Course: Solid State Physics
Grading: Home-work (40%), Mid-term exam (30%), final-term exam (30%)

Prerequisite: PHYS 5413

1) The Drude theory of metals
   - Drude model, Electrical conductivity
   - Hall effect, Thermal conductivity
2) The Sommerfeld theory of electrons
   - Ground-state energy of electron gas
   - Thermal properties of electron gas
3) Crystal lattice
   - Bravais lattice, Lattice vectors
   - Primitive cell, Wigner-Seitz cell, Conventional cell
   - Common crystal structures
4) Reciprocal lattice
   - Reciprocal lattice, Brillouin zone
   - Miller indices of lattice planes
5) X-ray diffraction
   - Bragg and von Laue formulations
   - Structure factor and atomic form factor
6) General theory of electrons in a periodic potential
   - Bloch’s theorem
   - Born-von Karman boundary condition
   - Crystal momentum, Density of states
7) Electrons in a weak periodic potential
   - Formation of energy gap
   - Three schemes to describe energy bands, Fermi surface
8) Theory of phonon vibration
   - General theory of lattice vibration
   - One- and three-dimensional lattice vibrations
9) Cohesive energy
   - Lennard-Jones potential, cohesive energy, bulk modulus, Madelung constant, covalent crystals

Office: Physics 207
Office hours: MWF 3:00-4:00PM