Statistical Physics Second Revised And Enlarged Edition

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Methods of Quantum Field Theory in Statistical Physics Courier Corporation
This revised and expanded edition of Statistical and Thermal Physics introduces students to the essential ideas and techniques used in many areas of contemporary physics. Ready-to-run programs help make the many abstract concepts concrete. The text requires only a background in introductory mechanics and some basic ideas of quantum theory, discussing material typically found in undergraduate texts as well as topics such as fluids, critical phenomena, and computational techniques, which serve as a natural bridge to graduate study. --

The Principles of Statistical Mechanics Cambridge University Press
The application of statistical methods to physics is essential. This unique book on statistical physics offers an advanced approach with numerous applications to the modern problems students are confronted with. Therefore the text contains more concepts and methods in statistics than the student would need for statistical mechanics alone. Methods from mathematical statistics and stochastics for the analysis of data are discussed as well. The book is divided into two parts, focusing first on the modeling of statistical systems and then on the analysis of these systems. Problems with hints for solution help the students to deepen their knowledge. The third edition has been updated and enlarged with new sections deepening the knowledge about data analysis. Moreover, a customized set of problems with solutions is accessible on the Web at extras.springer.com.

Statistical and Thermal Physics 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.

Statistical Physics II Walter de Gruyter GmbH & Co KG

In each generation, scientists must redefine their fields: abstracting, simplifying and distilling the previous standard topics to make room for new advances and methods. Sethna's book takes this step for statistical mechanics - a field rooted in physics and chemistry whose ideas and methods are now central to information theory, complexity, and modern biology. Aimed at advanced undergraduates and early graduate students in all of these fields, Sethna limits his main presentation to the topics that future mathematicians and biologists, as well as physicists and chemists, will find fascinating and central to their work. The amazing breadth of the field is reflected in the author's large supply of carefully crafted exercises, each an introduction to a whole field of study: everything from chaos through information theory to life at the end of the universe.

Sturge's Statistical and Thermal Physics, Second Edition Cambridge University Press

This volume is a compilation of carefully selected questions at the PhD qualifying exam level, including many actual questions from Columbia University, University of Chicago, MIT, State University of New York at Buffalo, Princeton University, University of Wisconsin and the University of California at Berkeley over a twenty-year period. Topics covered in this book include the laws of thermodynamics, phase changes, Maxwell-Boltzmann statistics and kinetic theory of gases.This latest edition has been updated with more problems and solutions and the original problems have also been modernized, excluding outdated questions and emphasizing those that rely on calculations. The problems range from fundamental to advanced in a wide range of topics on thermodynamics and statistical physics, easily enhancing the student's knowledge through workable exercises. Simple-to-solve problems play a useful role as a first check of the student's level of knowledge whereas difficult problems will challenge the student's capacity on finding the solutions.

Introduction to Statistical Physics, Second Edition Springer Science & Business Media

This concise primer (based on lectures given at summer schools on complex systems and on a masters degree course in complex systems modeling) will provide graduate students and newcomers to the field with the basic knowledge of the concepts and methods of statistical physics and its potential for application to interdisciplinary topics.

Indeed, in recent years, statistical physics has begun to attract the interest of a broad community of researchers in the field of complex system sciences, ranging from biology to the social sciences, economics and computer science. More generally, a growing number of graduate students and researchers feel the need to learn some basic concepts and questions originating in other disciplines without necessarily having to master all of the corresponding technicalities and jargon. Generally speaking, the goals of statistical physics may be summarized as follows: on the one hand to study systems composed of a large number of interacting ‘entities’, and on the other to predict the macroscopic (or collective) behavior of the system considered from the microscopic laws ruling the dynamics of the individual ‘entities’. These two goals are, to some extent, also shared by what is nowadays called ‘complex systems science’ and for these reasons, systems studied in the framework of statistical physics may be considered as among the simplest examples of complex systems—allowing in addition a rather well developed mathematical treatment.

Statistical Physics John Wiley & Sons

This Is An Introductory Book Which Explains The Foundations Of The Subject And Its Application. It Is Intended Primarily For Graduate Students But May Provide Useful Information And Reading To Science And Engineering Students At All Levels. It Assumes That Readers Have Knowledge Of Basic Thermodynamics And Quantum Mechanics. With This, The Theory Has Been Developed In A Simple, Logical And Understandable Way. Some Applications Of Statistical Thermodynamics Have Been Described In Detail With Illustrative Solved Examples.There Are Two Basic Approaches In Statistical Mechanics; One Based On The Study Of Independent Particles In An Isolated System And The Other Based On The Concept Of Ensembles. In This Book Attempt Has Been Made To Take Advantage Of Both Approaches. While The Fundamental Concepts Have Been Developed By First Approach, Concept Of Ensembles Have Been Included To Bring Out The Importance Of This Concept In The Application Of Statistical Thermodynamics To Chemical Systems Where Interparticle Interactions Become Important.Part I Of The Book Deals With The Background Concepts, Fundamentals In Mathematics, Classical Mechanics, Quantum Mechanics And Thermodynamics Which Are Essential For Statistical Mechanics. Part Ii Covers Formalism Of Statistical Mechanism And Its Relation To Thermodynamics As Well As The Statistical Mechanics Of Ensembles, Quantum Statistics And Fluctuations. Part Iii Includes Chapters On The Applications Of The Formalism To Real Laboratory Chemical Systems. In This Part Additions Such As Imperfect Gases, Equilibrium Isotope And Kinetic Isotope Effects And Reactions At The Surfaces Have Been Made, In This Edition. Part Iv Is Also An Addition Which Covers Quantum Systems Such As Ideal Fermi Gas (Free Electrons In Metals), Photon Gas And Ideal Bose Gas (Helium Gas).

Statistical Thermodynamics Princeton University Press

Suitable for graduate students in chemical physics, statistical physics, and physical chemistry, this text develops an innovative, probabilistic approach to statistical mechanics. The treatment employs Gauss's principle and incorporates Bose-Einstein and Fermi-Dirac statistics to provide a powerful tool for the statistical analysis of physical phenomena. The treatment begins with an introductory chapter on entropy and

probability that covers Boltzmann's principle and thermodynamic probability, among other topics. Succeeding chapters offer a case history of black radiation, examine quantum and classical statistics, and discuss methods of processing information and the origins of the canonical distribution. The text concludes with explorations of statistical equivalence, radiative and material phase transitions, and the kinetic foundations of Gauss's error law. Bibliographic notes complete each chapter.

The Concept of Probability in Statistical Physics Oxford University Press

Classic text combines thermodynamics, statistical mechanics, and kinetic theory in one unified presentation. Topics include equilibrium statistics of special systems, kinetic theory, transport coefficients, and fluctuations. Problems with solutions. 1966 edition.

Courier Dover Publications

A Modern Course in Statistical Physics is a textbook that illustrates the foundations of equilibrium and non-equilibrium statistical physics, and the universal nature of thermodynamic processes, from the point of view of contemporary research problems. The book treats such diverse topics as the microscopic theory of critical phenomena, superfluid dynamics, quantum conductance, light scattering, transport processes, and dissipative structures, all in the framework of the foundations of statistical physics and thermodynamics. It shows the quantum origins of problems in classical statistical physics. One focus of the book is fluctuations that occur due to the discrete nature of matter, a topic of growing importance for nanometer scale physics and biophysics. Another focus concerns classical and quantum phase transitions, in both monatomic and mixed particle systems. This fourth edition extends the range of topics considered to include, for example, entropic forces, electrochemical processes in biological systems and batteries, adsorption processes in biological systems, diamagnetism, the theory of Bose-Einstein condensation, memory effects in Brownian motion, the hydrodynamics of binary mixtures. A set of exercises and problems is to be found at the end of each chapter and, in addition, solutions to a subset of the problems is provided. The appendices cover Exact Differentials, Ergodicity, Number Representation, Scattering Theory, and also a short course on Probability.

An Introduction to Statistical Thermodynamics Springer Science & Business Media

In this revised and enlarged second edition, Tony Guénault provides a clear and refreshingly readable introduction to statistical physics. The treatment itself is self-contained and concentrates on an understanding of the physical ideas, without requiring a high level of mathematical sophistication. The book adopts a straightforward quantum approach to statistical averaging from the outset. The initial part of the book is geared towards explaining the equilibrium properties of a simple isolated assembly of particles. The treatment of gases gives full coverage to Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics.

Exactly Solved Models in Statistical Mechanics Springer Science & Business Media

The book is divided into two parts. The first part looks at the modeling of statistical systems before moving on to an analysis of these systems. This second edition contains new material on: estimators based on a probability distribution for the parameters; identification of stochastic models from observations; and statistical tests and classification methods.

Statistical Physics Elsevier

"There is a symbiotic relationship between theoretical nonequilibrium statistical mechanics on the one hand and the theory and practice of computer simulation on the other. Sometimes, the initiative for progress has been with the pragmatic requirements of computer simulation and at other

times, the initiative has been with the fundamental theory of nonequilibrium processes. This book summarises progress in this field up to 1990"--Publisher's description.

Statistical Physics I World Scientific Publishing Company

The original work by M.D. Sturge has been updated and expanded to include new chapters covering non-equilibrium and biological systems. This second edition re-organizes the material in a more natural manner into four parts that continues to assume no previous knowledge of thermodynamics. The four divisions of the material introduce the subject inductively and rigorously, beginning with key concepts of equilibrium thermodynamics such as heat, temperature and entropy. The second division focuses on the fundamentals of modern thermodynamics: free energy, chemical potential and the partition function. The second half of the book is then designed with the flexibility to meet the needs of both the instructor and the students, with a third section focused on the different types of gases: ideal, Fermi-Dirac, Bose-Einstein, Black Body Radiation and the Photon gases. In the fourth and final division of the book, modern thermostatistical applications are addressed: semiconductors, phase transitions, transport processes, and finally the new chapters on non-equilibrium and biological systems. Key Features: Provides the most readable, thorough introduction to statistical physics and thermodynamics, with magnetic, atomic, and electrical systems addressed alongside development of fundamental topics at a non-rigorous mathematical level Includes brand-new chapters on biological and chemical systems and non-equilibrium thermodynamics, as well as extensive new examples from soft condensed matter and correction of typos from the prior edition Incorporates new numerical and simulation exercises throughout the book Adds more worked examples, problems, and exercises

Statistical Mechanics Cambridge University Press

The purpose of this textbook is to bring together, in a self-contained introductory form, the scattered material in the field of stochastic processes and statistical physics. It offers the opportunity of being acquainted with stochastic, kinetic and nonequilibrium processes. Although the research techniques in these areas have become standard procedures, they are not usually taught in the normal courses on statistical physics. For students of physics in their last year and graduate students who wish to gain an invaluable introduction on the above subjects, this book is a necessary tool. Contents:Stochastic Processes and the Master Equation:Stochastic ProcessesMarkovian ProcessesMaster EquationsKramers Moyal ExpansionBrownian Motion, Langevin and Fokker-Planck EquationsDistributions, BBGKY Hierarchy, Density Operator:Probability Density as a FluidBBGKY HierarchyMicroscopic Balance EquationsDensity OperatorLinear Nonequilibrium Thermodynamics and Onsager Relations:Onsager Regression to Equilibrium HypothesisOnsager RelationsMinimum Production of EntropyLinear Response Theory, Fluctuation-Dissipation Theorem:Correlation Functions: Definitions and PropertiesLinear Response TheoryFluctuation-Dissipation TheoremInstabilities and Far from Equilibrium Phase-Transitions:Limit Cycles, Bifurcations, Symmetry BreakingNoise Induced TransitionsFormation and Propagation of Patterns in Far from Equilibrium Systems:Reaction-Diffusion Descriptions and Pattern FormationPattern Propagation Readership: Graduate students in physics and chemistry. keywords:Stochastic Processes;Langevin and Fokker-Planck Equations;Statistical Physics;Onsager Relations;Linear Response;Nonequilibrium Statistical Physics;Transport Processes;Noise Induced Transitions;Instabilities;Pattern Formation and Propagation “This book introduces ways to investigate nonequilibrium statistical physics, mainly via stochastic processes, and presents results achieved with such methodology … it is suitable for seminars directed towards relatively mature students in theoretical physics or applied mathematics.” H Muthsam “The present book is a good choice for a single book covering the field … suitable for undergraduate students in the last year and graduate students. They will find in it a suggestive introduction that motivates them to dig deeper into the field and to look for those

topics omitted from the text … highly recommended to anyone interested in becoming acquainted with nonequilibrium statistical physics." Journal of Statistical Physics

Statistical Physics World Scientific Publishing Company

This is a textbook which gradually introduces the student to the statistical mechanical study of the different phases of matter and to the phase transitions between them. Throughout, only simple models of both ordinary and soft matter are used but these are studied in full detail. The subject is developed in a pedagogical manner, starting from the basics, going from the simple ideal systems to the interacting systems, and ending with the more modern topics. The textbook provides the student with a complete overview, intentionally at an introductory level, of the theory of phase transitions. All equations and deductions are included.

Basics of Statistical Physics World Scientific Publishing Company

A lucid presentation of statistical physics and thermodynamics which develops from the general principles to give a large number of applications of the theory.

Problems and Solutions on Thermodynamics and Statistical Mechanics (Second Edition) Springer Science & Business Media

This new version of a classic updates much of the material in earlier editions, including the first chapter, on the history of the field. Important modifications reflect major discoveries of the past decades. A historical perspective is maintained throughout. The reader is drawn into the process of discovery: starting with a phenomenon, finding plausible explanations and competing theories — and finally, the solution. The theory of magnetism is practically a metaphor for theoretical physics. The very first quantum many-body theory (Bethe's ansatz) was devised for magnetic chains, just as mean-field theory was invented a century ago by Weiss to explain Curie's Law. The first two chapters of this book are immensely readable, taking us from prehistory to the "spin valves" of the most recent past. Topics in subsequent chapters include: angular momenta and spin (Chapter 3), quantum theory of simple systems, followed by increasingly technical insights into ordered and random systems, thermal fluctuations, phase transitions, chaos and the like. Contemporary developments in nanotechnology now seek to take advantage of the electron's spin as well as of its charge. The time is not far off when nano-circuits made entirely of silicon exhibit such many-body properties as superconductivity or ferromagnetism — without any superconducting materials or magnetic ions being present. The reader of this book will be prepared for such exotic twenty-first century applications. Daniel C Mattis, BS, MS, PhD, Fellow of the American Physical Society (APS), is a frequent lecturer at research institutions and the author of several textbooks and numerous research articles. His expertise includes many-body theory, electrical conductivity, quantum theory of magnetism and most recently, nanotechnology. Prof. Mattis is on the editorial panel for high-temperature superconductivity of the International Journal of Modern Physics B and Modern Physics Letters B, both published by World Scientific. Currently serving as Professor in the Physics department at the University of Utah in Salt Lake City, Utah, USA, at various times he has been visiting Professor at Yale University (New Haven), State University of New York (Buffalo), Temple University (Philadelphia), and served as "Wei-Lun Visiting Professor" at the Chinese University of Hong Kong. A founding member of the "Few-Body Physics" section of the APS, he has also served as Chair of the standing committee of the APS for the

"International Freedom of Scientists."

Statistical Physics Springer Science & Business Media

This volume of Statistical Physics consititutes the second part of Statistical Physics (Springer Series in Solid-State Science, Vols. 30, 31) and is devoted to nonequilibrium theories of statistical mechanics. We start with an intro duction to the stochastic treatment of Brownian motion and then proceed to general problems involved in deriving a physical process from an underlying more basic process. Relaxation from nonequilibrium to equilibrium states and the response of a system to an external disturbance form the central problems of nonequilibrium statistical mechanics. These problems are treated both phenomenologically and microscopically along the lines of re cent developments. Emphasis is placed on fundamental concepts and methods rather than on applications which are too numerous to be treated exhaustively within the limited space of this volume. For information on the general aim of this book, the reader is referred to the Foreword. For further reading, the reader should consult the bibliographies, although these are not meant to be exhaustive.

The Statistical Mechanics of Financial Markets Springer Science & Business Media

Statistical Mechanics: Fundamentals and Model Solutions, Second Edition Fully updated throughout and with new chapters on the Mayer expansion for classical gases and on cluster expansion for lattice models, this new edition of Statistical Mechanics: Fundamentals and Model Solutions provides a comprehensive introduction to equilibrium statistical mechanics for advanced undergraduate and graduate students of mathematics and physics. The author presents a fresh approach to the subject, setting out the basic assumptions clearly and emphasizing the importance of the thermodynamic limit and the role of convexity. With problems and solutions, the book clearly explains the role of models for physical systems, and discusses and solves various models. An understanding of these models is of increasing importance as they have proved to have applications in many areas of mathematics and physics. Features Updated throughout with new content from the field An established and well-loved textbook Contains new problems and solutions for further learning opportunity Author Professor Teunis C. Dorlas is at the Dublin Institute for Advanced Studies, Ireland.