

2003-2004

ANDHRA UNIVERSITY  
DEPARTMENT OF PHYSICS  
M.Sc. MATERIALS SCIENCE  
(EFFECTIVE FROM 2003-2004 ADMITTED BATCH)

II SEMESTER *SSP S-213*

MS 204 : SOLID STATE PHYSICS.

(Common Paper for M.Sc. MATERIALS SCIENCE, M.Sc. PHYSICS,

M.Sc. SPACE PHYSICS & M.Sc. (Tech.) ELECTRONICS)

1. CRYSTAL STRUCTURE : 4 Hrs.  
Periodic array of atoms. Fundamental types of 3 dimensional lattices, Index system for crystal planes, simple crystal structure – sodium chloride, cesium chloride and diamond.  
Chapter : 1 C.KITTEL.
2. CRYSTAL DIFFRACTION AND RECIPROCAL LATTICE : 4 Hrs.  
The incident beam, X-rays, neutrons and electrons Bragg's law, Derivation of Scattered wave amplitude – Bragg's law in Fourier space Fourier analysis – Reciprocal lattice to b.c.c. and f.c.c. Lattices.  
Chapter : 1 & 2 C.KITTEL.
3. PHONONS AND LATTICE VIBRATIONS : 4 Hrs.  
Vibration of mono atomic lattices – group velocity, long wave length limit – First Brillouin Zone. Lattices with two atoms per primitive cell – Quantization of Lattice Vibrations – Phonon momentum.  
Chapter : 4 C.KITTEL.
4. FREE ELECTRON FERMI GAS : 6 Hrs.  
Energy levels and density of orbitals in one dimension – Free electron gas in 3 dimension Heat capacity of the electron gas – experimental heat capacity of metals – motion in magnetic fields – Hall effect, Ratio of thermal and electrical conductivity.  
Chapter : 7 C.KITTEL.
5. THE BAND THEORY OF SOLIDS : 8 Hrs.  
The Bloch Theorem and derivation, electron matter in periodic potential – Kronig – Penny Model – Derivation of important consequences. The distinction Between metals, insulators and semi conductors.  
Chapter : 10. A.J.DEKKER.
6. SEMI-CONDUCTORS : 6 Hrs.  
Band gap – Intrinsic carrier concentration – Mobility in the intrinsic region. Impurity Conductivity – N type and P type semi-conductors, mobility in the presence of impurity.  
Chapter : 12. C.KITTEL.
7. DIELECTRICS AND FERROELECTRICS : 6 Hrs.  
Macroscopic electric field – depolarization field, Local electric field at an atom – field of dipoles inside a cavity. Dielectric constant and polarizability – derivation of Clausius – Mossotti relation – Ferroelectric materials – classification.  
Chapter : 13 C.KITTEL.
8. MAGNETIC MATERIALS : 8 Hrs.  
Dia magnetism and paramagnetism Langevin diamagnetism equation – Theory of paramagnetism – weiss theory of Ferromagnetism. Relation of weiss constant with exchange integral, temperature dependence of saturation magnetization.  
Chapters : 14 & 15 C.KITTEL.
9. SUPER CONDUCTIVITY : 4 Hrs.  
Experimental survey – Occurrence, Meessner effect, Heat capacity, Energy gap. Microwave and infrared properties and isotope effect.  
Chapter: 12 C. KITTEL.

TEXT BOOKS :

1. "Solid State Physics " by A.J.DEKKER.
2. "Introduction to Solid State Physics " by C.KITTEL.

\* PLEASE SET TWO DIFFERENT  
QUESTION PAPER  
\* KINDLY ALHET TO THE  
SYLLABUS STRICTLY.