

Condensed Matter Physics

Mondays + Wednesdays, 2:15 pm

Lecturer: Kabir Ramola

Grader: Parswa Nath

Grades will be assigned as follows

50% Assignments

25% Midterm Exam

25% Final Exam

LIST OF TOPICS

Drude/Sommerfeld Theory of Metals

Crystal Lattices, The Reciprocal lattice

Determination of Crystal Structure by X-Ray Diffraction

The Free Electron Model and its limitations

Electrons in Periodic Potentials: General Properties, Electrons in a Weak Periodic Potential

The Tight-Binding Model

Calculating Band Structure

The Semiclassical Model of Electron Dynamics

The Semiclassical Theory of Conduction in Metals

Beyond the Independent Electron Approximation

The Hartree-Fock Equations

Fermi Liquid Theory

Diamagnetism and Paramagnetism

Magnetic Ordering

Superconductivity

Field theories, critical phenomena, and the renormalization group

Hydrodynamic Descriptions

Reference Materials

- *Solid State Physics* by N. W. Ashcroft and N. Mermin
- *Principles of Condensed Matter Physics* by P. M. Chaikin and T. C. Lubensky