Lesson Plan

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Class and Section: M.Sc. Physics 2nd Sem.

Subject: Solid State Physics Paper code: 18PHY22HC3

Week	Date	Topics
1	1st March-7th March	**Unit I: Crystal structure:**
		Recapitulation of basic concepts
		Bravis lattice, Primitive vectors, Primitive, conventional
		Wigner-Seitz unit cells
		Crystal structures
		lattices with basis, Lattice planes
		Miller indices
2	7th March-14th March	Miller indices (Continue)
		Simple crystal structures- Sodium chloride
		Cesium chloride structure
		Diamond structure
		Zinc blende structures
		Determination of crystal structure by diffraction
3	15th March-21th March	Reciprocal lattice
		Brillion zones (examples of sc, bcc and fcc lattices)
		Brillion zones (examples of sc, bcc and fcc lattices) (Continue)
		Bragg formulations of X-ray diffraction by a crystal and their equivalence
		Laue formulations of X-ray diffraction by a crystal and their equivalence
		Ewald construction, Brillion interpretation,
		Crystal and atomic structure factors of the bcc and fcc lattices
		Structure factor of the bcc and fcc lattices
4	29th March-4th April	Experimental methods of structure analysis: Types of probe beam
		Experimental methods of structure analysis: the Laue, rotating crystal
		Experimental methods of structure analysis: rotating crystal and powder methods.

Week	Date	Topics
5	5th April-11th April	
		Classical theory of lattice vibration
		Vibrations of crystals with monatomic basis
		Dispersion relation
6		First Brillouin zone
		Group velocity
		Two atoms per primitive basis- acoustical and optical modes
		Two atoms per primitive basis- acoustical and optical modes (Continue)
	12th April-18th April	Quantization of lattice vibration: Phonons
7		Phonon momentum
		Inelastic scattering of neutrons by phonons;
		Thermal properties: Lattice (phonon) heat capacity,
		Normal modes,
	19th April-25th April	Density of states in one and three dimensions,
8		Density of states in one and three dimensions (Continue)
		Models of Debye and Einstein
		Models of Debye and Einstein (Continue)
		Effects due to anharmonic
		crystal interactions,
	26th April-2nd May	Thermal expansion
9		**Electronic properties of solids:** Free electron gas model in three dimensions
		Density of states
		Fermi energy
		Effect of temperature on Fermi energy
	3rd May-9th May	Mechanism of beta decay

		Energetics of beta decay
		Heat capacity of the electron gas
		Experimental heat capacity of metals
		Thermal effective mass
		Electrical conductivity and Ohm's law
10		Hall effect
		Failure of the free electron gas model
		Band theory of solids: Periodic potential
		Band theory of solids: Periodic potential (Continue)
		Bloch's theorem
		Kronig-Penney model
		Wave equation of electron in a periodic potential,
		Number of orbitals in an energy band, Classification into metals, semiconductors and insulators (Continue)
	10^{th} May - 16^{th} May	Tight binding method and its application to sc and bcc structures
