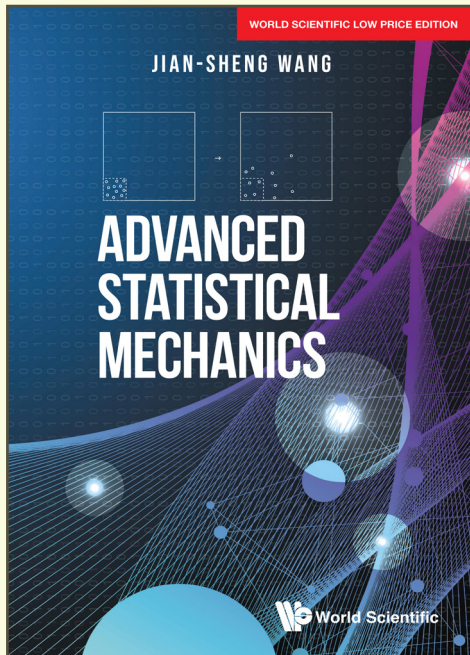


Advanced Statistical Mechanics



By **Jian-Sheng Wang**
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ABOUT THE BOOK

This short textbook covers roughly 13 weeks of lectures on advanced statistical mechanics at the graduate level. It starts with an elementary introduction to the theory of ensembles from classical mechanics, and then goes on to quantum statistical mechanics with density matrix. These topics are covered concisely and briefly. The advanced topics cover the mean-field theory for phase transitions, the Ising models and their exact solutions, and critical phenomena and their scaling theory. The mean-field theories are discussed thoroughly with several different perspectives — focusing on a single degree, or using Feynman–Jensen–Bogoliubov inequality, cavity method, or Landau theory. The renormalization group theory is mentioned only briefly. As examples of computational and numerical approach, there is a chapter on Monte Carlo method including the cluster algorithms. The second half of the book studies nonequilibrium statistical mechanics, which includes the Brownian motion, the Langevin and Fokker–Planck equations, Boltzmann equation, linear response theory, and the Jarzynski equality. The book ends with a brief discussion of irreversibility. The topics are supplemented by problem sets (with partial answers) and supplementary readings up to the current research, such as heat transport with a Fokker–Planck approach.

READERSHIP

Advanced undergraduate and graduate students in Physics; researchers in the field of thermal transport or nonequilibrium statistical physics.

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