Title	**Solid State and Material Chemistry**	Number	CYL6XX0
Department	Chemistry	L-T-P [C]	3-0-0 [3]
Offered for	M.Sc. (CY) Program	Type	Compulsory
Prerequisite			

Objectives

The Instructor will:

1. To provide an overview of the relationships between molecular or solid state structures and material properties.
2. To provide an interdisciplinary understanding of solid state chemistry which aims to provide an understanding of how molecular structure affects the properties of materials.

Learning Outcomes

The students are expected to have the ability to:

1. The student will obtain required knowledge for understanding material science problems and structure of solids.
2. Insight into electronic structure of crystals and compare it with the electronic structure of nanomaterials, chemical-physical fundamentals as well as basic method of characterisation of solids.

Contents

Structure of Solids: Crystalline and Amorphous, diffraction techniques, symmetry and point groups, packing in solids, classification, lattice energy, bonding, structures: NaCl, TiO_2, ZnS, wurtzite, Perovskite, covalent and ionic solids.(10 Lectures)
Crystal defects: non-stoichiometry, cluster, diffusion, Fick's Law and Kirkendall effect, Identification of defects using microscopic techniques.(6 Lectures)
*Solid state reaction:*Chemical and Physical Methods of preparation, reactivity of solids, decomposition mechanism, single crystal growth and thin film deposition. (10 Lectures)
*Band theory:*Intrinsic and extrinsic semiconductors, insulators,density of states, Dielectrics, Hall effect, Thomson, Peltier and Seeback effects.(Lectures 8)
Properties of Solids: Magnetic, Electrical and Optical properties, Different type of Magnetism and Superconductivity, Introduction to nanomaterials and properties.(Lectures 6)

Textbooks

1. B. D. Cullity and S. R. Stock, (2014), *Elements of X-ray diffraction*, 3rd edition, Pearson
2. West, A.R., (2015), *Solid State Chemistry and Its Applications*, 2nd edition, John Wiley & Sons
3. Lesley E Smart and Elaine E Moore, (2005), *Solid State Chemistry: An Introduction*, 3rd Edition, Taylor and Francis

Reference Books

1. Cheetham, A.K. and Day, P., (1997), *Solid State Chemistry Compounds*, 2nd Edition, Clarendon Press, Oxford
2. Harry R. Allcock, (2008), *Introduction to Materials Chemistry*, 1st Edition, Wiley.
3. C N R Rao and J Gopalkrishnan, (2004) *New Directions in Solid State Chemistry*, 2nd Edition, Cambridge.

Self Learning Material

1. Subramaniam, A, *Structure of Materials*, NPTEL Course Material, Department of Materials Science and Engineering, Indian Institute of Technology Kanpur, http://nptel.ac.in/courses/113104014/16