

8.333: Statistical Mechanics of Particles

Fall 2003

NB. This outline is subject to change as term progresses.

Tentative outline

1. *Thermodynamics*- Thermal equilibrium, the laws of thermodynamics; temperature, energy, entropy, and other functions of state. (4 Lec.)
2. *Probability theory*- Probability densities, cumulants and correlations; central limit theorem; laws of large numbers. (2.5 Lec.)
3. *Kinetic theory*- Phase space densities; Liouville's theorem, BBGKY hierarchy, the Boltzmann equation; transport phenomena. (4.5 Lec.)
4. *Classical Statistical Mechanics*- Postulates; microcanonical, canonical and grand canonical ensembles; non-interacting examples. (3 Lec.)
5. *Interacting systems*- Virial and cluster expansions; van der Waals theory; liquid-vapor condensation. (4 Lec.)
6. *Quantum Statistical Mechanics*- Quantization effects in molecular gases; phonons, photons; density matrix formulation. (3 Lec.)
7. *Identical particles*- Degenerate quantum gases; Fermi liquids; Bose condensation; superfluidity. (5 Lec.)

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- [8.333](#) Course Outline - last update 8/27/03 by M. Kardar