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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. 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. 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. Very Good, No Highlights or Markup, all pages are intact. The laws of thermodynamics have wide ranging practical applications in all branches of engineering. This invaluable textbook covers all the subject matter in a typical undergraduate course in engineering thermodynamics, and uses carefully chosen worked examples and problems to expose students to diverse applications of thermodynamics. This new edition has been revised and updated to include two new chapters on thermodynamic property relations, and the statistical interpretation of entropy. Problems with numerical answers are included at the end of each chapter. As a guide, instructors can use the examples and problems in tutorials, quizzes and examinations. Request Inspection Copy Provides an essential treatment of the subject and rigorous methods to solve all kinds of energy engineering problems. This book covers the essential theories of thermodynamics supported by a large number of solved examples to enhance the vision of the students towards application of thermodynamics in engineering practice. In this book, the author has addressed the subtleties of the subject matter where

students feel uncomfortable, drawing on his more than two decades of experience of teaching at undergraduate and postgraduate levels. The book has evolved from class lecture notes prepared over the years, while teaching the subject and therefore presents the subject in a coherent and logical manner, covering all the nuance of the subject. The whole book is divided into nine chapters, which covers all the fundamental concepts of Zeroth, First and Second Laws of Thermodynamics, Thermodynamic relations, the concept of Availability, Exergy and vapour, Gas power cycles, and Thermodynamic potential. The book is written in simple and lucid language and shall meet the requirements of undergraduate students of engineering and technology studying in various institutes/universities across the globe. Designed for use in a standard two-semester engineering thermodynamics course sequence. The first half of the text contains material suitable for a basic Thermodynamics course taken by engineers from all majors. The second half of the text is suitable for an Applied Thermodynamics course in mechanical engineering programs. The text has numerous features that are unique among engineering textbooks,

including historical vignettes, critical thinking boxes, and case studies. All are designed to bring real engineering applications into a subject that can be somewhat abstract and mathematical. Over 200 worked examples and more than 1,300 end of chapter problems provide the use opportunities to practice solving problems related to concepts in the text. Provides the reader with clear presentations of the fundamental principles of basic and applied engineering thermodynamics. Helps students develop engineering problem solving skills through the use of structured problem-solving techniques. Introduces the Second Law of Thermodynamics through a basic entropy concept, providing students a more intuitive understanding of this key course topic. Covers Property Values before the First Law of Thermodynamics to ensure students have a firm understanding of property data before using them. Over 200 worked examples and more than 1,300 end of chapter problems offer students extensive opportunity to practice solving problems. Historical Vignettes, Critical Thinking boxes and Case Studies throughout the book help relate abstract concepts to actual engineering applications. For greater

instructor flexibility at exam time, thermodynamic tables are provided in a separate accompanying booklet. Available online testing and assessment component helps students assess their knowledge of the topics. Email textbooks@elsevier.com for details. Human thermal comfort, namely in the areas of heating, ventilation and air conditioning (collectively known as 'HVAC'), is ubiquitous wherever human habitation may be found. Today, a large portion of the developed world's current energy demands are used to artificially keep the temperatures of our environments comfortable. It is therefore imperative for everyone, decision-makers and engineers alike, involved with the future of energy to be appropriately acquainted with HVAC. Lecture Notes on Engineering Human Thermal Comfort explains the quintessence of engineering human thermal comfort through straight-forward writing designed to help students better comprehend the materials presented. Illustrative figures, anecdotal banter, and ironical analogies interject the necessary technical humdrum to provide timeous stimuli in the midst of arduous technical details. This book is primarily for senior undergraduate engineering students

interested in engineering human thermal comfort. It invokes some undergraduate knowledge of thermodynamics, heat transfer, and fluid mechanics as needed, to enable students to appreciate thermal comfort engineering without the need to seek out other textbooks. *Modern Engineering Thermodynamics - Textbook with Tables* Booklet offers a problem-solving approach to basic and applied engineering thermodynamics, with historical vignettes, critical thinking boxes and case studies throughout to help relate abstract concepts to actual engineering applications. It also contains applications to modern engineering issues. This textbook is designed for use in a standard two-semester engineering thermodynamics course sequence, with the goal of helping students develop engineering problem solving skills through the use of structured problem-solving techniques. The first half of the text contains material suitable for a basic Thermodynamics course taken by engineers from all majors. The second half of the text is suitable for an Applied Thermodynamics course in mechanical engineering programs. The Second Law of Thermodynamics is introduced through a basic entropy concept, providing students a more

intuitive understanding of this key course topic. Property Values are discussed before the First Law of Thermodynamics to ensure students have a firm understanding of property data before using them. Over 200 worked examples and more than 1,300 end of chapter problems provide an extensive opportunity to practice solving problems. For greater instructor flexibility at exam time, thermodynamic tables are provided in a separate accompanying booklet. University students in mechanical, chemical, and general engineering taking a thermodynamics course will find this book extremely helpful. Provides the reader with clear presentations of the fundamental principles of basic and applied engineering thermodynamics. Helps students develop engineering problem solving skills through the use of structured problem-solving techniques. Introduces the Second Law of Thermodynamics through a basic entropy concept, providing students a more intuitive understanding of this key course topic. Covers Property Values before the First Law of Thermodynamics to ensure students have a firm understanding of property data before using them. Over 200 worked examples and more than 1,300 end of chapter problems

offer students extensive opportunity to practice solving problems. Historical Vignettes, Critical Thinking boxes and Case Studies throughout the book help relate abstract concepts to actual engineering applications. For greater instructor flexibility at exam time, thermodynamic tables are provided in a separate accompanying booklet. Energy-its discovery, its availability, its use-concerns all of us in general and the engineers of today and tomorrow in particular. The study of thermodynamics-the science of energy-is a critical element in the education of all types of engineers. Engineering Thermodynamics provides a thorough introduction to the art and science of engineering thermodynamics. It describes in a straightforward fashion the basic tools necessary to obtain quantitative solutions to common engineering applications involving energy and its conversion, conservation, and transfer. This book is directed toward sophomore, junior, and senior students who have studied elementary physics and calculus and who are majoring in mechanical engineering; it serves as a convenient reference for other engineering disciplines as well. The first part of the book is

devoted to basic thermodynamic principles, essentially presented in the classic way; the second part applies these principles to many situations, including air conditioning and the interpretation of statistical phenomena. 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. This leading text in the field maintains its engaging, readable style while presenting a broader range of applications that motivate engineers to learn the core thermodynamics concepts. Two new coauthors

help update the material and integrate engaging, new problems. Throughout the chapters, they focus on the relevance of thermodynamics to modern engineering problems. Many relevant engineering based situations are also presented to help engineers model and solve these problems. Intended as a textbook for "applied" or engineering thermodynamics, or as a reference for practicing engineers, the book uses extensive in-text, solved examples and computer simulations to cover the basic properties of thermodynamics. Pure substances, the first and second laws, gases, psychrometrics, the vapor, gas and refrigeration cycles, heat transfer, compressible flow, chemical reactions, fuels, and more are presented in detail and enhanced with practical applications. This version presents the material using SI Units and has ample material on SI conversion, steam tables, and a Mollier diagram. A CD-ROM, included with the print version of the text, includes a fully functional version of QuickField (widely used in industry), as well as numerous demonstrations and simulations with MATLAB, and other third party software. Prof. Newman is considered one of the great chemical engineers of his

time. His reputation derives from his mastery of all phases of the subject matter, his clarity of thought, and his ability to reduce complex problems to their essential core elements. He is a member of the National Academy of Engineering, Washington, DC, USA, and has won numerous national awards including every award offered by the Electrochemical Society, USA. His motto, as known by his colleagues, is "do it right the first time." He has been teaching undergraduate and graduate core subject courses at the University of California, Berkeley (UC Berkeley), USA, since joining the faculty in 1966. His method is to write out, in long form, everything he expects to convey to his class on a subject on any given day. He has maintained and updated his lecture notes from notepad to computer throughout his career. This book is an exact reproduction of those notes. This book presents concepts needed to define single- and multi-component systems, starting with the Gibbs function. It helps readers derive concepts of entropy and temperature and the development of material properties of pure substances. It acquaints them with applications of thermodynamics, such as cycles, open systems, and phase transitions,

and eventually leads them to concepts of multiple-component systems, in particular, chemical equilibria and phase equilibria. It covers topics such as the interconversion of mechanical and thermal energy, processes involving compression of gases, the Carnot and practical refrigeration cycles, the liquefaction of gases, Joule-Kelvin expansion, Amagat's law, Dalton's law, the virial equation, Redlich-Kwong and van der Waals equation of state, Gibbs' phase rule, Gibbs' mixing rule, fugacity coefficient, and activity coefficient and discusses a multitude of examples of different systems at work. It clearly presents all concepts that are necessary for engineers. "In response to the growing economic and technological importance of polymers, ceramics, and semi-conductors, many materials science and engineering as they apply to all the classes of materials."--Back cover. Using a classical viewpoint, this Second Edition offers a comprehensive treatment of engineering thermodynamics in order to provide a sound basis for subsequent courses in heat transfer and fluid mechanics and to prepare students to use thermodynamics in professional practice. New features include

more than 1300 end-of-chapter problems ranging from confidence-building exercises to more challenging issues that may involve systems with several components, including numerous problems requiring the use of a computer; over 100 design and open-ended problems which are intended as brief design experiences affording students opportunities to develop their engineering judgment and creativity; the International Temperature Scale and refrigerant material; plus interactive software designed to reinforce important ideas and hone students' problem-solving skills. Statistical physics has its origins in attempts to describe the thermal properties of matter in terms of its constituent particles, and has played a fundamental role in the development of quantum mechanics. Based on lectures taught by Professor Kardar at MIT, this textbook introduces the central concepts and tools of statistical physics. It contains a chapter on probability and related issues such as the central limit theorem and information theory, and covers interacting particles, with an extensive description of the van der Waals equation and its derivation by mean field approximation. It also contains an integrated set of problems, with solutions

to selected problems at the end of the book and a complete set of solutions is available to lecturers on a password protected website at www.cambridge.org/9780521873420. A companion volume, *Statistical Physics of Fields*, discusses non-mean field aspects of scaling and critical phenomena, through the perspective of renormalization group.

Engineering Thermodynamics has been designed for students of all branches of engineering specially undergraduate students of Mechanical Engineering. The book will also serve as reference manual for practising engineers. The book has been written in simple language and systematically develops the concepts and principles essential for understanding the subject. The text has been supplemented with solved numerical problems, illustrations and question banks. The present book has been divided in five parts:

- Thermodynamic Laws and Relations
- Properties of Gases and Vapours
- Thermodynamics Cycles
- Heat Transfer and Heat Exchangers
- Annexures

The book is designed for students taking introductory and intermediate thermodynamics within degree and HND courses in mechanical engineering, chemical engineering and process engineering. The text provides a progressive development of ideas together

with progress questions placed at regular intervals throughout the material. If a Writer would know how to behave himself with relation to Posterity; let him consider in old Books, what he finds, that he is glad to know; and what Omissions he most laments.

Jonathan Swift This book emerges from a long story of teaching. I taught chemical engineering thermodynamics for about ten years at the University of Naples in the 1960s, and I still remember the awkwardness that I felt about any textbook I chose to consider—all of them seemed to be vague at best, and the standard of logical rigor seemed immensely inferior to what I could find in books on such other of the students in my first class subjects as calculus and fluid mechanics. One (who is now Prof. F. Gioia of the University of Naples) once asked me a question which I have used here as Example 4. 2—more than 20 years have gone by, and I am still waiting for a more intelligent question from one of my students. At the time, that question compelled me to answer in a way I didn't like, namely "I'll think about it, and I hope I'll have the answer by the next time we meet. " I didn't have it that soon, though I did manage to have it before the

end of the course. This introductory text is appropriate for the first course in engineering thermodynamics. Its beginning chapter outlines different engineering systems, illustrating the usefulness of engineering thermodynamics. Real-world applications are used to show the power of thermodynamics. Engineering Thermodynamics is a core course for students majoring in Mechanical and Aerospace Engineering. Before taking this course, students usually have learned Engineering Mechanics—Statics and Dynamics, and they are used to solving problems with calculus and differential equations. Unfortunately, these approaches do not apply for Thermodynamics. Instead, they have to rely on many data tables and graphs to solve problems. In addition, many concepts are hard to understand, such as entropy. Therefore, most students feel very frustrated while taking this course. The key concept in Engineering Thermodynamics is state-properties: If one knows two properties, the state can be determined, as well as the other four properties. Unlike most textbooks, the first two chapters of this book introduce thermodynamic properties and laws with the ideal gas model, where equations can be engaged. In this way,

students can employ their familiar approaches, and thus can understand them much better. In order to help students understand entropy in depth, interpretation with statistical physics is introduced. Chapters 3 and 4 discuss control-mass and control-volume processes with general fluids, where the data tables are used to solve problems. Chapter 5 covers a few advanced topics, which can also help students understand the concepts in thermodynamics from a broader perspective. *Thermodynamics in Materials Science, Second Edition* is a clear presentation of how thermodynamic data is used to predict the behavior of a wide range of materials, a crucial component in the decision-making process for many materials science and engineering applications. This primary textbook accentuates the integration of principles, strategies, and data. The present book covers essential material in thermodynamics. It is aimed at those students who desire a fundamental understanding of the subject of thermodynamics and provides them with the ability of solving engineering problems related to thermodynamics. Part I, consisting of Lectures 1 and 2, provides a brief overview of the subject of

thermodynamics, the generality, the applicability, and how it's related to the composition of matter. Dimensions and units of various quantities, the definitions of a system, the boundary, the surroundings, and constraints, as well as thermodynamic states, properties, and processes are also introduced. Part II, consisting of Lectures 3 through 9, covers in more detail properties, laws, systems and processes. Various properties of matter are discussed along with the concepts of energy, work, heat, and mass and energy balances in steady state and transient analyses. The second law of thermodynamics is also introduced and entropy relations for compressible, incompressible, and ideal gas systems are provided. In addition, entropy change in systems, and efficiencies of isentropic processes of various components utilized in thermodynamic cycles are also discussed. Part III consists of Lectures 10 through 14 and deals with thermodynamic cycles. Basic concepts, such as the maximum work theorem, the Carnot engine and its efficiency, heat engine cycles, the endoreversible engine, vapor power cycles, gas power cycles, and refrigeration and heat pump cycles are covered. Part IV, consisting of Lectures 15

through 17, deals with the subjects of mixtures and psychrometrics. Basic concepts, the evaluation of compositions, the Dalton and Amagat models, mixture properties, psychrometric charts, air conditioning systems, and their processes are discussed. Offering a concise overview of the most critical concepts of thermodynamics, the volume is ideal for those new to the field or requiring a refresher. This textbook is written for junior-level mechanical engineering students taking their first two courses in thermodynamics. Basic balances of mass, energy, availability and entropy are stressed. The concept of availability is introduced early and integrated throughout the book. By discarding the classical approach and placing more emphasis on second-law analysis, a better understanding of the second law is obtained. Orderly problem-solving techniques, systems (closed and open), property diagrams and units are emphasized. This book provides the foundations of analytical thermodynamics for graduate level. The content is based on the author's lecture notes developed over 30 years of academic teaching. It aims to present thermodynamics to the readers as easy to understand as possible, being

suitable for professors teaching advanced thermodynamics or graduate students learning thermodynamics. The chapters include the basics of analytical thermodynamics, modelling of homogeneous and heterogeneous systems, thermodynamics of interfaces and three-phase contact lines and the Second Law in engineering thermodynamics. This textbook comprehensively covers the fundamentals and advanced concepts of thermodynamics in a single volume. It provides a detailed discussion of advanced concepts that include energy efficiency, energy sustainability, energy security, organic Rankine cycle, combined cycle power plants, combined cycle power plant integrated with organic Rankine cycle and absorption refrigeration system, integrated coal gasification combined cycle power plants, energy conservation in domestic refrigerators, and next-generation low-global warming potential refrigerants. Pedagogical features include solved problems and unsolved exercises interspersed throughout the text for better understanding. This textbook is primarily written for senior undergraduate students in the fields of mechanical, automobile, chemical, civil, and aerospace engineering for courses on engineering

thermodynamics/thermodynamics and for graduate students in thermal engineering and energy engineering for courses on advanced thermodynamics. It is accompanied by teaching resources, including a solutions manual for instructors. FEATURES Provides design and experimental problems for better understanding Comprehensively discusses power cycles and refrigeration cycles and their advancements Explores the design of energy-efficient buildings to reduce energy consumption Property tables, charts, and multiple-choice questions comprise appendices of the book and are available at <https://www.routledge.com/9780367646288>. Tough Test Questions? Missed Lectures? Not Enough Time? Fortunately for you, there's Schaum's Outlines. More than 40 million students have trusted Schaum's to help them succeed in the classroom and on exams. Schaum's is the key to faster learning and higher grades in every subject. Each Outline presents all the essential course information in an easy-to-follow, topic-by-topic format. You also get hundreds of examples, solved problems, and practice exercises to test your skills. This Schaum's Outline gives you Practice problems with full explanations that reinforce knowledge

Coverage of the most up-to-date developments in your course field In-depth review of practices and applications Fully compatible with your classroom text, Schaum's highlights all the important facts you need to know. Use Schaum's to shorten your study time-and get your best test scores! Schaum's Outlines-Problem Solved. Moran's Principles of Engineering Thermodynamics, SI Version, continues to offer a comprehensive and rigorous treatment of classical thermodynamics, while retaining an engineering perspective. With concise, applications-oriented discussion of topics and self-test problems, this book encourages students to monitor their own learning. This classic text provides a solid foundation for subsequent studies in fields such as fluid mechanics, heat transfer and statistical thermodynamics, and prepares students to effectively apply thermodynamics in the practice of engineering. This edition is revised with additional examples and end-of-chapter problems to increase student comprehension. This Book Presents A Systematic Account Of The Concepts And Principles Of Engineering Thermodynamics And The Concepts And Practices Of Thermal Engineering. The Book Covers Basic Course Of

Engineering Thermodynamics And Also Deals With The Advanced Course Of Thermal Engineering. This Book Will Meet The Requirements Of The Undergraduate Students Of Engineering And Technology Undertaking The Compulsory Course Of Engineering Thermodynamics. The Subject Matter Of Book Is Sufficient For The Students Of Mechanical Engineering/Industrial-Production Engineering, Aeronautical Engineering, Undertaking Advanced Courses In The Name Of Thermal Engineering/Heat Engineering/ Applied Thermodynamics Etc. Presentation Of The Subject Matter Has Been Made In Very Simple And Understandable Language. The Book Is Written In SI System Of Units And Each Chapter Has Been Provided With Sufficient Number Of Typical Numerical Problems Of Solved And Unsolved Questions With Answers. Prof. Newman is considered one of the great chemical engineers of his time. His reputation derives from his mastery of all phases of the subject matter, his clarity of thought, and his ability to reduce complex problems to their essential core elements. He has been teaching undergraduate and graduate core subject courses at the University of California, Berkeley (UC Berkeley), USA, since joining the faculty in

1966. His method is to write out, in long form, everything he expects to convey to his class on a subject on any given day. He has maintained and updated his lecture notes from notepad to computer throughout his career. This book is an exact reproduction of those notes. The book presents concepts needed to define single- and multi-component systems, starting with the Gibbs function. It helps readers derive concepts of entropy and temperature and the development of material properties of pure substances. It acquaints them with applications of thermodynamics, such as cycles, open systems, and phase transitions, and eventually leads them to concepts of multiple-component systems, in particular, chemical and phase equilibria. It clearly presents all concepts that are necessary for engineers. This textbook provides a strong foundation in the basic thermodynamics needed to analyze real-world engineering applications of thermodynamics in the field of energy systems. Written in a format readable to students new to the subject, this book will also help entrepreneurs venturing into the world of energy and power without a background in mechanical engineering. This book presents the basic

theories of thermodynamics by focusing on the application of the subject matter to the most common applications of thermodynamics. It takes real-world problems from the author's over 40 years of experience as a practical, professional engineer and provides in-depth solutions to each problem using concepts the student has learned from earlier chapters. The case studies provide both examples of how thermodynamics is used in state-of-the-art tools to solve the case studies' problems, as well as ideas for future energy-efficient systems.

Related Link(s) Mechanical Engineering

The present book covers material in intermediate thermodynamics. It is aimed at those students who desire a deep fundamental understanding of the subject of thermodynamics. It is assumed that the student is familiar with differential equations and has completed a first course in thermodynamics. The material covered in the book is in four parts. In Part I, consisting of Lectures 1 and 2, we cover fundamental concepts of thermodynamics. These lectures provide a brief overview of the subject of thermodynamics, the generality, the applicability, how it's related to the composition of matter, and

the laws of thermodynamics. Dimensions and units of various quantities, the definitions of a system, the boundary, the surroundings, constraints, and processes, as well as thermodynamic postulates which lead to the definition of entropy, the fundamental relation, and the energy minimum principle are also introduced in these lectures. Part II, consisting of Lectures 3 through 9, covers the theoretical basis of thermodynamics. Lecture 3 discusses the fundamental relation, the Euler equation, the equations of state, as well as the equilibrium state. Lecture 4 discusses the Gibbs-Duhem relation, molar coordinates, the ideal gas, generalized compressibility, and the virial equations of state. Lecture 5 provides an application of basic concepts to obtain the fundamental relation of the van der Waals fluid. Additional forms of the fundamental relation which are more useful in applications (the Helmholtz free energy, the enthalpy, and the Gibbs free energy), obtained via Legendre transformations, and a discussion on the chemical potential are given in Lectures 6 and 7. Lecture 8 discusses the number of properties necessary to fully describe a system, and the relationship between Maxwell relations and

the restrictions on such properties. Lastly, Lecture 9 discusses the concept of thermodynamic stability and the Le Chatelier and Le Chatelier-Braun principles. Part III consists of Lectures 10 through 14 and deals with phase transitions, mixtures, solutions, and excess functions. Phases, phase transitions, latent heat, the Clapeyron equation, and the Gibbs phase rule are covered in Lectures 10 and 11. Lectures 12 and 13 deal with ideal and non-ideal gas mixtures and solutions. Lecture 14 provides a discussion of the concept of mixing and excess functions. Part IV, consisting of Lectures 15 through 17, covers chemical reactions and combustion. Lecture 15 deals with chemical reactions of ideal gases, the equilibrium constant, the law of mass action, the energy of formation, and the heat release from reactions. Lectures 16 and 17 cover fundamental concepts of combustion including the mass and energy balances in open and closed systems. Two appendices are included to aid the understanding of some fundamental concepts. Appendix A discusses the relationship between the macroscopic view of thermodynamics and the microscopic mechanical view and how the two are connected through statistics. Appendix B

provides a clear explanation of Legendre transformations which are necessary to obtain alternate forms of the fundamental relation. Offering a concise overview of the most critical concepts of thermodynamics, the volume is ideal for those desiring a deeper understanding of the subject.

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