	LECTURE PLAN M. Sc. Physics Semester III CC-9 Condensed Matter Physics (24L6.5-PHY-301)	
Unit	**Topics to be Covered**	**No of Lectures Required (44)**
1.	Crystalline solids, lattice, the basis, lattice translation, vectors, direct lattice, two and three dimensional Bravais lattice, conventional unit cells of FCC, BCC, NaCl, CsCl, Diamond and cubic ZnS, primitive lattice cell of FCC, BCC and HCP; closed packed structures: packing fraction of simple cubic, BCC, FCC, HCP and diamond structures.	05
	Interaction of x-rays with matter, absorption of x-rays, elastic scattering from a perfect lattice, the reciprocal lattice and its application to diffraction techniques Ewald's construction, the Laue, powder and rotating crystal methods, atomic form factor, crystal structure factor and intensity of diffraction maxima. Crystal structure factors of BCC, FCC, monatomic diamond lattice, polyatomic CuZn.	05
	Problems & Revision	01
2.	Lattice specific heat, Vibration of one-dimensional mono- and diatomic- chains, phonon momentum, density of normal modes in one and three dimensions, quantization of lattice vibrations, measurement of phonon dispersion using inelastic neutron scattering.	05
	Point defects, line defects and planer (stacking) faults, Fundamental ideas of the role of dislocation in plastic deformation and crystal growth, the observation of imperfection in crystals, x-rays and electron microscopic techniques,	04
	Superfluidity, orientational order kind of liquid crystalline order, Quasi-crystal	01
	Problems & Revision	01
	MID SEM SESSIONAL EXAM	
3.	Free electron theory, Electron in periodic lattice, block theorem Kronig-penny model and band theory, classification of solids, effective mass, weak-binding method and its application to linear lattice, tight -binding method and its application to cubic bcc and fcc crystals, concepts of holes, Fermi surface : construction of Fermi surface in two- dimension,	05
	De Hass van alfen effect, cyclotron resonance, magneto-resistance, Weiss Theory of Ferromagnetism Heisenberg model and molecular field theory of ferromagnetism of spin waves and magnons, Curie-weiss law for susceptibility. Ferri and Anti Ferro-magnetic order. Domains and Block wall energy	05
	Problems & Revision	01
4.	Ginzburg-Landau theory and application to Josephson effect: d-c Josephson effect, a-c Josephson effect, macroscopic quantum interference, Interaction of electron with acoustical and optical phonons, polarons,	04
	Occurrence of superconductivity, Meissner effect, Type-I and Type-II superconductors, Heat capacity, Energy gap, Isoptope effect, London equation, Coherence length, Cooper pairing due to phonons, Postulates of BCS theory of superconductivity, BCS ground state, Persistent current. High temperature oxide super conductors (introduction and discovery)	06
	Problems & Revision	01