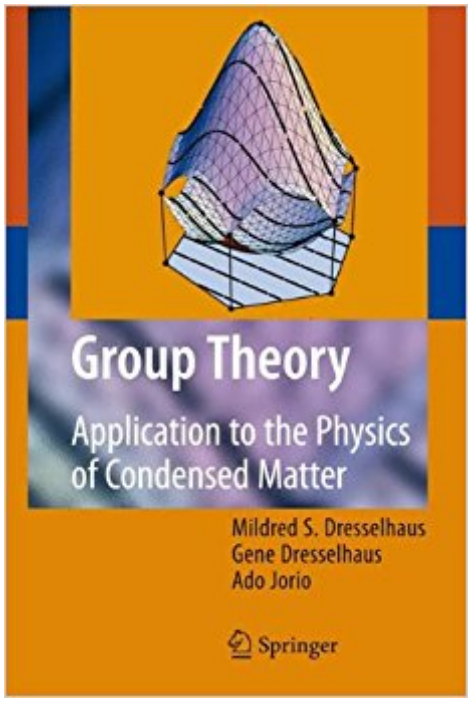
Group Theory: Application To The Physics Of Condensed Matter



Synopsis

This concise, class-tested book was refined over the authorsâ ™ 30 years as instructors at MIT and the University Federal of Minas Gerais (UFMG) in Brazil. The approach centers on the conviction that teaching group theory along with applications helps students to learn, understand and use it for their own needs. Thus, the theoretical background is confined to introductory chapters. Subsequent chapters develop new theory alongside applications so that students can retain new concepts, build on concepts already learned, and see interrelations between topics. Essential problem sets between chapters aid retention of new material and consolidate material learned in previous chapters.

Book Information

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Customer Reviews

From the reviews:"It was developed for a graduate course taught mostly by Millie Dresselhaus at MIT for more than 30 years, with many revisions of lecture notes. Very much a graduate text or specialist monograph, the book covers a wealth of applications across solid-state physics. â | The book can be warmly recommended to students and researchers in solid-state physics, either to serve as a text for an advanced lecture course or for individual study â | ." (Volker Heine, Physics Today, November, 2008)"This textbook is based on the authorsâ ™ pedagogical experience during their 30 years at MIT. â | the book develops all of the relevant mathematics (linear algebra) and the necessary physics (quantum mechanics), it is eminently suitable to a wide audience in physics, chemistry and materials science." (Barry R. Masters, Optics and Photonics News, July/August,

2009)â œThis is an excellent text â | . originates from lectures by Charles Kittel and J. H. van Vleck in the 1950s and much of the material was presented in courses by the authors over the last three decades. The material is meant for Electrical Engineering and Physics students at the graduate level â | . has exercises at the end of each chapter and an extensive set of appendices. The exposition is clear and detailed. This is a very good book for its target audience.â • (W. Miller Jr., Zentralblatt MATH, Vol. 1175, 2010)â œThe goal of the book under review is to teach group theory in close connection to applications. â | Every chapter of the book finishes with several selected problems. Specific to this book is the feature that every abstract theoretical group concept is introduced and applied in a concrete physical way. This is why the book is very useful for anyone interested in applications of group theory to the wide range of condensed matter phenomena.â •Â- Â- Â- (Oktay K. Pashaev, Mathematical Reviews, Issue 2010 i)â œIt is highly welcomed because of its well-thought structuring and the plenty of non-trivial examples. The authors develop those parts of the theory of groups which are interesting for physicists, from chapter to chapter offering nearly at any step one or more informative application.â • (G. Kowol, Monatshefte fÃ r Mathematik, Vol. 157 (2), June, 2009)

Every process in physics is governed by selection rules that are the consequence of symmetry requirements. The beauty and strength of group theory resides in the transformation of many complex symmetry operations into a very simple linear algebra. This concise and class-tested book has been pedagogically tailored over 30 years MIT and 2 years at the University Federal of Minas Gerais (UFMG) in Brazil. The approach centers on the conviction that teaching group theory in close connection with applications helps students to learn, understand and use it for their own needs. For this reason, the theoretical background is confined to the first 4 introductory chapters (6-8 classroom hours). From there, each chapter develops new theory while introducing applications so that the students can best retain new concepts, build on concepts learned the previous week, and see interrelations between topics as presented. Essential problem sets between the chapters also aid the retention of the new material and for the consolidation of material learned in previous chapters. The text and problem sets have proved a useful springboard for the application of the basic material presented here to topics in semiconductor physics, and the physics of carbon-based nanostructures.

Notation in the book is bad, makes it hard to read.For example, in the same equation can be used R_n - for translations, and R_alpha for rotations. Confusing.

This book appears not to intend as an introduction for either the group theory or the quantum theory, but for those who already learned basics of those theories and would like to advance further to the application for the solid state physics.It starts with a rough review of the basics (such as the Great Orthogonality Theorem) and speeds up to the applications to the quantum mechanics and solid state physics.It covers a good amount of topics including IR and Raman vibrations and quite well written.The only flaws I noticed are several trivial typos and lacks of the definition of jargon (they sometimes use a little bit unusual expressions such as the Wonderful Orthogonality Theorem instead of the Great Orthogonality Theorem or Schur's Orthogonality Relation without mentioning the difference from the common names) and symbols (as the tech books usually do).I totally recommend this book for the people with basics and would like to learn how those theories are connected and applied to the solid state physics.