Pathria Statistical Mechanics Solutions

This book addresses the application of methods used in statistical physics to complex systems—from simple phenomenological analogies to more complex aspects, such as correlations, fluctuation-dissipation theorem, the concept of free energy, renormalization group approach and scaling. Statistical physics contains a well-developed formalism that describes phase transitions. It is useful to apply this formalism for damage phenomena as well. Fractals, the Ising model, percolation, damage mechanics, fluctuations, free energy formalism, renormalization group, and scaling, are some of the topics covered in Statistical Physics of Phase Transitions.
Statistical Mechanics, Fourth Edition, explores the physical properties of matter based on the dynamic behavior of its microscopic constituents. This valuable textbook introduces the reader to the historical context of the subject before delving deeper into chapters about thermodynamics, ensemble theory, simple gases theory, Ideal Bose and Fermi systems, statistical mechanics of interacting systems, phase transitions, and computer simulations. In the latest revision, the book's authors have updated the content throughout, including new coverage on biophysical applications, updated exercises, and computer simulations. This updated edition will be an indispensable to students and researchers of statistical mechanics, thermodynamics, and physics. Retains the valuable organization and trusted coverage of previous market-leading editions Includes new coverage on biophysical applications and computer simulations Offers Mathematica files for student use and a secure solutions manual for qualified instructors Covers Bose-Einstein condensation in atomic gases, Thermodynamics of the early universe, Computer simulations: Monte Carlo and molecular dynamics, Correlation functions and scattering, Fluctuation-dissipation theorem and the dynamical structure factor, and much more
This book is the second edition of an excellent undergraduate-level overview of classical and modern physics, intended for students of physics and related subjects, and also perfectly suited for the education of physics teachers. The twelve-chapter book begins with Newtons laws of motion and subsequently covers topics such as thermodynamics and statistical physics, electrodynamics, special and general relativity, quantum mechanics and cosmology , the standard model and quantum chromodynamics. The writing is lucid, and the theoretical discussions are easy to follow for anyone comfortable with standard mathematics. An important addition in this second edition is a set of exercises and problems, distributed throughout the book. Some of the problems aim to complement the text, others to provide readers with additional useful tools for tackling new or more advanced topics. Furthermore, new topics have been added in several chapters; for example, the discovery of extra-solar planets from the wobble of their mother stars, a discussion of the Landauer principle relating information erasure to an increase of entropy, quantum logic, first order quantum corrections to the ideal gas equation of state due to the Fermi-Dirac and Bose-Einstein statistics. Both gravitational lensing and the time-correction in geo-positioning satellites are explained as theoretical applications of special and general relativity. The discovery of gravitational waves, one of the most important achievements of physical sciences, is presented as well. Professional scientists, teachers, and researchers will also want to have this book on their bookshelves, as it provides an excellent refresher on a wide

range of topics and serves as an ideal starting point for expanding ones knowledge of new or unfamiliar fields. Readers of this book will not only learn much about physics, they will also learn to love it.

Solid State Physics emphasizes a few fundamental principles and extracts from them a wealth of information. This approach also unifies an enormous and diverse subject which seems to consist of too many disjoint pieces. The book starts with the absolutely minimum of formal tools, emphasizes the basic principles, and employs physical reasoning (" a little thinking and imagination" to quote R. Feynman) to obtain results. Continuous comparison with experimental data leads naturally to a gradual refinement of the concepts and to more sophisticated methods. After the initial overview with an emphasis on the physical concepts and the derivation of results by dimensional analysis, The Physics of Solids deals with the Jellium Model (JM) and the Linear Combination of Atomic Orbitals (LCAO) approaches to solids and introduces the basic concepts and information regarding metals and semiconductors.

Written as a collection of problems, hints and solutions, this book should provide help in learning about both fundamental and applied aspects of this vast field of knowledge, where rapid and exciting developments are taking place.

This text features 182 challenging problems with detailed solutions, textbook references, clear illustrations, and an easy-to-use layout.

This introductory textbook for standard undergraduate courses in thermodynamics has been completely rewritten to explore a greater number of topics, more clearly and concisely. Starting with an overview of important quantum behaviours, the book teaches students how to calculate probabilities in order to provide a firm foundation for later chapters. It introduces the ideas of classical thermodynamics and explores them both in general and as they are applied to specific processes and interactions. The remainder of the book deals with statistical mechanics. Each topic ends with a boxed summary of ideas and results, and every chapter contains numerous homework problems, covering a broad range of difficulties. Answers are given to odd-numbered problems, and solutions to even-numbered problems are available to instructors at www.cambridge.org/9781107694927.

Introducing a unified framework for describing and understanding complex interacting systems common in physics, chemistry, biology, ecology, and the social sciences, this comprehensive overview of dynamic critical phenomena covers the description of systems at thermal equilibrium, quantum systems, and non-equilibrium systems. Powerful mathematical techniques for dealing with complex dynamic systems are carefully introduced, including field-theoretic tools and the perturbative dynamical renormalization group approach, rapidly building up a mathematical toolbox of relevant skills. Heuristic and qualitative arguments outlining the essential theory behind each type of system are introduced at the start of each chapter, alongside real-world numerical and experimental data, firmly linking new mathematical techniques to their practical applications. Each chapter is supported by carefully tailored problems for solution, and comprehensive suggestions for further reading, making this an excellent introduction to critical dynamics for graduate students and researchers across many disciplines within physical and life sciences.

Statistical MechanicsAcademic Press

The Compendium of Theoretical Physics contains the canonical curriculum of

theoretical physics. From classical mechanics over electrodynamics, quantum mechanics and statistical physics/thermodynamics, all topics are treated axiomatic-deductively and confimed by exercises, solutions and short summaries.

This book contains a modern selection of about 200 solved problems and examples arranged in a didactic way for hands-on experience with course work in a standard advanced undergraduate/first-year graduate class in thermodynamics and statistical physics. The principles of thermodynamics and equilibrium statistical physics are few and simple, but their application often proves more involved than it may seem at first sight. This book is a comprehensive complement to any textbook in the field, emphasizing the analogies between the different systems, and paves the way for an in-depth study of solid state physics, soft matter physics, and field theory.

A preeminent physicist unveils a field-defining theory of the origins and purpose of life. Why are we alive? Most things in the universe aren't. And everything that is alive traces back to things that, puzzlingly, weren't. For centuries, the scientific question of life's origins has confounded us. But in Every Life Is on Fire, physicist Jeremy England argues that the answer has been under our noses the whole time, deep within the laws of thermodynamics. England explains how, counterintuitively, the very same forces that tend to tear things apart assembled the first living systems. But how life began isn't just a scientific question. We ask it because we want to know what it really means to be alive. So England, an ordained rabbi, uses his theory to examine how, if at all, science helps us find purpose in a vast and mysterious universe. In the tradition of Viktor Frankl's Man's Search for Meaning, Every Life Is on Fire is a profound testament to how something can come from nothing.

Ray, wave and quantum concepts are central to diverse and seemingly incompatible models of light. Each model particularizes a specific ''manifestation'' of light, and then corresponds to adequate physical assumptions and formal approximations, whose domains of applicability are well-established. Accordingly each model comprises its own set of geometric and dynamic postulates with the pertinent mathematical means. At a basic level, the book is a complete introduction to the Wigner optics, which bridges between ray and wave optics, offering the optical phase space as the ambience and the Wigner function based technique as the mathematical machinery to accommodate between the two opposite extremes of light representation: the localized ray of geometrical optics and the unlocalized wave function of wave optics. At a parallel level, the analogies with other branches of both classical and quantum physics, like classical and quantum mechanics, quantum optics, signal theory as well as magnetic optics, are evidenced by pertinent comments and/or rigorous mathematics. So, the Lie algebra and group methods are introduced and explained through the elementary optical systems within both the ray and wave optics contexts, the former being related to the symplectic group and the latter to

the metaplectic group. In a like manner, the Wigner function is introduced by following the original issue to individualize a phase space representation of quantum mechanics, which is mirrored by the issue to individualize a local frequency spectrum within the signal theory context. The basic analogy with the optics of charged particles inherently underlying the ray-optics picture in phase space is also evidenced within the wave-optics picture in the Wigner phase space. · amalgamation of a great deal of contributions having witnessed the phase space picture of optics over the past 30 years · introduces abstract concepts through concrete systems · hosts of figures and logical diagrams to favour intuition and to introduce mathematics · emphasis on the interrelations with quantum optics, signal theory and magnetic optics · feeds a feeling for genuine issues in higher mathematics and theoretical physics

A primer on Ginzberg-Landau Theory considering common and topological excitations including their thermodynamics and dynamical phenomena.

Following the Boltzmann-Gibbs approach to statistical mechanics, this new edition of Dr ter Haar's important textbook, Elements of Statistical Mechanics, provides undergraduates and more senior academics with a thorough introduction to the subject. Each chapter is followed by a problem section and detailed bibliography. The first six chapters of the book provide a thorough introduction to the basic methods of statistical mechanics and indeed the first four may be used as an introductory course in themselves. The last three chapters offer more detail on the equation of state, with special emphasis on the van der Waals gas; the second-quantisation approach to many-body systems, with an examination of two-time temperature-dependent Green functions; phase transitions, including various approximation methods for treating the Ising model, a brief discussion of the exact solution of the two-dimensional square Ising model, and short introductions to renormalisation group methods and the Yang and Lee theory of phase transitions. In the problem section which follows each chapter the reader is asked to complete proofs of basic theory and to apply that theory to various physical situations. Each chapter bibliography includes papers which are of historical interest. A further help to the reader are the solutions to selected problems which appear at the end of the book.

This book series in the rapidly growing field of computational physics offers up-to-date (submitted to the publisher by electronic mail) reviews for the researcher. The first volume, written by authors from four continents, emphasizes statistical physics. For example, Ising problems are reviewed where theoretical approaches led to contradictory approaches and only quality computing answered who is right. In addition, fields as diverse as neural networks, granular materials, and computer algebra are reviewed. The next volume on percolation and other fields is already in preparation. Contents:Computational Aspects of Damage Spreading (N Jan & L de Arcangelis)Monte Carlo Simulations of Dilute Ising Models (W Selke et al.)Interfacial Dynamics in Disordered Magnets: Relaxation, Critical Dynamics, and Domain Growth (D Chowdhury & B Biswal)Ising System in

Oscillating Field: Hysteretic Response (M Acharyya & B K Chakrabarti)Recent Results on the Decay of Metastable Phases (P A Rikvold & B M Gorman)Multineuron Interaction Effects (R M C de Almeida et al.)Random and Self-Avoiding Walks in Disordered Media (H Nakanishi)Granular Dynamics: A Review About Recent Molecular Dynamics Simulations of Granular Materials (G H Ristow)Symbolic–Numeric Interfaces (M C Dewar) Readership: Computational physicists, theoretical physicists and statistical physicists. keywords:Nucleation;Interface;Damage Spreading;Neural Nets

Using examples from contemporary physics, this textbook clearly explains the mathematics students of physics need for their courses and research.

Treating mechanics through a clearly written introduction of the theory of microscopic bodies based on the fundamental atomic laws, this book contains a brief but self-contained discussion of thermodynamics and the classical kinetic theory of gases. An introduction to the modern theory of critical phenomena is featured that is concise and pedagogically orientated. This second edition contains up-to-date coverage of recent major advances and important applications, such as superfluids and the Quantum Hall Effect. A large part of the text is devoted to selected applications of statistical mechanics and its value as an illustration of calculating techniques.

A number of factors have come together in the last couple of decades to define the emerging interdisciplinary field of structural molecular biology. First, there has been the considerable growth in our ability to obtain atomic-resolution structural data for biological molecules in general, and proteins in particular. This is a result of advances in technique, both in x-ray crystallography, driven by the development of electronic detectors and of synchrotron radiation x-ray sources, and by the development ofNMR techniques which allow for inference of a three-dimensional structure of a protein in solution. Second, there has been the enormous development of techniques in DNA engineering which makes it possible to isolate and clone specific molecules of interest in sufficient quantities to enable structural measurements. In addition, the ability to mutate a given amino acid sequence at will has led to a new branch of biochemistry in which quantitative measurements can be made assessing the influence of a given amino acid on the function of a biological molecule. A third factor, resulting from the exponential increase in computing power available to researchers, has been the emergence of a growing body of people who can take the structural data and use it to build atomic-scale models of biomolecules in order to try and simulate their motions in an aqueous environment, thus helping to provide answers to one of the most basic questions of molecular biology: the relation of structure to function.

Statistical Mechanics explores the physical properties of matter based on the dynamic behavior of its microscopic constituents. After a historical introduction, this book presents chapters about thermodynamics, ensemble theory, simple gases theory, Ideal Bose and Fermi systems, statistical mechanics of interacting systems, phase transitions, and computer simulations. This edition includes new topics such as BoseEinstein condensation and degenerate Fermi gas behavior in ultracold atomic gases and chemical equilibrium. It also explains the correlation functions and scattering; fluctuationdissipation theorem and the dynamical structure factor; phase equilibrium and the Clausius-Clapeyron equation; and exact solutions of one-

dimensional fluid models and two-dimensional Ising model on a finite lattice. New topics can be found in the appendices, including finite-size scaling behavior of Bose-Einstein condensates, a summary of thermodynamic assemblies and associated statistical ensembles, and pseudorandom number generators. Other chapters are dedicated to two new topics, the thermodynamics of the early universe and the Monte Carlo and molecular dynamics simulations. This book is invaluable to students and practitioners interested in statistical mechanics and physics. Bose-Einstein condensation in atomic gases Thermodynamics of the early universe Computer simulations: Monte Carlo and molecular dynamics Correlation functions and scattering Fluctuation-dissipation theorem and the dynamical structure factor Chemical equilibrium Exact solution of the two-dimensional Ising model for finite systems Degenerate atomic Fermi gases Exact solutions of one-dimensional fluid models Interactions in ultracold Bose and Fermi gases Brownian motion of anisotropic particles and harmonic oscillators

The structure of this text is simple and transparent, enabling the easy mapping of the text onto a one-semester course syllabus and the attendant study. There are 8 chapters total and one three-part appendix. Throughout the text the student finds numerous examples (solved problems) reaching from cosmic to molecular evolution or from cloud formation to Bose condensation.

Statistical Thermodynamics of Semiconductor Alloys is the consideration of thermodynamic properties and characteristics of crystalline semiconductor alloys by the methods of statistical thermodynamics. The topics presented in this book make it possible to solve such problems as calculation of a miscibility gap, a spinodal decomposition range, a short-range order, deformations of crystal structure, and description of the order-disorder transitions. Semiconductor alloys, including doped elemental semiconductors are the basic materials of solid-state electronics. Their structural stability and other characteristics are key to determining the reliability and lifetime of devices, making the investigation of stability conditions an important part of semiconductor physics, materials science, and engineering. This book is a guide to predicting and studying the thermodynamic properties and characteristics of the basic materials of solid-state electronics. Includes a complete and detailed consideration of the cluster variation method (CVM) Provides descriptions of spinodal decomposition ranges of crystalline alloys Presents a representation of thermodynamics characteristics and properties as a miscibility gap by using the different approximations of CVM Covers a unique, detailed consideration of the valence force field model with the complete collection of formulas

This book addresses problems in three main developments in modern condensed matter physics– namely topological superconductivity, many-body localization and strongly interacting condensates/superfluids–by employing fruitful analogies from classical mechanics. This strategy has led to tangible results, firstly in superconducting nanowires: the density of states, a smoking gun for the long sought Majorana zero mode is calculated effortlessly by mapping the problem to a textbook-level classical point particle problem. Secondly, in localization theory even the simplest toy models that exhibit many-body localization are mathematically cumbersome and results rely on simulations that are limited by computational power. In this book an alternative viewpoint is developed by describing many-body localization in terms of quantum rotors that have incommensurate rotation frequencies, an exactly solvable system. Finally, the

fluctuations in a strongly interacting Bose condensate and superfluid, a notoriously difficult system to analyze from first principles, are shown to mimic stochastic fluctuations of space-time due to quantum fields. This analogy not only allows for the computation of physical properties of the fluctuations in an elegant way, it sheds light on the nature of space-time. The book will be a valuable contribution for its unifying style that illuminates conceptually challenging developments in condensed matter physics and its use of elegant mathematical models in addition to producing new and concrete results.

Statistical Mechanics, Fourth Edition explores the physical properties of matter based on the dynamic behavior of its microscopic constituents. This valuable textbook introduces the reader to the historical context of the subject before delving deeper into chapters about thermodynamics, ensemble theory, simple gases theory, Ideal Bose and Fermi systems, statistical mechanics of interacting systems, phase transitions, and computer simulations. In the latest revision, the book's authors have updated the content throughout, including new coverage on biophysical applications, updated exercises, and computer simulations. This updated edition will be an indispensable to students and researchers of statistical mechanics, thermodynamics, and physics. Retains the valuable organization and trusted coverage of previous market-leading editions Includes new coverage on biophysical applications and computer simulations Offers Mathematica files for student use and a secure solutions manual for qualified instructors Covers Bose-Einstein condensation in atomic gases, Thermodynamics of the early universe, Computer simulations: Monte Carlo and molecular dynamics, Correlation functions and scattering, Fluctuation-dissipation theorem and the dynamical structure factor, and much more

This book aims to cover a broad range of topics in statistical physics, including statistical mechanics (equilibrium and non-equilibrium), soft matter and fluid physics, for applications to biological phenomena at both cellular and macromolecular levels. It is intended to be a graduate level textbook, but can also be addressed to the interested senior level undergraduate. The book is written also for those involved in research on biological systems or soft matter based on physics, particularly on statistical physics. Typical statistical physics courses cover ideal gases (classical and quantum) and interacting units of simple structures. In contrast, even simple biological fluids are solutions of macromolecules, the structures of which are very complex. The goal of this book to fill this wide gap by providing appropriate content as well as by explaining the theoretical method that typifies good modeling, namely, the method of coarse-grained descriptions that extract the most salient features emerging at mesoscopic scales. The major topics covered in this book include thermodynamics, equilibrium statistical mechanics, soft matter physics of polymers and membranes, non-equilibrium statistical physics covering stochastic processes, transport phenomena and hydrodynamics. Generic methods and theories are described with detailed derivations, followed by applications and examples in biology. The book aims to help the readers build, systematically and coherently through basic principles, their own understanding of nonspecific concepts and theoretical methods, which they may be able to apply to a broader class of biological problems.

This IMA Volume in Mathematics and its Applications MATHEMATICAL APPROACHES TO BIOMOLECULAR STRUCTURE AND DYNAMICS is one of the two

volumes based on the proceedings of the 1994 IMA Sum mer Program on "Molecular Biology" and comprises Weeks 3 and 4 of the four-week program. Weeks 1 and 2 appeared as Volume 81: Genetic Mapping and DNA Sequencing. We thank Jill P. Mesirov, Klaus Schulten, and De Witt Sumners for organizing Weeks 3 and 4 of the workshop and for editing the proceedings. We also take this opportunity to thank the National Institutes of Health (NIH) (National Center for Human Genome Research), the National Science Foundation (NSF) (Biological Instrumen tation and Resources), and the Department of Energy (DOE), whose fi nancial support made the summer program possible. A vner Friedman Robert Gulliver v PREFACE The revolutionary progress in molecular biology within the last 30 years opens the way to full understanding of the molecular structures and mech anisms of living organisms. Interdisciplinary research in mathematics and molecular biology is driven by ever growing experimental, theoretical and computational power. The mathematical sciences accompany and support much of the progress achieved by experiment and computation as well as provide insight into geometric and topological properties of biomolecular structure and processes. This volume consists of a representative sample of the papers presented during the last two weeks of the month-long Institute for Mathematics and Its Applications Summer 1994 Program in Molecular Biology.

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.

'This is an excellent book from which to learn the methods and results of statistical mechanics.' Nature 'A well written graduate-level text for scientists and engineers... Highly recommended for graduate-level libraries.' Choice This highly successful text, which first appeared in the year 1972 and has continued to be popular ever since, has now been brought up-to-date by incorporating the remarkable developments in the field of 'phase transitions and critical phenomena' that took place over the intervening years. This has been done by adding three new chapters (comprising over 150 pages and containing over 60 homework problems) which should enhance the usefulness of the book for both students and instructors. We trust that this classic text, which has been widely acclaimed for its clean derivations and clear explanations, will continue to provide further generations of students a sound training in the methods of statistical physics.

During the last decade there has been a renewed interest in research on supramolecular assemblies in solutions, such as micelles and microemulsions, not only because of their extensive applications in industries dealing with catalysts, detergency, biotechnology, and enhanced oil recovery, but also due to the development of new and more powerful experimental and theoretical tools for probing the microscopic behavior of these systems. Prominent among the array of the newly available experimental techniques are photon correlation spectroscopy, small-angle neutron and X-ray scattering, and neutron spin-echo and nuclear magnetic resonance spectroscopies. On the theoretical side, the traditionally emphasized thermodynamic approach to the study of the phase behavior of self-assembled systems in solutions is gradually being replaced by statistical mechanical studies of semi-micro scopic and microscopic models of the assemblies. Since the statistical mechanical approach demands as its starting point the microscopic struc tural information of the self-assembled system, the experimental determina tion of the structures of micelles and microemulsions becomes of paramount interest. In this regard the scattering techniques mentioned above have played an important role in recent years and will continue to do so in the future. In applying the scattering techniques to the supramolecular species in solution, one cannot often regard the solution to be ideal. This is because the inter-aggregate interaction is often long-ranged since it is coulombic in nature and the interparticle correlations are thus appreciable.

The present book is an outcome of the SERC school on Computational Statistical Physics held at the Indian Institute of Technology, Guwahati, in December 2008. Numerical experimentation has played an extremely important role in statistical physics in recent years. Lectures given at the School covered a large number of topics of current and continuing interest. Based on lectures by active researchers in the field- Bikas Chakrabarti, S Chaplot, Deepak Dhar, Sanjay Kumar, Prabal Maiti, Sanjay Puri, Purusattam Ray, Sitangshu Santra and Subir Sarkar- the nine chapters comprising the book deal with topics that range from the fundamentals of the field, to problems and questions that are at the very forefront of current research. This book aims to expose the graduate student to the basic as well as advanced techniques in computational statistical physics. Following a general introduction to statistical mechanics and critical phenomena, the various chapters cover Monte Carlo and molecular dynamics simulation methodology, along with a variety of applications. These include the study of coarsening phenomena and diffusion in zeolites. /p In addition, graphical enumeration techniques are covered in detail with applications to percolation and polymer physics, and methods for optimisation are also discussed. Beginning graduate students and young researchers in the area of statistical physics will find the book useful. In addition, this will also be a valuable general reference for students and researchers in other areas of science and engineering.

Ons verlangen om te willen weten is oneindig: wat is de oorsprong van het heelal, wat is tijd, wat zijn zwarte gaten, hoe zit de kosmos in elkaar? Deze vragen vormen het uitgangspunt van Carlo Rovelli's Zeven korte beschouwingen over natuurkunde. In dit overzichtelijke boek behandelt hij de belangrijkste ontwikkelingen in de twintigste-eeuwse natuurkunde. Zo bespreekt hij Einsteins relativiteitstheorie, de kwantummechanica en zwarte gaten, de architectuur van het heelal en andere brandende kwesties met betrekking tot de fysische wereld. Carlo Rovelli (1956) is een

gerenommeerd Italiaans natuurkundige en schrijver. Hij is een autoriteit op het gebied van de kwantumgravitatie _ een belangrijk onderwerp in de natuurkunde van dit moment. Rovelli is verbonden aan het Centrum voor theoretische natuurkunde van de Universiteit van Aix-Marseille. Van Zeven korte beschouwingen over natuurkunde zijn in Italië al meer dan 200.000 exemplaren verkocht. ‘Door Carlo Rovelli’s Zeven korte beschouwingen over natuurkunde zijn de relativiteitstheorie en de kwantumfysica veranderd in bestsellermateriaal.’ La Repubblica ‘Natuurkunde wordt altijd al gepopulariseerd, maar professor Rovelli’s boek doet meer: zijn stijl onderscheidt zich doordat die zowel authentiek als aantrekkelijk is, en hij behandelt vraagstukken die zijn lezers werkelijk interesseren.’ Corriere della Sera ‘Net zo ongecompliceerd als de titel impliceert.’ The Guardian

By uniting basic concepts in equilibrium and time-dependent statistical mechanics with modern computational techniques, the book provides a comprehensive view of how theory proceeds from concepts to model construction to practical algorithms.

In Thermal Physics: Thermodynamics and Statistical Mechanics for Scientists and Engineers, the fundamental laws of thermodynamics are stated precisely as postulates and subsequently connected to historical context and developed mathematically. These laws are applied systematically to topics such as phase equilibria, chemical reactions, external forces, fluid-fluid surfaces and interfaces, and anisotropic crystal-fluid interfaces. Statistical mechanics is presented in the context of information theory to quantify entropy, followed by development of the most important ensembles: microcanonical, canonical, and grand canonical. A unified treatment of ideal classical, Fermi, and Bose gases is presented, including Bose condensation, degenerate Fermi gases, and classical gases with internal structure. Additional topics include paramagnetism, adsorption on dilute sites, point defects in crystals, thermal aspects of intrinsic and extrinsic semiconductors, density matrix formalism, the Ising model, and an introduction to Monte Carlo simulation. Throughout the book, problems are posed and solved to illustrate specific results and problem-solving techniques. Includes applications of interest to physicists, physical chemists, and materials scientists, as well as materials, chemical, and mechanical engineers Suitable as a textbook for advanced undergraduates, graduate students, and practicing researchers Develops content systematically with increasing order of complexity Self-contained, including nine appendices to handle necessary background and technical details

This title covers the theoretical basis and practical aspects of the study of dielectric properties of biological systems, such as water, electrolyte and polyelectrolytes, solutions of biological macromolecules, cells suspensions and cellular systems.

This is a textbook for the standard undergraduate-level course in thermal physics. The book explores applications to engineering, chemistry, biology, geology, atmospheric science, astrophysics, cosmology, and everyday life.

Exceptionally articulate treatment of negative temperatures, relativistic effects, black hole thermodynamics, gravitational collapse, much more. Over 100 problems with worked solutions. Geared toward advanced undergraduates and graduate students.

Nikolas Zöller examines the working principles and the underlying theoretical foundations of a microscopic heat engine. In particular, he investigates the system’s stochastic dynamics in the underdamped regime which has hardly been studied in the past, but will be experimentally feasible in the near future due to recent technological

developments. Emphasis is put on the maximization of the engine’s efficiency at maximum power through optimization of the driving protocol. In addition, possible experimental realizations of a microscopic heat engine are discussed.