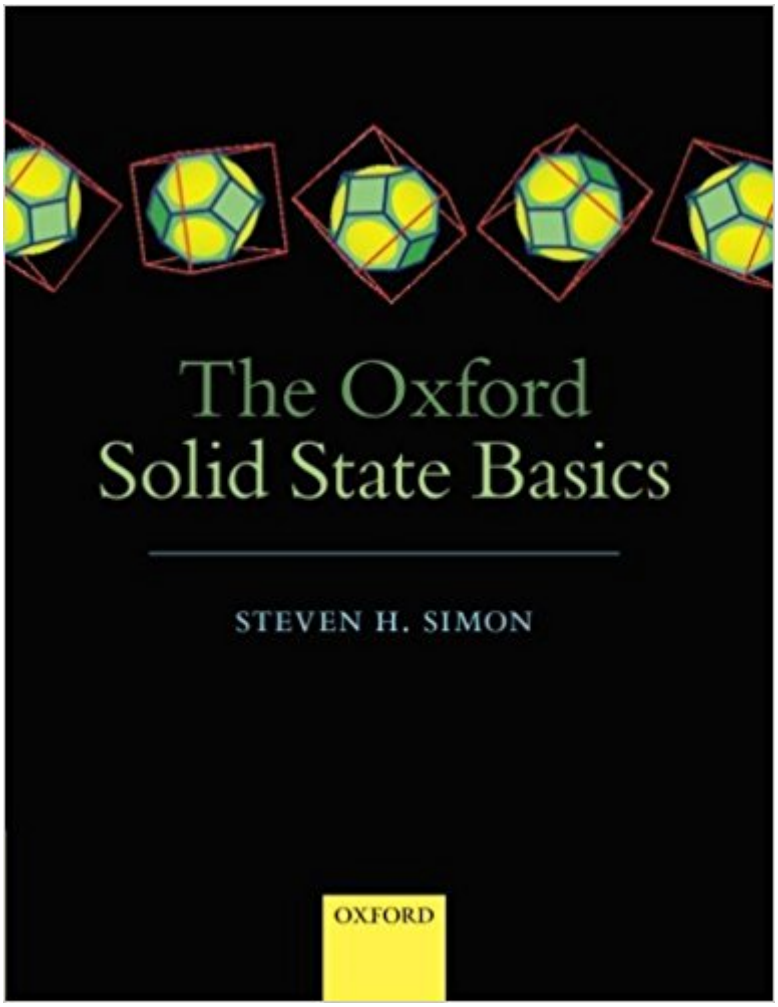
The Oxford Solid State Basics



Synopsis

The study of solids is one of the richest, most exciting, and most successful branches of physics. While the subject of solid state physics is often viewed as dry and tedious this new book presents the topic instead as an exciting exposition of fundamental principles and great intellectual breakthroughs. Beginning with a discussion of how the study of heat capacity of solids ushered in the quantum revolution, the author presents the key ideas of the field while emphasizing the deep underlying concepts. The book begins with a discussion of the Einstein/Debye model of specific heat, and the Drude/Sommerfeld theories of electrons in solids, which can all be understood without reference to any underlying crystal structure. The failures of these theories force a more serious investigation of microscopics. Many of the key ideas about waves in solids are then introduced using one dimensional models in order to convey concepts without getting bogged down with details. Only then does the book turn to consider real materials. Chemical bonding is introduced and then atoms can be bonded together to crystal structures and reciprocal space results. Diffraction experiments, as the central application of these ideas, are discussed in great detail. From there, the connection is made to electron wave diffraction in solids and how it results in electronic band structure. The natural culmination of this thread is the triumph of semiconductor physics and devices. The final section of the book considers magnetism in order to discuss a range of deeper concepts. The failures of band theory due to electron interaction, spontaneous magnetic orders, and mean field theories are presented well. Finally, the book gives a brief exposition of the Hubbard model that undergraduates can understand. The book presents all of this material in a clear fashion, dense with explanatory or just plain entertaining footnotes. This may be the best introductory book for learning solid state physics. It is certainly the most fun to read.To request a copy of the Solutions Manual, visit: http://global.oup.com/uk/academic/physics/admin/solutions

Book Information

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Customer Reviews

"The style of the book is very accessible for undergraduates. The topics are well motivated and the explanations are clear, helped by a generous set of figures for illustration. This textbook may well establish itself as an alternative to the available classics." --Derek Lee, Imperial College London"The author, Steven Simon, is well known as an insightful scientist and an engaging and witty speaker, and it is a pleasure to see how well his talents translate to the printed page. He has re-examined with a modern eye the question of which topics should be covered in a student's firstexposure to the physics of solids. My impression is that his presentation of those topics will be accessible for the student, illuminating for the expert, and entertaining for all." --Joel E. Moore, University of California, Berkeley, and Lawrence Berkeley National Laboratory

Steven H. Simon, Professor of Theoretical Condensed Matter Physics, Department of Physics, University of Oxford, and Fellow of Somerville College, Oxford.Professor Steven Simon earned a BSc degree from Brown in Physics & Mathematics in 1989 and a PhD in Theoretical Physics from Harvard in 1995. Following a two-year post-doc at MIT, he joined Bell Labs, where he was a director of research for nine years. He is currently Professor of Theoretical Condensed Matter Physics in the Department of Physics at the University of Oxford, and a Fellow of Somerville College, Oxford. His research is in the area of condensed matter physics and communication, including subjects ranging from microwave propagation to high temperature superconductivity. He is interested in quantum effects and how they are manifested in phases of matter. He has recently been studying phases of matter known as "topological phases" that are invariant under smooth deformations of space-time. He is also interested in whether such phases of matter can be used for quantum information processing and quantum computation.

I tried to prepare for my first solid state physics course using Kittel and Ashcroft/Mermin. They are both OK books but their method of teaching the subject is not very intuitive. I found myself lost between the huge gaps in their derivations. Simon talks you through each section; it reads very much like a lecture. After reading this book, the other two books made a lot more sense. I highly suggest reading this book first, though. I had so many misunderstandings from the other two books

that I had to unlearn a lot of things. The best part is that Simon actually tells you chapters in the other books to read further if you want more than an introduction to the specific topic at hand. I wanted to give this book 4.5 stars but has quantized the stars to whole integers. The reason I wanted to take off a half star is because of the jumps in derivations. Unfortunately, in upper division physics, almost all texts do this, some more than others. While I wish he would work out some example problems and not make giant leaps in derivations, it wasn't worth a whole point deduction. Hands down best introductory Solid State Physics textbook.

Fantastic text for undergraduate introduction to Solid State physics. I found this book, in my undergraduate course, prepared me well for my condensed matter course at the graduate level. The real reason I love this book is the excellent footnotes. Simon will keep you entertained as you tackle a beautiful subject with footnotes that extend your understanding, share in your confusion, or go completely off topic once in a while (Stoner's Criterion). It's a great experience, I highly suggest you get a copy!

This book does a very good job of providing simple figures and perspectives to build intuition about Solid State Physics. For this reason, it is highly complementary to Ashcroft and Mermin, who provide excruciating details on essentially the same topics covered here. I have found great success in first referencing this book to get the main equations and concepts understood and only then moving on to more verbose texts.

as expected

Thank you.

This is a great introductory level solid state book. I really appreciate the humor and the way the content is presented as in a story book. Definitely not your typical boring textbook. I've recommended it to my student and they all appreciated its crystal clear explanations. It is not too heavy in math but the physics is flawless. An amazing resource I will recommend for a Solid State Course.

Fast delivery and good book.

Great book. Short, concise, and modern. I know it is the "Oxford Basics", one additional chapter on superconductivity would be a nice addition.

The Floridas: The Sunshine State * The Alligator State * The Everglade State * The Orange State * The Flower State * The Peninsula State * The Gulf State The Oxford Solid State Basics The Solid State: An Introduction to the Physics of Crystals for Students of Physics, Materials Science, and Engineering (Oxford Physics Series) Oxford Handbook of Political Psychology (Oxford Handbooks) published by Oxford University Press, USA (2003) A Woman's Guide To Financial Security After Divorce: The Basics: Creating A Solid Foundation (Think Financially, Not EmotionallyÃ Â® Book 3) G is for Garden State: A New Jersey Alphabet (Discover America State by State) North Dakota State Parks: Indian Hills State Recreation Area (North Dakota State Parks Series) Washington State Bed & Breakfast Cookbook: From the Warmth & Hospitality of 72 Washington State B&b's and Country Inns (Washington State Bed and Breakfast Cookbook) Solid State Logic Non-Volatile Memory:The NVM Solutions from eMemory (International Series on Advances in Solid State Electronics and Technology) Solid State Electronic Devices (7th Edition) Solid State Physics Introduction to Microelectronic Fabrication: Volume 5 of Modular Series on Solid State Devices (2nd Edition) Waves and Fields in Optoelectronics (Prentice-Hall series in solid state physical electronics) Solid State Electronic Devices (6th Edition) Fundamentals of Network Analysis and Synthesis (Prentice-Hall electrical engineering series. Solid state physical electronics series. Prentice-Hall networks series) Fundamentals of Solid State Electronics Handbook of Solid State Batteries (Materials and Energy) Basic Solid-State Electronics, Vol. 5: Information Management Basic Solid-State Electronics, Vol. 4: Information Reception