

# Solid State Theory

## Lattices

1. Crystal lattice
2. Classification of Bravais Lattices and crystal structures
3. Simple lattices, symmetry and anisotropy

## Band structures

4. Electron in a periodic potential - band structure
5. Band filling: Metals, Insulators, Semiconductors
6. Anisotropic Fermi gas
7. Group theory in quantum mechanics
8. Band structure of p-orbitals

## Semiconductors

9. Semiconductors
10. Doping semiconductors
11. Graphene

## Phonons

12. Phonons, introduction
13. Phonons, thermal properties
14. Electron phonon interaction

## Interactions

15. Coulomb interaction in metals
16. Landau's theory of Fermi liquid
17. Fermi liquid II

## Transport

18. Transport in metals
19. The Boltzmann kinetic equation
20. Diffusion, thermal conductivity, thermoelectric phenomena.
21. Anderson localization
22. Weak localization, variable range hopping
23. Hall effect

## Quantum effects

24. Paramagnetism, diamagnetism, de Haas - van Alphen effect
25. Quantum Hall effect

## Magnetism

26. Magnetism in metals, Stoner instability
27. Magnetism of localized moments, Mott transition