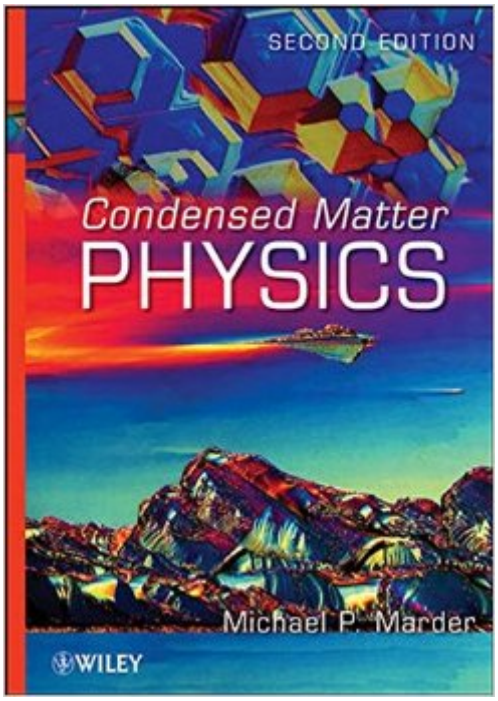
Condensed Matter Physics



Synopsis

Now updatedâ ”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.

Book Information

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Customer Reviews

The classic solid state / condensed matter text by Ashcroft and Mermin (A&M) is now 25 years old. It's a very accessible and elegantly written book, but condensed matter is a fast-moving subject, and it's embarassing that A&M is still used today. The alternatives have all been too specialized, too formal, and/or too leadenly written in comparison.This book by Marden may finally replace A&M. Like Ashcroft and Mermin, Marden is a member of the Cornell mafia. Some parts of the book practically echo A&M, and the writing style is at least as friendly to the beginning grad student ("Now it will be protested that atoms without dipole moments do not have dipole moments. This is true. However...") But the large number of new developments of the last 25 years are discussed or at least mentioned. In addition to the same-old band structure, magnetism, etc., liquids are covered (a surprising omission in A&M), as are surfaces, soft matter, optical properties of materials, etc. The book is fairly logically structured and works well as a text, except that there is way too much material here to cover in a year.The first printing is full of errors, listed on a web page created by the author. You may want to wait until the second printing before plunking down $95 (too high for impoverished grad students). Top and bottom margins are practically nonexistent. Photographs and shaded 3D drawings are poorly reproduced and murky; they appear to have been printed on a smeary $79.95 inkjet printer and then reproduced.

I used Marder's book (the corrected printing) during a solid state physics course this past Spring 2003 semeseter. While I have to commend Marder at his attempt to provide a great deal of breadth on the enormous field of condensed matter, I think he fell short on the details and pedagogy that are necessary for someone new to the subject. Too often, I found myself (and the others I worked with) having to refer to Ashcroft & Mermin's text to complete HW problems assigned out of Marder's book. Also, his notation in certain chapters was unnecessarily confusing, especially the chapter(s) on phonons. I have since read most of the book by Taylor & Heinonen, and I found it to be of much more use than Marder's book. T&H's book is very well written and the concepts flow smoothly from one to the next. In fact, many of the things I struggled to understand last semester were so clearly explained in their text, that I wondered how I could have been so confused! Marder's book has been praised by others as a modern improvement to the A&M standard, but up-to-date topics are of little use if the first-timer has difficulty understanding the nuances of core ideas (e.g., transport, band-structure, and electron-phonon interactions). My opinion is that a good library should include A&M's text for those fundamentals that never go away (crystal structure, semiconductors, etc.) and a book such as T&H's or Chaikin & Lubensky's for the more modern topics ("soft" condensed

matter, mesoscopic physics, etc.).

Note that a corrected printing (not 'new edition') came out in February 2001. Make sure you get this version, which is identified on the cover.

I admire anyone who attempts to teach all of condensed matter physics in one book. That being said, being comprehensive and being comprehendible are two very different things. While being the former it sacrifices the latter. Marder does not do a good job of explaining the physical concepts needed to build a better understanding of advanced material. In addition, his end-of-chapter problems can be relatively uninformative and tedious i.e. you are left asking why did I just do this problem? Inevitably I find myself going back to Ashcroft & Mermin's wonderful but dated book. Hopefully one day they will publish a new edition...

This book seem to cover more topics in condensed matter physics than others. It was be a good reference book. It includes some old topics (space groups) and new experimental results. Since it covers so many topics, it may be hard to use it as a textbook.

Most classic texts such as Ashcroft and Mermin cover a large array of topics, most of which have become outdated. Their method of presentation also tends to be a little stodgy. Marder's book is an attempt to present an overview of modern solid state physics.It is an ambitious endeavour that is bound to fall short. There are far too many topics present and some of them are a little too advanced to be in this book. Consequently, the discussion tends to be more qualitative and there is a certain element of hand-waving. I found the sections on Luttinger liquids, Berry phases, etc to be somewhat disappointing.But, some of the other topics such as granular materials, band theory, etc are presented in an easily comprehensible manner. And despite all the flaws, the book is still a good read and more importantly, it is contemporary and gives a student a good introduction to current topics of research.

Every student (all 8 of us!) in my graduate SSP class agrees that this book's mathematical notation is inconsistent. This leads to difficulties in following derivations. There are also assumptions made in derivations that cloud a beginner's ability to follow through. For example, the author assumes (rightly or wrongly) that you already master Fourier series and transforms. This can lead to serious difficulties in solving problems because you have to recognize from context which space each

variables lives in, which is not obvious for the uninitiated. Also, I found his explanation of the DOS quite confusing when it should be a really simple concept. For these reasons, I am constantly referring back to Ashcroft-Mermin, which is a real gem that does not have these issues. Only after reading Ashcroft-Mermin does Marder make sense, to me.I bought the book when it sold for 55$ but I think the current 95$ is overpriced. For 20$ more a beginner should buy the Ashcroft-Mermin.