- **Crystal structure**: lattice, X-ray diffraction, reciprocal lattice, Quasicrystals**
- **The electron liquid**: Drude's phenomenological theory of metals; Sommerfeld's quantum theory.
- **Electrons in a periodic potential**: Fermi surface; density of states; Bloch's theorem; metals vs. insulators; the tight-binding approach; Wannier functions; Techniques for band-structure calculations.
- **Electrons dynamics**: electric and magnetic fields; holes; the Hall effect and magnetoresistance; electrical and thermal conduction in metals; Angle resolved photoemission spectroscopy and probing the Fermi surface; impurity scattering; weak and strong localization and mesoscopics; correlations and screening.
- **Lattice vibrations**: normal modes of vibration (*i.e.* phonons); neutron scattering and probing phonon dispersion relations; effects of anharmonicities; heat capacity.
- **Insulators**: classification of solids; dielectric and optical properties.
- **Hubbard Model and strong correlation effects****: