Programme: M. Sc. Part-I (Chemistry)
Course Code: ICC-401 **Title of the Course: General Inorganic Chemistry**
Number of Credits: 03 **Effective from AY: 2018-19**

Prerequisites for the course:	Students should have studied the courses in Chemistry at F.Y. B.Sc., S.Y.B.Sc. and T.Y.BSc. levels so as to have basic knowledge of Inorganic Chemistry and basic principles.	No. of lectures
Course Objectives:	1. To introduce atomic / molecular structure and symmetry. 2. To provide fundamental knowledge of solid state chemistry. 3. To introduce basic aspects of coordination / organometallic / bioinorganic chemistry. 4. To provide the concepts of acids and bases.	
Course Outcomes:	1. Students should be in a position to understand atomic and molecular structure and the importance of symmetry. 2. Students should be able to understand molecular shapes. 3. Students should be in a position to understand concepts in i) solid state chemistry, ii) coordination chemistry, iii) organometallic chemistry, iv) bioinorganic chemistry.	
Content:	**1. Atomic structure, molecular structure and bonding** 1.1 Atomic Structure: Structures of hydrogenic atoms: some principles of quantum mechanics. Many electron atoms: penetration & shielding, building up principle, classification of elements. spectroscopic terms. Atomic/ionic radii, ionization energy, electron affinity, electrononegativity, polarizability. 1.2 Molecular Structure & bonding: Lewis structures, VSPER model, the basic shapes. Valence bond theory: the hydrogen molecule, homonuclear diatomic & polyatomic molecules; hybridisation. molecular orbital theory: approximation, boding & antibonding orbitals. Homonuclear diatomic & Heteronuclear diatomic molecules. **2. Molecular Symmetry**: 2.1 Symmetry elements 2.2 Symmetry operations, equivalent symmetry elements and equivalent atoms, symmetry point groups with examples, point groups of higher symmetry, systematic procedure for symmetry classification of molecules and illustrative examples, 2.3 Dipole moment, optical activity and point groups. **3. Solid state chemistry** 3.1 Structures of solids: crystal structures, lattices & unit cells, close packing of spheres, holes in closed-packed structures. 3.2 Structures of metals & alloys: polytypism, nonclosed-packed structures, polymorphism of metals, atomic radii of metals, alloys, substitutional solid solutions, interstitial solid solutions of non-metals, intermetallic compounds. 3.3 Ionic solids: Basic characteristic structures of ionic solids, the rationalization of structures, ionic radii, radius ratio, structure maps, the energetics of ionic bonding, lattice energy.	9 hr 4 hr 6 hr

	4. **Coordination Chemistry** 4.1 Introduction, representative ligands, nomenclature, 4.2 Constitution & geometry, low coordination numbers, intermediate coordination numbers, higher coordination numbers, polymetallic compounds. 4.3 Isomerism & chirality in square planar & octahedral complexes, ligand chirality. 4.4 Thermodynamics of complex formation: formation constants, chelate & macrocyclic effects, steric effects & electron delocalization. 4.5 Electronic properties of metal complexes: CFT applied to octahedral and tetrahedral complexes, magnetic moments/CFSE. Electronic spectroscopy: basic concepts, interpretation of spectra of d^1 & d^2 ions (Orgel diagram for octahedral and tetrahedral complexes). 5. **Organometallic Chemistry** 5.1 Introduction to organometallic chemistry, nomenclature, stability and inert gas rules (neutral atom and donor pair electron count methods). 5.2 Ligands CO & phosphines, homoleptic carbonyls/synthesis/ properties/ oxidation-reduction of carbonyls/ basicity/reactions of CO/spectroscopic properties of metal carbonyls. 5.3 Oxidative addition and reductive elimination. 6. **Basic Bioinorganic Chemistry** 6.1 Macronutrients/micronutrients. Role of elements in biology. Metal ion transport role. 6.2 Definition of metallobiomolecules / metalloporphyrins, structure of porphine and heme group, examples of metalloenzymes of copper and zinc. 7. **Acids and Bases** 7.1 Brönsted Acidity, proton transfer equillibria in water, solvent levelling, solvent system definition if acids & bases, characteristics of Brönsted acids, 7.2 Periodic trends in aqua acid strengths, non-aqeuous solvents, Lewis acidity, hard & soft acids and bases, solvents as acids & bases, superacids & superbases.	5 hr 4 hr 3 hr 5 hr
Pedagogy:	Mainly lectures / tutorials. Seminars / assignments / presentations / self-study or a combination of some of these could also be used to some extent.	

Text Books / Reference Books	1. P. W. Atkins, T. Overton, J. Rourke, M. Weller & F. Armstrong, *Shriver & Atkins Inorganic Chemistry*, Oxford Publications, 2009, 5th Ed. 2. J. E. Huheey, E. A. Kieter, R. L. Kieter & O. K. Medhi, *Inorganic Chemistry: Principles of Structure & Reactivity*, Pearson, 2011, 4th Ed. 3. F. A. Cotton, G. Wilkinson & P. L. Gauss, *Basic Inorganic Chemistry*, Wiley, 2008 (reprint), 3rd Ed. 4. J. D. Lee, *Concise Inorganic Chemistry*, Wiley, 2008, 5th Ed. 5. F. A. Cotton, *Chemical applications of group theory*, Wiley Eastern, New Delhi, 1976, 3rd Ed. 6. L. Pauling, *The Nature of The Chemical Bond*, Cornell University Press, 1960, 3rd Ed. 7. M.C. Day & J. Selbin, *Theoretical Inorganic Chemistry*, Van Nostrand-Reinhold, New York, 1969,2nd Ed. 8. H.V. Keer, *Principles of Solid state Chemistry*, New age Intl. Ltd, New Delhi, 1995. 9. A.R. West, *Solid State Chemistry and Its Applications*, John Wiley & Sons, Singapore, 1987. 10. D.K. Chakrabarty, *Solid State Chemistry*, New Age Publishers, 1996, 2nd Ed. 11. F. A. Cotton & G. Wilkinson, *Advanced Inorganic Chemistry*, Wiley Eastern, New Delhi, 1984, 3rd Ed.	