



Modern Thermodynamics: From Heat Engines to Dissipative Structures

Dilip Kondepudi, Ilya Prigogine

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Thermodynamics is a core part of most science and engineering curricula. However, most texts that are currently available to students still treat thermodynamics very much as it was presented in the 19th century, generally for historical rather than pedagogical reasons. Modern Thermodynamics takes a different approach, and deals with the relationship between irreversible processes and entropy. The relationship between irreversible processes and entropy is introduced early on, enabling the reader to benefit from seeing the relationship in such processes as heat conduction and chemical reactions. This text presents thermodynamics in a contemporary and exciting manner, with a wide range of applications, and many exercises and examples. Students are also encouraged to use computers through the provision of Mathematica code and Internet / WWW addresses where real data and additional information can be found. FEATURES A truly modern approach to thermodynamics, presenting it as a science of irreversible processes whilst avoiding dividing the subject into equilibrium and non-equilibrium thermodynamics. An extensive range of applications drawn from science and engineering, along with many real world examples, and exercises. Written by two well-known authors, of whom Professor Ilya Prigogine was awarded the Nobel Prize for his research into thermodynamics. CONTENTS: Part I: Historical Roots: From Heat Engines to Cosmology: Basic Concepts; First Law of Thermodynamics; Second Law of Thermodynamics and the Arrow of Time; Entropy in the Realm of Chemical Reactions; Part II: Equilibrium Thermodynamics: Extremum Principles and General Thermodynamic Relations; Basic Thermodynamics of Gases, Liquids and Solids; Thermodynamics of Phase Change; Thermodynamics of Solutions; Thermodynamics of Chemical Transformations; Fields and Internal Degrees of Freedom; Thermodynamics of Radiation; Part III: Fluctuations and Stability: The Gibbs' Theory of Stability; Critical Phenomena and Configurational Heat Capacity; Theory of Stability and Fluctuations Based on Entropy Production; Part IV: Linear Nonequilibrium Thermodynamics: Nonequilibrium Thermodynamics: The Foundations; Nonequilibrium Thermodynamics: The Linear Regime; Nonequilibrium Stationary States and their Stability: Linear Regime; Part V: Order Through Fluctuations: Nonlinear Thermodynamics; Dissipative Structures; Postface: Where do we go from here?

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