Physics 467: Quantum Statistical Mechanics FS2002

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0. **Introduction**
   - 0.1 What is quantum statistical physics?
   - 0.2 Plan of the course
1. **Conventions and Reminders**
   - 1.1 Statistical mechanics
   - 1.2 Quantum mechanics of many-particle systems
2. **Green functions and linear response theory**
   - 2.1 Kubo formalism
   - 2.2 Fluctuation dissipation theorem
   - 2.3 Retarded, advanced and causal Green functions
   - 2.4 Equations of motion
   - 2.5 Single-particle Green function
3. **Simple Applications**
   - 3.1 Stoner theory of ferromagnetism
   - 3.2 Spin waves and random phase approximation
   - 3.3 Screening and plasma oscillations
   - 3.4 BCS theory of superconductivity
4. **Functional integral formulation**
   - 4.1 Coherent states
   - 4.2 Feynman path integral
   - 4.3 Imaginary time formalism
   - 4.4 The partition function of many particle systems
5. **Perturbation theory**
   - 5.1 Wicks theorem
   - 5.2 Feynman diagrams
   - 5.3 Linked cluster theorem
   - 5.4 Self-energy and irreducible diagrams
6. **Landau theory of Fermi liquids**
   - 6.1 Quasiparticles and interactions