

# Fundamentals of Thermodynamics and Statistical Mechanics: Second Edition

Eduardo Sanchez Velasco



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# **Fundamentals of Thermodynamics and Statistical Mechanics: Second Edition** Eduardo Sanchez Velasco

This book is an expanded version of the lectures on thermodynamics and statistical mechanics that the author taught for several years to undergraduates majoring in physics at Truman State University. The structure of the book mirrors closely, in content and style, what one will get in an actual classroom lecture. The book is divided into two parts. The first part covers equilibrium thermodynamics. Starting with a few simple postulates, the text presents the basics of thermodynamic cycles, engines, absolute temperature, and the second law. These concepts are then used to introduce entropy and thermodynamic potentials, and to study equilibrium and stability of thermodynamic systems and phase transitions. The second part of the book is devoted to equilibrium statistical mechanics, where the formulation of thermodynamics in terms of potentials, developed in the first part of the text, is used extensively. The book covers the foundations of the main three ensembles used in statistical mechanics: the microcanonical, the canonical, and the grand canonical ensembles. The basic principles of the three ensembles are illustrated with simple applications that include classical and quantum ideal gases, quantum models of solids, and simple spin systems. The book can be used for classroom instruction and for self-directed study; it has numerous worked examples with detailed calculations, and more than four hundred problems and exercises.

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