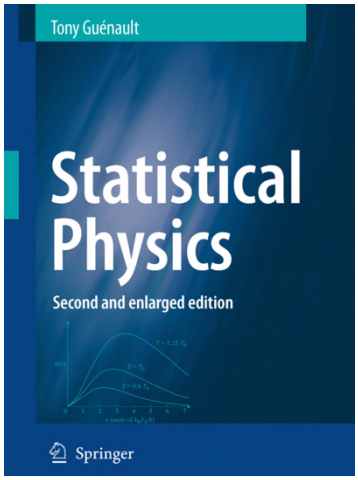
Foundations of Physics 3B

Statistical Physics



There are a large number of books titled "Statistical Physics" or "Statistical Mechanics". Many of these are suitable, particularly the introductory text books. This course will follow *Statistical Physics* by *Tony Guenault*. You must read the sections/chapters (page numbers indicated below) before coming to the lectures.

I'll update this document as the course progresses, possibly shuffling things around a little depending on the rate we progress thourgh the lecures.

Lecture 1:
Chapter 1, Basic Ideas. Probability and distributions. P1-4.

Lectures 2-3:
Chapter 1, Outline of the statistical method, counting states. P4-11.

Lectures 3-4:
Chapter 1/2, equilibrium distributions, counting microstates, most probable distribution. P13-17.

Lecture 5:
Chapter 2, Maximizing entropy, Statistical definition of temperature, Partition function. P17-24.

Lecture 6:
Chapter 3, Harmonic Oscillator Example. P36-41.

Lecture 7:
Chapter 3, The spin-1/2 Solid, Adiabatic Cooling. P25-36.

Lectures 8-9:
Chapter 5. The Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein Distributions. P51-62.

Lecture 10:
Counting number of states in 1,2,3 dimensional quantum systems and defining the density of states, $g(\varepsilon)d\varepsilon$. Mainly Chapter 4.

Lecture 11:
Thermal averages and the Maxwell-Boltzmann speed distribution. P63-67.

Lecture 12:
Maxwell-Boltzmann distribution and the Gibbs' Paradox, P68-72.

Lectures 12-13:

Statistical mechanics of diatomic gases. P73-82.

Lectures 13-14:
Fermi-Dirac gases, the Fermi energy, thermodynamics. P83-90.

Lectures 14-15:
Applications of Fermi-Dirac statistics; Metals and ^{3}He. P91-95.

Lectures 15-16:
Bose-Einstein gases. P97-104.

Lecture 17:
"Phoney" Bosons – photons and phonons. P104-110.

Lecture 18:
Shannon Information Entropy. (Not in book).