1. Lectures: M-W 12:30 - 1:45 p.m., Room - Physics 4220

2. Instructor: T. R. Kirkpatrick
   Office: IPST Building (085), Room 1110, Telephone 301-405-4801
   Office Hours: By appointment after class
   E-mail: tedkirkp@umd.edu

3. Relevant Textbooks:
   
   *Quantum Theory of Many Particle Systems* by A. L. Fetter and J. D. Walecka
   
   *Quantum Many-Particle Systems* by John W. Negele and Henri Orland
   
   *Many-Particle Systems* by G. D. Mahan
   
   *Methods of Quantum Field Theory in Statistical Physics* by A. A. Abrikov, L. P. Gorkov, and I. E. Dzyaloshinski: (AGD)

4. Grade Weighting:
   
   Homework: Given every four weeks
I. Introductory Material

(i) Second Quantization

(ii) Model Hamiltonians

    (a) electron gas model
    (b) tight binding models - The Hubbard Model
    (c) spin Hamiltonians
    (d) The Anderson Model

(iii) Coherent States

    (a) Boson coherent states
    (b) Grassmann algebra
    (c) Fermion coherent states

II. Green’s Functions at Zero Temperature - The Canonical Quantization Approach

(i) Pictures

(ii) Definition of Green’s Functions

(iii) Feynmann Diagrams and Perturbation Theory

(iv) Physical Content of Self Energies

III. Green’s Functions at Finite Temperatures

(i) Canonical Quantization Approach

(ii) Perturbation Theory

(iii) Analytic Properties

    (a) Zero temperature Green’s functions
    (b) Finite temperature Green’s functions

(iv) Real time Green’s functions and linear response
IV. The Fermi and Electron Gas Problems

(i) Hartree-Fock Approximation

(ii) Screening in an electron gas

(iii) Zero sound in an imperfect Fermi gas

(iv) Plasma oscillations in an electron gas

V. Superconductivity (conventional)

(i) Experiments

(ii) Cooper instability

(iii) Gorkov theory - BCS theory

(iv) Field theory approach

(v) Thermodynamics of SC state

(vi) Transport in superconductors

VI. Magnetism

(I) Experiments

(ii) Ferromagnetism

(iii) Antiferromagnetism