Class: Solid State Physics 1, 601

Instructor: Professor Jak Chakhalian

Textbooks: Class notes will be derived from multiple sources. The prime text is Ashcroft and Mermin, "Solid State Physics"

Grading: Homework (30%), mid-term (30%), final (30%), in-class presentation + report (10%). Final grade is determined by averaging over all the components.

Office hours: Tuesday 9:30-10:30 am, room 109 Physics & Astronomy

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Topics to be covered (tentative)

1. What is condensed matter?
2. Phase transitions
3. The Drude theory of metals
    a. Drude model
    b. Conductivity
    c. Hall effect
    d. Thermal conductivity
4. The Sommerfeld theory of electrons
    a. Ground state energy of electrons
    b. Thermal properties of electron gas
5. Crystal lattice
    a. Bravais lattice, lattice vector
    b. Primitive cell, Wigner-Seitz cell and conventional cell
    c. Common crystal structures
6. Reciprocal lattice and Brilliouin zone, Miller notation
7. X-ray diffraction
    a. Bragg and von Laue formulations
    b. Structure factor and atomic form factor
8. General theory of electrons in a periodic potential
    a. Bloch theorem
    b. Born von Karman boundary condition
    c. Band structure of real solids
9. Optical properties of dielectrics and metals
10. Theory of phonons
    a. General theory of phonon vibrations
    b. 1D lattice vibrations
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Note, we will follow the University increment weather policy. We will follow the University integrity and ethics policies.