

2000 - 2001

SSP-S 305

SYLLABUS

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
II M.Sc. PHYSICS & II M.Sc.(Tech.) ELECTRONICS
III SEMESTER
P305: SOLID STATE PHYSICS - II

1. **Lattice Dynamics:**
Anharmonic crystal interactions – thermal expansion, thermal conductivity, lattice thermal resistivity, unklapp processes, imperfections.
2. **Energy bands in solids:**
Nearly free electron model, origin of the energy gap – wave equation of electron in a periodic potential – Crystal momentum of an electron – Approximate solution near a zone boundary – Number of orbitals in a band – metals and insulators
3. **Fermi Surfaces of Metals:**
Reduced Zone scheme – Periodic Zone scheme – construction of Fermi surfaces – Electron orbits, hole orbits and open orbits – Calculation of energy bands – Tight binding method for energy bands – Experimental methods for Fermi surface studies – Quantization of orbits in a magnetic field – de Haas – Van Alphen effect – extremal orbits – Fermi surface of copper.
4. **Ferroelectricity:**
Classification of ferroelectric crystals – Polarization catastrophe – Landau theory of the phase transition – Second order transition – First order transition – Soft optical phonons – Antiferroelectricity – Ferroelectric domains – Piezoelectricity – Ferroelasticity.
5. **Point Defects and Alloys:**
Lattice vacancies – Diffusion in metals – Colour centers – F – Centers and other centers in alkali halides – Alloys, order – disorder transformation – elementary theory of order.
6. **Superconductivity:**
Thermodynamics of the superconducting transition – London equation – Coherence length – the accomplishments of the B.C.S. theory – B.C.S. ground state – Type II superconductors – Vortex state – Estimation of H_{c1} and H_{c2} .

TEXT BOOKS:

1. "Solid State Physics" 3rd Edition Chapters (5,7,9,12,13,17) by C.Kittel.