

Statistical Mechanics (5750)

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I. Equilibrium systems.

- 1.1 Microcanonical ensembles
- 1.2 Temperature
- 1.3 Ideal gas
- 1.4 Phase space dynamics and ergodicity

II Entropy.

- 2.1 Entropy as irreversibility
- 2.2 Entropy as disorder
- 2.3 Entropy as ignorance

III Free energies.

- 3.1 Generalized ensembles, partition functions and free energies
- 3.2 Thermodynamics and free energies
- 3.3 Chemical reactions
- 3.4 Inhomogeneous systems and diffusion

IV Phase transitions.

- 4.1 Phase equilibria and Maxwell's construction
- 4.2 The Ising model
- 4.3 Order parameters, broken symmetry and correlations
- 4.4 Mean field theory
- 4.5 The renormalization group method

Recommended texts

[C] David Chandler, *Introduction to modern statistical mechanics* (Oxford University Press 1987)

[S] James Sethian, *Entropy, order parameters and complexity* (Oxford University Press 2006)

[H] T. L. Hill, *An introduction to statistical thermodynamics* (Dover Press 1986)