SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Physics)
Semester: III
Syllabus with Effect from: June - 2014

Paper Code: PS03EPHY01	**Total Credit: 4**
Title Of Paper: Crystallography & Materials Science	

Unit	Description in detail	Weightage (%)
I	Salient feature of Reciprocal lattice, Graphical construction, Vector- algebraic discussion, Relation to inter-planar spacing, Ewald construction, Interpretation of Bragg's law, Reciprocal lattice & X- ray diffraction, Laue equation – equivalence of Laue equation and Bragg's law, Projection- Spherical, stereographic & gnomonic. Reciprocal lattice and electron diffraction Electron diffraction pattern and Indexing of polycrystalline and single crystal specimen.	25%
II	Scattering of X- rays by crystal, Structure factor Equation for an electron, an atom and a unit cell, Structure factor calculation for different structures, X-ray optics, wavelength dispersion, Chemical analysis by X-ray spectrometer. Ferroelectric crystals: Rochelle Salts & $BaTiO_3$, Classification of Ferroelectric, electric displacive transition: Polarization catastrophe, 'Frozen in' Transverse Optical Phonons, Thermo dynamic theory of ferroelectric transition, ferroelectric domain, Piezoelectricity, piezoelectric co-efficient, simple application with respect to piezoelectric slab.	25%
III	Polaritons, LST relation, Electron-electron interaction, electron-phonon interaction: polarons, Peierls instability of linear metals, optical reflectance, Kramers-Kroning relations, electronic interband transitions, Raman Effect in crystals. Integral and Fractional Quantum Hall Effect, High temperature superconductivity, Superconducting devices, SQUID magnetometers, GMR-CMR materials,	25%
IV	Amorphous semiconductors – Band structure, electronic conduction, optical properties, switching and Xerography. Amorphous Ferro-magnets, Fiber optics - principle, Fullerenes -preparation, properties and applications Liquid crystals, classification of liquid crystals, properties and applications of liquid crystals, Polymers, classification of polymers, structures of long chain polymer. Magnetic fluids-preparations, characterization, properties and applications.	25%

Basic Text & Reference Books:-

- Introduction to Solid State Physics - C. Kittel
- Principles of Solid State Physics - R. A. Levy
- Solid State Physics- S.O. Pillai
- Elements of X-Ray diffraction - B.D. Cullity
- Elementary Solid State Physics - Ali Omar
- Elements of Solid State Physics - J.P. Srivastava
- Nano; The Essentials By T. Pradeep (Tata McGraw Hill Publ)