GROUP - (C) ELECTIVE PAPER
PAPER I. CHEMISTRY OF MATERIALS

M.M. - 75 | 60 Hrs. (2 Hrs./Week)

Units	Topics	
I	**Multiphase Materials**	**5 Hrs.**
	Ferrous alloys; Fe-C phase transformation in ferrous alloys; stainless steels, non-ferrous alloys, properties of ferrous and nonferrous alloys and their applications.	
	Glasses, Ceramics, Composites and Nanomaterials	**5 Hrs.**
	Glassy state, glass formers and glass modifiers, applications. Ceramic structures, mechanical properties, clay products. Refractories, characterizations, properties and applications.	
	Microscopic composites; dispersion-strengthened and particle-reinforced, fibre-reinforced composites, macroscopic composites. Nanocrystalline phase, preparation procedures, special properties, applications.	
II	**Thin Films and Langmuir - Blodgett Films**	**5 Hrs.**
	Preparation techniques; evaporation/sputtering, chemical processes, MOCVD, sol-gel etc. Langmuir- Blodgett (LB) film, growth techniques, photolithography, properties and application of thin and LB films.	
	Liquid Crystals	**10 Hrs.**
	Mesmorphic behaviour, thermotropic liquid crystals, positional order bond orientational order, nematic and smectic mesophases; smectic - nematic transition and clearing temperature-homeotropic, planar and schlieren textures,	
	twisted nematics, chiral nematics, molecular arrangement in smectic A and smectic C phases, optical properties of liquid crystals. Dielectric susceptibility and dielectric constants. Lyotropic phases and their description of ordering in liquid crystals.	
III	**Polymeric Materials**	**5 Hrs.**
	Molecular shape, structure and configuration, crystallinity, stress-strain behaviour, thermal behaviour, polymer types and their applications, conducting and ferro-electric polymers.	
	Ionic Conductors	**5 Hrs.**
	Types of ionic conductors, mechanism of ionic conduction, interstitial jumps (Frenkel); vacancy mechanism, diffusion superionic conductors; phase transitions and mechanism of conduction in superionic conductors, examples and applications of ionic conductors.	
IV	**High T_c Materials**	**10 Hrs.**
	Defect perovskites, high T_c superconductivity in cuprates, preparation and characterization of 1-2-3 and 2-1-4 materials, normal state properties; anisotropy; temperature dependence of electrical resistance; optical phonon modes; superconducting state; heat capacity; coherence length, elastic constants, position lifetimes, microwave absorption-pairing and multigap structure in high T_c materials, applications of high T_c materials.	
	Materials for Solid State Devices	**3 Hrs.**
	Rectifiers, transistors, capacitors - IV - V compounds, low-dimensional quantum structures; optical properties.	

V	**Organic Solids, Fullerenes, Molecular Devices**	**9 Hrs.**
	Conducting organics, organic superconductors, magnetism in organic materials.	
	Fullerenes-doped, fullerenes as superconductors.	
	Molecular rectifiers and transistors, artificial photosynthetic devices, optical storage memory and switches - sensors.	
	Nonlinear optical materials: nonlinear optical effects, second and third order - molecular hyperpolarisability and second order electric susceptibility materials for second and third harmonic generation.	