topic is explained in the context of bulk materials and then extended to low-dimensional materials where applicable. Problem sets review the content of each chapter to help students to understand the material described in each of the chapters more deeply and to prepare them to master the

next chapters.

Solid State Physics: Essential Concepts
Pearson Education India

Solid-State Physics
Springer Science & Business Media

While the standard solid state topics are covered, the basic ones often have more detailed derivations than is customary (with an emphasis on crystalline solids). Several recent topics are introduced, as are some subjects normally included only in condensed matter physics. Lattice vibrations, electrons, interactions, and spin effects (mostly in magnetism) are discussed the most comprehensively. Many problems are included whose level is

from "fill in the steps" to long and challenging, and the text is equipped with references and several comments about experiments with figures and tables.

Conquering the Physics GRE

A self-contained guide to the Physics GRE, reviewing all of the topics covered alongside three practice exams with fully worked solutions.

Electronic Structure of Organic Semiconductors

Morgan & Claypool Publishers

Written in the perspective of an experimental chemist, this book puts together some fundamentals from chemistry, solid state physics and quantum chemistry, to

help with understanding and predicting the electronic and optical properties of organic semiconductors, both polymers and small molecules. The text is intended to assist graduate students and researchers in the field of organic electronics to use theory to design more efficient materials for organic electronic devices such as organic solar cells, light emitting diodes and field effect transistors. After addressing some basic topics in solid state physics, a comprehensive introduction to molecular orbitals and band theory leads to a description of computational methods based on Hartree-Fock and density functional

theory (DFT), for predicting geometry conformations, frontier levels and energy band structures. Topological defects and transport and optical properties are then addressed, and one of the most commonly used transparent conducting polymers, PEDOT:PSS, is described in some detail as a case study.

Solid State Physics
Springer Science & Business Media

Intended for a two semester advanced undergraduate or graduate course in Solid State Physics, this treatment offers modern coverage of the theory and related experiments, including the group theoretical approach to band structures, Moessbauer recoil free fraction, semi-classical electron

theory, magnetoconductivity, electron self-energy and Landau theory of Fermi liquid, and both quantum and fractional quantum Hall effects. Integrated throughout are developments from the newest semiconductor devices, e.g. space charge layers, quantum wells and superlattices. The first half includes all material usually covered in the introductory course, but in greater depth than most introductory textbooks. The second half includes most of the important developments in solid-state researches of the past half century, addressing e.g. optical and electronic properties such as collective bulk and surface modes and spectral function of a

quasiparticle, which is a basic concept for understanding LEED intensities, X ray fine structure spectroscopy and photoemission. So both the fundamental principles and most recent advances in solid state physics are explained in a class-tested tutorial style, with end-of-chapter exercises for review and reinforcement of key concepts and calculations.

Introduction to Applied Solid State Physics *Springer Science & Business Media*

In addition to the topics discussed in the First Edition, this Second Edition contains introductory treatments of superconducting materials and of ferromagnetism. I think

the book is now more balanced because it is divided perhaps 60% - 40% between devices (of all kinds) and materials (of all kinds). For the physicist interested in solid state applications, I suggest that this ratio is reasonable. I have also rewritten a number of sections in the interest of (hopefully) increased clarity. The aims remain those stated in the Preface to the First Edition; the book is a survey of the physics of a number of solid state devices and materials. Since my object is a discussion of the basic ideas in a number of fields, I have not tried to present the "state of the art," especially in semiconductor devices. Applied solid state physics is too vast and rapidly changing to

cover completely, and there are many references available to recent developments. For these reasons, I have not treated a number of interesting areas. Among the lacunae are superlattices, heterostructures, compound semiconductor devices, ballistic transistors, integrated optics, and light wave communications. (Suggested references to those subjects are given in an appendix.) I have tried to cover some of the recent revolutionary developments in superconducting materials.

**Condensed Matter
Field Theory**
*Cambridge University
Press*
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.

Optical Properties of Solids Academic Press
Optical Properties of Solids covers the important concepts of intrinsic optical properties and

photoelectric emission. The book starts by providing an introduction to the fundamental optical spectra of solids. The text then discusses Maxwell's equations and the dielectric function; absorption and dispersion; and the theory of free-electron metals. The quantum mechanical theory of direct and indirect transitions between bands; the applications of dispersion relations; and the derivation of an expression for the dielectric function in the self-consistent field approximation are also encompassed. The book further tackles current-current correlations; the fluctuation-dissipation theorem; and the effect of surface plasmons on optical properties and

photoemission. People involved in the study of the optical properties of solids will find the book invaluable.

Advances in Solid State Theory
Morgan & Claypool Publishers

This book will introduce advanced concepts and topics of solid-state theory. To this end we need a tool box that enables us to treat electron-electron interactions, and possibly also electron-phonon or phonon-phonon interactions in some well-defined, appro

Solid State Physics
John Wiley & Sons

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

The Solid State

Elementary Solid State Physics
Addison-Wesley

Polarized Electrons In Surface Physics
World Scientific

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Solid State Physics

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The ideal companion in condensed matter physics - now in new

and revised edition. Solving homework problems is the single most effective way for students to familiarize themselves with the language and details of solid state physics. Testing problem-solving ability is the best means at the professor's disposal for measuring student progress at critical points in the learning process. This book enables any instructor to supplement end-of-chapter textbook assignments with a large number of challenging and engaging practice problems and discover a host of new ideas for creating exam questions. Designed to be used in tandem with any of the excellent textbooks on this subject, Solid State Physics: Problems and

Solutions provides a self-study approach through which advanced undergraduate and first-year graduate students can develop and test their skills while acclimating themselves to the demands of the discipline. Each problem has been chosen for its ability to illustrate key concepts, properties, and systems, knowledge of which is crucial in developing a complete understanding of the subject, including:

- * Crystals, diffraction, and reciprocal lattices.
- * Phonon dispersion and electronic band structure.
- * Density of states.
- * Transport, magnetic, and optical properties.
- * Interacting electron systems.
- * Magnetism.
- * Nanoscale Physics.