

Thermodynamics And An Introduction To Thermostatistics Physics

The only text to cover both thermodynamic and statistical mechanics--allowing students to fully master thermodynamics at the macroscopic level. Presents essential ideas on critical phenomena developed over the last decade in simple, qualitative terms. This new edition maintains the simple structure of the first and puts new emphasis on pedagogical considerations. Thermostatistics is incorporated into the text without eclipsing macroscopic thermodynamics, and is integrated into the conceptual framework of physical theory.

This survey of thermal systems engineering combines coverage of thermodynamics, fluid flow, and heat transfer in one volume. Developed by leading educators in the field, this book sets the standard for those interested in the thermal-fluids market. Drawing on the best of what works from market leading texts in thermodynamics (Moran), fluids (Munson) and heat transfer (Incropera), this book introduces thermal engineering using a systems focus, introduces structured problem-solving techniques, and provides applications of interest to all engineers.

A focused look at the principles and applications of thermodynamics Offering a concise, highly focused approach, Sonntag and Borgnakke's Introduction to Engineering Thermodynamics, 2nd Edition is ideally suited for a one-semester course or the first course in a thermal-fluid sciences sequence. Based on their highly successful text, Fundamentals of Thermodynamics, Introduction to Engineering Thermodynamics, 2nd Edition covers both fundamental principles and practical applications in a more student-friendly format. The authors guide students, from readily measured thermodynamic properties through basic concepts like internal energy, entropy, and the first and second laws, up through brief coverage of psychrometrics, power cycles, and an introduction to combustion and heat transfer. Highlights of the Second Edition * New chapter on Chemical Reactions. * Revised coverage of heat transfer, with a stronger emphasis on applications. * New Concept Checkpoints, which allow students to test themselves on how well they understand concepts just presented. * How-to sections at the end of most chapters, which answer commonly asked questions. * Revised examples, illustrations, and homework problems, as well as a large number of new problems. * ThermoNet online tutorials, with accompanying graphics, animations, and video clips. Available online with the registration code in this text. * Computer-Aided Thermodynamic Tables 2 Software (CATT2) by Claus Borgnakke, provides automated table lookup and interpolation of property data for a wide variety of substances. Available for download on the text's website.

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.

"A large number of exercises of a broad range of difficulty make this book even more useful...a good addition to the literature on thermodynamics at the undergraduate level." — Philosophical Magazine Although written on an introductory level, this wide-ranging text provides extensive coverage of topics of current interest in equilibrium statistical mechanics. Indeed, certain traditional topics are given somewhat condensed treatment to allow room for a survey of more recent advances. The book is divided into four major sections. Part I deals with the principles of quantum statistical mechanics and includes discussions of energy levels, states and eigenfunctions, degeneracy and other topics. Part II examines systems composed of independent molecules or of other independent subsystems. Topics range from ideal monatomic gas and monatomic crystals to polyatomic gas and configuration of polymer molecules and rubber elasticity. An examination of systems of interacting molecules comprises the nine chapters in Part III, reviewing such subjects as lattice statistics, imperfect gases and dilute liquid solutions. Part IV covers quantum statistics and includes sections on Fermi-Dirac and Bose-Einstein statistics, photon gas and free-volume theories of quantum liquids. Each chapter includes problems varying in difficulty — ranging from simple numerical exercises to small-scale "research" propositions. In addition, supplementary reading lists for each chapter invite students to pursue the subject at a more advanced level. Readers are assumed to have studied thermodynamics, calculus, elementary differential equations and elementary quantum mechanics. Because of the flexibility of the chapter arrangements, this book especially lends itself to use in a one-or two-semester graduate course in chemistry, a one-semester senior or graduate course in physics or an introductory course in statistical mechanics.

Thermodynamics and an Introduction to Thermostatistics John Wiley & Sons

"Introduction to Chemical Engineering Thermodynamics, 6/e," presents comprehensive coverage of the subject of thermodynamics from a chemical engineering viewpoint. The text provides a thorough exposition of the principles of thermodynamics and details their application to chemical processes. The chapters are written in a clear, logically organized manner, and contain an abundance of realistic problems, examples, and illustrations to help students understand complex concepts. New ideas, terms, and symbols constantly challenge the readers to think and encourage them to apply this fundamental body of knowledge to the solution of practical problems. The comprehensive nature of this book makes it a useful reference both in graduate courses and for professional practice. The sixth edition continues to be an excellent tool for teaching the subject of chemical engineering thermodynamics to undergraduate students.

The laws of thermodynamics the science that deals with energy and its transformation have wide applicability in several branches of engineering and science. The revised edition of this introductory text for undergraduate engineering courses covers the physical concepts of thermodynamics and demonstrates the underlying principles through practical situations. The traditional classical (macroscopic) approach is used in this text. Numerous solved examples and more than 550 unsolved problems (included as chapter-end exercises) will help the reader gain confidence for applying the principles of thermodynamics in real-life problems. Sufficient data needed for solving problems have been included in the appendices.

Statistical thermodynamics plays a vital linking role between quantum theory and chemical thermodynamics, yet students often find the subject unpalatable. In this updated version of a popular text, the authors overcome this by emphasising the concepts involved, in particular demystifying the partition function. They do not get bogged down in the mathematical niceties that are essential for a profound study of the subject but which can confuse the beginner. Strong emphasis is placed on the physical basis of statistical thermodynamics and the relations with

experiment. After a clear exposition of the distribution laws, partition functions, heat capacities, chemical equilibria and kinetics, the subject is further illuminated by a discussion of low-temperature phenomena and spectroscopy. The coverage is brought right up to date with a chapter on computer simulation and a final section which ranges beyond the narrow limits usually associated with student texts to emphasise the common dependence of macroscopic behaviour on the properties of constituent atoms and molecules. Since first published in 1974 as 'Entropy and Energy Levels', the book has been very popular with students. This revised and updated version will no doubt serve the same needs.

An Introduction to Equilibrium Thermodynamics discusses classical thermodynamics and irreversible thermodynamics. It introduces the laws of thermodynamics and the connection between statistical concepts and observable macroscopic properties of a thermodynamic system. Chapter 1 discusses the first law of thermodynamics while Chapters 2 through 4 deal with statistical concepts. The succeeding chapters describe the link between entropy and the reversible heat process concept of entropy; the second law of thermodynamics; Legendre transformations and Jacobian algebra. Finally, Chapter 10 provides an introduction to irreversible thermodynamics. This book will be useful as an introductory text to thermodynamics for engineering students.

Introduction to Applied Thermodynamics is an introductory text on applied thermodynamics and covers topics ranging from energy and temperature to reversibility and entropy, the first and second laws of thermodynamics, and the properties of ideal gases. Standard air cycles and the thermodynamic properties of pure substances are also discussed, together with gas compressors, combustion, and psychrometry. This volume is comprised of 16 chapters and begins with an overview of the concept of energy as well as the macroscopic and molecular approaches to thermodynamics. The following chapters focus on temperature, entropy, and standard air cycles, along with gas compressors, combustion, psychrometry, and the thermodynamic properties of pure substances. Steam and steam engines, internal combustion engines, and refrigeration are also considered. The final chapter is devoted to heat transfer by conduction, radiation, and convection. The transfer of heat energy between fluids flowing through concentric pipes is described. This book will appeal to mechanical engineers and students as well as those interested in applied thermodynamics.

This course-derived undergraduate textbook provides a concise explanation of the key concepts and calculations of chemical thermodynamics. Instead of the usual 'classical' introduction, this text adopts a straightforward postulatory approach that introduces thermodynamic potentials such as entropy and energy more directly and transparently. Structured around several features to assist students' understanding, Chemical Thermodynamics : Develops applications and methods for the ready treatment of equilibria on a sound quantitative basis. Requires minimal background in calculus to understand the text and presents formal derivations to the student in a detailed but understandable way. Offers end-of-chapter problems (and answers) for self-testing and review and reinforcement, of use for self- or group study. This book is suitable as essential reading for courses in a bachelor and master chemistry program and is also valuable as a reference or textbook for students of physics, biochemistry and materials science.

Presents comprehensive coverage of the subject of thermodynamics from a chemical engineering viewpoint. This text provides an exposition of the principles of thermodynamics and details their application to chemical processes. It contains problems, examples, and illustrations to help students understand complex concepts.

Approachable and concise undergraduate textbook introducing the concepts of atmospheric thermodynamics.

Starting with just a few basic principles of probability and the distribution of energy, Introduction to Molecular Thermodynamics takes students on an adventure into the inner workings of the molecular world like no other, from probability to Gibbs energy and beyond, following a logical step-by-step progression of ideas.

This manual contains the complete solution for all the 505 chapter-end problems in the textbook An Introduction to Thermodynamics, and will serve as a handy reference to teachers as well as students. The data presented in the form of tables and charts in the main textbook are made use of in this manual for solving the problems.

CD-ROM contains: "examples related to the text".

This text provides balanced coverage of the basic concepts of thermodynamics and heat transfer. Together with the illustrations, student-friendly writing style, and accessible math, this is an ideal text for an introductory thermal science course for non-mechanical engineering majors.

As the title implies, this book provides an introduction to thermodynamics for students on degree and HND courses in engineering. These courses are placing increased emphasis on business, design, management, and manufacture. As a consequence, the direct class-time for thermodynamics is being reduced and students are encouraged to self learn. This book has been written with this in mind. The text is brief and to the point, with a minimum of mathematical content. Each chapter defines a list of aims and concludes with a short summary. The summary provides an overview of the key words, phrases and equations introduced within the chapter. It is recognized that students see thermodynamics as a problem-solving activity and this is reflected by the emphasis on the modelling of situations. As a guide to problem solving, worked examples are included throughout the book. In addition, students are encouraged to work through the problems at the end of each chapter, for which outline solutions are provided. There is a certain timelessness about thermodynamics because the fundamentals do not change. However, there is currently some debate over which sign convention should apply to work entering, or leaving, a thermodynamic system. I have retained the traditional convention of work out of a system being positive. This fits in with the concept of a heat engine as a device that takes in heat and, as a result, produces positive work.

This book, now in its second edition, continues to provide a comprehensive introduction to the principles of chemical engineering thermodynamics and also introduces the student to the application of principles to various practical areas. The book emphasizes the role of the fundamental principles of thermodynamics in the derivation of significant relationships between the various thermodynamic properties. The initial chapter provides an overview of the basic concepts and processes, and discusses the important units and dimensions involved. The ensuing chapters, in a logical presentation, thoroughly cover the first and second laws of thermodynamics, the heat effects, the thermodynamic properties and their relations, refrigeration and liquefaction processes, and the equilibria between phases and in chemical reactions. The book is suitably illustrated with a large number of visuals. In the second edition, new sections on Quasi-Static Process and Entropy Change in Reversible and Irreversible Processes are included. Besides, new Solved Model Question Paper and several new Multiple Choice Questions are also added that help develop the students' ability and confidence in the application of the underlying concepts. Primarily intended for the undergraduate students of chemical engineering and other related engineering disciplines such as polymer, petroleum and pharmaceutical engineering, the book will also be useful for the postgraduate students of the subject as well as professionals in the relevant fields.

Designed for pharmacy students Now updated for its Second Edition, Thermodynamics of Pharmaceutical Systems provides pharmacy students with a much-needed introduction to the mathematical

intricacies of thermodynamics in relation to practical laboratory applications. Designed to meet the needs of the contemporary curriculum in pharmacy schools, the text makes these connections clear, emphasizing specific applications to pharmaceutical systems including dosage forms and newer drug delivery systems. Students and practitioners involved in drug discovery, drug delivery, and drug action will benefit from Connors' and Mecozzi's authoritative treatment of the fundamentals of thermodynamics as well as their attention to drug molecules and experimental considerations. They will appreciate, as well, the significant revisions to the Second Edition. Expanding the book's scope and usefulness, the new edition: Explores in greater depth topics most relevant to the pharmacist such as drug discovery and drug delivery, supramolecular chemistry, molecular recognition, and nanotechnologies Moves the popular review of mathematics, formerly an appendix, to the front of the book Adds new textual material and figures in several places, most notably in the chapter treating noncovalent chemical interactions Two new appendices provide ancillary material that expands on certain matters bordering the subject of classical thermodynamics Thermodynamics need not be a mystery nor confined to the realm of mathematical theory. Thermodynamics of Pharmaceutical Systems, Second Edition demystifies for students the profound thermodynamic applications in the laboratory while also serving as a handy resource for practicing researchers.

- Calculations approach: Strong mathematical rigor has been applied, and a complementary physical treatment given, to make students strong in the applied aspects of thermodynamics
- Problem solving presentation: 195 solved examples and 269 unsolved problems have been given. Hints to difficult problems have been give too.
- Concept checking Review Questions have been given at the end of every chapter
- Coverage on thermodynamic discussion of eutectics, solid solutions and phase separation

This is a self-contained, concise, rigorous book introducing the reader to the basics of atmospheric thermodynamics. This new edition has been brought completely up to date and reorganized to improve the quality and flow of the material. The introductory chapters provide definitions and useful mathematical and physical notes to help readers understand the basics. The book then describes the topics relevant to atmospheric processes, including the properties of moist air and atmospheric stability. It concludes with a brief introduction to the problem of weather forecasting and the relevance of thermodynamics. Each chapter contains worked examples and student exercises, with solutions available to instructors on a password protected website at www.cambridge.org/9780521796767. The author has taught atmospheric thermodynamics for over 20 years and is a highly respected researcher. This book is an ideal text for short undergraduate courses taken as part of an atmospheric science, meteorology, physics or natural science program.

This text presents statistical mechanics and thermodynamics as a theoretically integrated field of study. It stresses deep coverage of fundamentals, providing a natural foundation for advanced topics. The large problem sets (with solutions for teachers) include many computational problems to advance student understanding.

Imparts the similarities and differences between ratified and condensed matter, classical and quantum systems as well as real and ideal gases. Presents the quasi-thermodynamic theory of gas-liquid interface and its application for density profile calculation within the van der Waals theory of surface tension. Uses inductive logic to lead readers from observation and facts to personal interpretation and from specific conclusions to general ones.

The first comprehensive graduate-level introduction to stochastic thermodynamics Stochastic thermodynamics is a well-defined subfield of statistical physics that aims to interpret thermodynamic concepts for systems ranging in size from a few to hundreds of nanometers, the behavior of which is inherently random due to thermal fluctuations. This growing field therefore describes the nonequilibrium dynamics of small systems, such as artificial nanodevices and biological molecular machines, which are of increasing scientific and technological relevance. This textbook provides an up-to-date pedagogical introduction to stochastic thermodynamics, guiding readers from basic concepts in statistical physics, probability theory, and thermodynamics to the most recent developments in the field. Gradually building up to more advanced material, the authors consistently prioritize simplicity and clarity over exhaustiveness and focus on the development of readers' physical insight over mathematical formalism. This approach allows the reader to grow as the book proceeds, helping interested young scientists to enter the field with less effort and to contribute to its ongoing vibrant development. Chapters provide exercises to complement and reinforce learning. Appropriate for graduate students in physics and biophysics, as well as researchers, Stochastic Thermodynamics serves as an excellent initiation to this rapidly evolving field. Emphasizes a pedagogical approach to the subject Highlights connections with the thermodynamics of information Pays special attention to molecular biophysics applications Privileges physical intuition over mathematical formalism Solutions manual available on request for instructors adopting the book in a course

One of the goals of An Introduction to Applied Statistical Thermodynamics is to introduce readers to the fundamental ideas and engineering uses of statistical thermodynamics, and the equilibrium part of the statistical mechanics. This text emphasises on nano and bio technologies, molecular level descriptions and understandings offered by statistical mechanics. It provides an introduction to the simplest forms of Monte Carlo and molecular dynamics simulation (albeit only for simple spherical molecules) and user-friendly MATLAB programs for doing such simulations, and also some other calculations. The purpose of this text is to provide a readable introduction to statistical thermodynamics, show its utility and the way the results obtained lead to useful generalisations for practical application. The text also illustrates the difficulties that arise in the statistical thermodynamics of dense fluids as seen in the discussion of liquids.

Maintaining the substance that made Introduction to the Thermodynamic of Materials a perennial best seller for decades, this Sixth Edition is updated to reflect the broadening field of materials science and engineering. The new edition is reorganized into three major sections to align the book for practical coursework, with the first (Thermodynamic Principles) and second (Phase Equilibria) sections aimed at use in a one semester undergraduate course. The third section (Reactions and Transformations) can be used in other courses of the curriculum that deal with oxidation, energy, and phase transformations. The book is updated to include the role of work terms other than PV work (e.g., magnetic work) along with their attendant aspects of entropy, Maxwell equations, and the role of such applied fields on phase diagrams. There is also an increased emphasis on the thermodynamics of phase transformations and the Sixth Edition features an entirely new chapter 15 that links specific thermodynamic applications to the study of phase transformations. The book also features more than 50 new end of chapter problems and more than 50 new figures.

This textbook facilitates students' ability to apply fundamental principles and concepts in classical thermodynamics to solve challenging problems relevant to industry and everyday life. It also introduces the reader to the fundamentals of statistical mechanics, including understanding how the microscopic properties of atoms and molecules, and their associated intermolecular interactions, can be accounted for to calculate various average properties of macroscopic systems. The author emphasizes application of the fundamental principles outlined above to the calculation of a variety of thermodynamic properties, to

the estimation of conversion efficiencies for work production by heat interactions, and to the solution of practical thermodynamic problems related to the behavior of non-ideal pure fluids and fluid mixtures, including phase equilibria and chemical reaction equilibria. The book contains detailed solutions to many challenging sample problems in classical thermodynamics and statistical mechanics that will help the reader crystallize the material taught. Class-tested and perfected over 30 years of use by nine-time Best Teaching Award recipient Professor Daniel Blankschtein of the Department of Chemical Engineering at MIT, the book is ideal for students of Chemical and Mechanical Engineering, Chemistry, and Materials Science, who will benefit greatly from in-depth discussions and pedagogical explanations of key concepts. Distills critical concepts, methods, and applications from leading full-length textbooks, along with the author's own deep understanding of the material taught, into a concise yet rigorous graduate and advanced undergraduate text; Enriches the standard curriculum with succinct, problem-based learning strategies derived from the content of 50 lectures given over the years in the Department of Chemical Engineering at MIT; Reinforces concepts covered with detailed solutions to illuminating and challenging homework problems.

"Introduction to Chemical Engineering Thermodynamics presents comprehensive coverage of the subject of thermodynamics from a chemical engineering viewpoint. The text provides a thorough exposition of the principles of thermodynamics, and details their application to chemical processes. The content is structured to alternate between the development of thermodynamic principles and the correlation and use of thermodynamic properties as well as between theory and applications. The chapters are written in a clear, logically organized manner, and contain an abundance of realistic problems, examples, and illustrations to help students understand complex concepts. New ideas, terms, and symbols constantly challenge the readers to think and encourage them to apply this fundamental body of knowledge to the solution of practical problems"--Publisher's website.

Among the many laws of science, there are four laws that direct and constrain everything that happens in the Universe. From the sudden expansion of a cloud of gas to the unfurling of a leaf they help us understand the course of life itself. In this Very Short Introduction Peter Atkins' explains what the four laws are and how they work.

From the sudden expansion of a cloud of gas or the cooling of a hot metal, to the unfolding of a thought in our minds and even the course of life itself, everything is governed by the four Laws of Thermodynamics. These laws specify the nature of 'energy' and 'temperature', and are soon revealed to reach out and define the arrow of time itself: why things change and why death must come. In this Very Short Introduction Peter Atkins explains the basis and deeper implications of each law, highlighting their relevance in everyday examples. Using the minimum of mathematics, he introduces concepts such as entropy, free energy, and to the brink and beyond of the absolute zero temperature. These are not merely abstract ideas: they govern our lives. In this concise and compelling introduction Atkins paints a lucid picture of the four elegant laws that, between them, drive the Universe. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

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