



BONDS AND BANDS IN SOLIDS

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PRE-REQUISITES : Elementary Quantum Mechanics

INTENDED AUDIENCE : Chemistry, Physics, Materials Science, Electronics

COURSE OUTLINE :

Electronic and Vibrational states of Solids are seldom taught in this way

ABOUT INSTRUCTOR :

Prof. S. Ramasesha has been an honorary Professor of IISc since my retirement in 2015. I have taught regularly at IISc on solid state chemistry/Physics, quantum chemistry, group theory etc for about 40 years

COURSE PLAN :

- Week-1 :** One-electron Hamiltonian after B.O and SCF approx..
- Week-2 :** Bonding in H_n System, $n=2,3,\dots,N$
- Week-3 :** Bloch's theorem, Energy bands, Metal, Insulator, Semi-conductors
- Week-4 :** Brillouin Zones, Different Schemes, Density of States
- Week-5 :** Extension to p-orbitals, square lattices etc
- Week-6 :** Peiperl's instability, Nearly Free Electron Model
- Week-7 :** Fermi Surface, Density of States, Effective Mass etc.,
- Week-8 :** Failures of MO and Band Theories, Beyond energy band
- Week-9 :** Interacting electron models and Kinetic exchange
- Week-10 :** Energy levels in interacting models, Excitons
- Week-11 :** Lattice, vibrations, Acoustic modes, optic modes etc.,
- Week-12 :** Phonon Photon interaction, thermal properties of insulators