Introduction To Modern Statistical Mechanics

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HARRINGTON

Introduction To Modern Statistical Mechanics *2021-01-12*

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Modern Thermodynamics with Statistical Mechanics

Cambridge University Press
This book is an introduction to statistical mechanics, intended for

advanced undergraduate or beginning graduate students.

An Introduction to Statistical Mechanics and Thermodynamics

John Wiley & Sons

The essential introduction to modern statistical mechanics—now completely updated and expanded Statistical mechanics is one of the most exciting areas of physics today and has applications to subjects ranging from economics and social behavior to algorithmic theory and evolutionary biology. Statistical Mechanics in a Nutshell provides a self-contained introduction to this rapidly developing field. Starting with the basics of kinetic theory and requiring only a background in elementary calculus and mechanics, this concise book discusses the most important developments of recent decades and guides readers to the very threshold of today's cutting-edge research. Features a new chapter on stochastic thermodynamics with an introduction to the thermodynamics of information—the first treatment of its kind in an introductory textbook Offers a more detailed account of numerical simulations, including simulated annealing and other accelerated Monte Carlo methods The chapter on complex systems now features an accessible introduction to the replica theory of spin glasses and the Hopfield theory of neural networks, with an emphasis on applications Provides a new discussion of defect-mediated transitions and

their implications for two-dimensional melting An invaluable resource for graduate students and advanced undergraduates seeking a compact primer on the core ideas of statistical mechanics Solutions manual (available only to instructors) *Statistical Physics of Polymers* Elsevier Thermodynamics and Statistical Mechanics Thermodynamics and Statistical Mechanics An Integrated Approach This textbook brings together the fundamentals of the macroscopic and microscopic aspects of thermal physics by presenting thermodynamics and statistical mechanics as complementary theories based on small numbers of postulates. The book is designed to give the instructor flexibility in structuring courses for advanced undergraduates and/or beginning graduate students and is written on the principle that a good text should also be a good reference. The presentation of thermodynamics follows the logic of Clausius and Kelvin while relating the concepts involved to familiar phenomena and the modern student's knowledge of the atomic nature of matter. Another unique aspect of the book is the treatment of the mathematics involved. The essential mathematical concepts are briefly reviewed before using them, and the similarity of the mathematics to that employed in other fields of physics is emphasized. The text gives in-depth treatments of low-density

gases, harmonic solids, magnetic and dielectric materials, phase transitions, and the concept of entropy. The microcanonical, canonical, and grand canonical ensembles of statistical mechanics are derived and used as the starting point for the analysis of fluctuations, blackbody radiation, the Maxwell distribution, Fermi-Dirac statistics, Bose-Einstein condensation, and the statistical basis of computer simulations. *Elements of Statistical Mechanics* Cambridge University Press
Lectures on elementary statistical mechanics, taught at the University of Illinois and at the University of Pennsylvania.
Introduction to the Basic Concepts of Modern Physics Cambridge University Press
A self-contained, mathematical introduction to the driving ideas in equilibrium statistical mechanics, studying important models in detail.
Statistical Mechanics of Lattice Systems Springer Science & Business Media
This book presents a mathematically rigorous approach to the main ideas and phenomena of statistical physics. The introduction addresses the physical motivation, focusing on the basic concept of modern statistical physics, that is the notion of Gibbsian random fields. Properties of Gibbsian fields are analysed in two ranges of physical parameters: "regular" (corresponding to high-temperature and low-density regimes)

where no phase transition is exhibited, and "singular" (low temperature regimes) where such transitions occur. Next, a detailed approach to the analysis of the phenomena of phase transitions of the first kind, the Pirogov-Sinai theory, is presented. The author discusses this theory in a general way and illustrates it with the example of a lattice gas with three types of particles. The conclusion gives a brief review of recent developments arising from this theory.

The volume is written for the beginner, yet advanced students will benefit from it as well. The book will serve nicely as a supplementary textbook for course study. The prerequisites are an elementary knowledge of mechanics, probability theory and functional analysis.

Introduction to Statistical Physics

Springer Science & Business Media

This book discusses the computational approach in modern statistical physics in a clear and accessible way and demonstrates its close relation to other approaches in theoretical physics. Individual chapters focus on subjects as diverse as the hard sphere liquid, classical spin models, single quantum particles and Bose-Einstein condensation. Contained within the chapters are in-depth discussions of algorithms, ranging from basic enumeration methods to modern Monte Carlo techniques. The emphasis is on orientation, with

discussion of implementation details kept to a minimum. Illustrations, tables and concise printed algorithms convey key information, making the material very accessible. The book is completely self-contained and graphs and tables can readily be reproduced, requiring minimal computer code. Most sections begin at an elementary level and lead on to the rich and difficult problems of contemporary computational and statistical physics. The book will be of interest to a wide range of students, teachers and researchers in physics and the neighbouring sciences. An accompanying CD allows incorporation of the book's content (illustrations, tables, schematic programs) into the reader's own presentations.
Introduction to Mathematical Statistical Physics Cambridge University Press
Introduction to Quantum Statistical Mechanics (2nd Edition) may be used as an advanced textbook by graduate students, even ambitious undergraduates in physics. It is also suitable for non experts in physics who wish to have an overview of some of the classic and fundamental quantum models in the subject. The explanation in the book is detailed enough to capture the interest of the reader, and complete enough to provide the necessary background material needed to dwell further into the subject and explore the research literature.
Statistical Mechanics Wiley-Interscience

Thermodynamics is not the oldest of sciences. Mechanics can make that claim. Thermodynamicsisaproductofsomeofthegreatestscienti?cmindsofthe19thand 20th centuries. But it is suf?ciently established that most authors of new textbooks in thermodynamics ?nd it necessary to justify their writing of yet another textbook. I ?nd this an unnecessary exercise because of the centrality of thermodynamics as a science in physics, chemistry, biology, and medicine. I do acknowledge, however, that instruction in thermodynamics often leaves the student in a confused state. My attempt in this book is to present thermodynamics in as simple and as uni?ed a form as possible. As teachers we identify the failures of our own teachers and attempt to correct them. Although I personally acknowledge with a deep gratitude the appreciation for thermodynamics that I found as an undergraduate, I also realize that my teachers did not convey to me the sweeping grandeur of thermodynamics. Speci?cally the s- plicity and the power that James Clerk Maxwell found in the methods of Gibbs were not part of my undergraduate experience. Unfortunately some modern authors also seem to miss this central theme, choosing instead to introduce the thermodynamic potentials as only useful functions at various points in the development.

Statistical Mechanics

Cambridge University Press
From the reviews: "This book excels by its variety of modern examples in solid state physics, magnetism, elementary particle physics [...] I can recommend it strongly as a valuable source, especially to those who are teaching basic statistical physics at our universities." Physicalia
Thermodynamics and Statistical Mechanics OUP Oxford
Publisher Description
Methods in Statistical Mechanics Springer Science & Business Media
A valuable learning tool for students and an indispensable resource for professional scientists and engineers Several outstanding features make this book a superior introduction to modern statistical mechanics: It is the only intermediate-level text offering comprehensive coverage of both basic statistical mechanics and modern topics such as molecular dynamic methods, renormalization theory, chaos, polymer chain folding, oscillating chemical reactions, and cellular automata. It is also the only text written at this level to address both equilibrium and nonequilibrium statistical mechanics. Finally, students and professionals alike will appreciate such aids to comprehension as detailed derivations for most equations, more than 100 chapter-end exercises, and 15 computer programs written in FORTRAN that illustrate many of the concepts covered in the text. Statistical Mechanics

begins with a refresher course in the essentials of modern statistical mechanics which, on its own, can serve as a handy pocket guide to basic definitions and formulas. Part II is devoted to equilibrium statistical mechanics. Readers will find in-depth coverage of phase transitions, critical phenomena, liquids, molecular dynamics, Monte Carlo techniques, polymers, and more. Part III focuses on nonequilibrium statistical mechanics and progresses in a logical manner from near-equilibrium systems, for which linear responses can be used, to far-from-equilibrium systems requiring nonlinear differential equations.

Statistical Mechanics

Hodder Education

Going beyond traditional textbook topics, 'A Modern Course in Statistical Physics' incorporates contemporary research in a basic course on statistical mechanics. From the universal nature of matter to the latest results in the spectral properties of decay processes, this book emphasizes the theoretical foundations derived from thermodynamics and probability theory underlying all concepts in statistical physics. This completely revised and updated third edition continues the comprehensive coverage of numerous core topics and special applications, allowing professors flexibility in designing individualized courses. The inclusion of advanced

topics and extensive references makes this an invaluable resource for researchers as well as students -- a textbook that will be kept on the shelf long after the course is completed.

Statistical Mechanics

Springer Science & Business Media

Statistical Mechanics discusses the fundamental concepts involved in understanding the physical properties of matter in bulk on the basis of the dynamical behavior of its microscopic constituents. The book emphasizes the equilibrium states of physical systems. The text first details the statistical basis of thermodynamics, and then proceeds to discussing the elements of ensemble theory. The next two chapters cover the canonical and grand canonical ensemble. Chapter 5 deals with the formulation of quantum statistics, while Chapter 6 talks about the theory of simple gases. Chapters 7 and 8 examine the ideal Bose and Fermi systems. In the next three chapters, the book covers the statistical mechanics of interacting systems, which includes the method of cluster expansions, pseudopotentials, and quantized fields. Chapter 12 discusses the theory of phase transitions, while Chapter 13 discusses fluctuations. The book will be of great use to researchers and practitioners from wide array of disciplines, such as physics, chemistry, and engineering.

Introduction to Modern Statistical Mechanics

Cambridge University

Press
This is a textbook for the standard undergraduate-level course in thermal physics (sometimes called thermodynamics or statistical mechanics). Originally published in 1999, it quickly gained market share and has now been the most widely used English-language text for such courses, as taught in physics departments, for more than a decade. Its clear and accessible writing style has also made it popular among graduate students and professionals who want to gain abetter understanding of thermal physics. The book explores applications to engineering, chemistry, biology, geology, atmospheric science, astrophysics, cosmology, and everyday life. It includes twoappendices, reference data, an annotated bibliography, a complete index, and 486 homework problems.

An Introduction to Statistical Thermodynamics

Springer Science & Business Media

This textbook provides a comprehensive, yet accessible, introduction to statistical mechanics. Crafted and class-tested over many years of teaching, it carefully guides advanced undergraduate and graduate students who are encountering statistical mechanics for the first time through this – sometimes – intimidating subject. The book provides a strong foundation in thermodynamics and the ensemble formalism of statistical mechanics. An

introductory chapter on probability theory is included. Applications include degenerate Fermi systems, Bose-Einstein condensation, cavity radiation, phase transitions, and critical phenomena. The book concludes with a treatment of scaling theories and the renormalization group. In addition, it provides clear descriptions of how to understand the foundational mathematics and physics involved and includes exciting case studies of modern applications of the subject in physics and wider interdisciplinary areas. Key Features: Presents the subject in a clear and entertaining style which enables the author to take a sophisticated approach whilst remaining accessible Contains contents that have been carefully reviewed with a substantial panel to ensure that coverage is appropriate for a wide range of courses, worldwide Accompanied by volumes on thermodynamics and non-equilibrium statistical mechanics, which can be used in conjunction with this book, on courses which cover both thermodynamics and statistical mechanics

A Modern Course in Statistical Physics

Springer Science & Business Media

Complex systems that bridge the traditional disciplines of physics, chemistry, biology, and materials science can be studied at an unprecedented level of detail using increasingly sophisticated theoretical methodology and high-

speed computers. The aim of this book is to prepare burgeoning users and developers to become active participants in this exciting and rapidly advancing research area by uniting for the first time, in one monograph, the basic concepts of equilibrium and time-dependent statistical mechanics with the modern techniques used to solve the complex problems that arise in real-world applications. The book contains a detailed review of classical and quantum mechanics, in-depth discussions of the most commonly used ensembles simultaneously with modern computational techniques such as molecular dynamics and Monte Carlo, and important topics including free-energy calculations, linear-response theory, harmonic baths and the generalized Langevin equation, critical phenomena, and advanced conformational sampling methods. Burgeoning users and developers are thus provided firm grounding to become active participants in this exciting and rapidly advancing research area, while experienced practitioners will find the book to be a useful reference tool for the field.

Statistical Physics of Particles Cambridge University Press

This unique and consistent mathematical treatise contains a deductive description of equilibrium statistics and thermodynamics. The most important elements

of non-equilibrium phenomena are also treated. In addition to the fundamentals, the text tries to show how large the area of statistical mechanics is and how many applications can be found here. Modern areas such as renormalization group theory, percolation, stochastic equations of motion and their applications in critical dynamics, as well as fundamental thoughts of irreversibility are discussed. The text will be useful for advanced students in physics and other sciences who have profound knowledge of quantum mechanics.

Nonequilibrium Statistical Physics OUP Oxford

A master teacher presents the ultimate introduction to classical mechanics for people who are serious about learning physics "Beautifully clear explanations of famously 'difficult' things," -- Wall Street Journal If you ever regretted not taking physics in college -- or simply want to know how to think like a physicist -- this is the book for you. In this bestselling introduction to classical mechanics, physicist Leonard Susskind and hacker-scientist George Hrabovsky offer a first course in physics and associated math for the ardent amateur. Challenging, lucid, and concise, The Theoretical Minimum provides a tool kit for amateur scientists to learn physics at their own pace.

Topics In Statistical Mechanics (Second Edition) Courier Corporation

A comprehensive and

pedagogical text on nonequilibrium statistical physics, covering topics from random walks to pattern formation.