Semester Lecture Plan

Name of the college: Government College of Arts, Science & Commerce, Sanquelim-Goa		
Name of Faculty: Dr. Dattaprasad D Narulkar	**Subject:** Chemistry	
Paper code: **CHC 200** (Concepts in Inorganic and Physical Chemistry)	**Program/Course: S.Y. B.Sc. (major)**	**Division: -**
Academic year: 2024 - 2025	**Semester: III**	**Total Lectures: 30 (Theory)**
Course Objectives: 1. To understand the origin of the periodic table and to study various periodic properties and their trends. 2. To learn the postulates of Valence Bond Theory, Molecular Orbital Theory and Valence Shell Electron Pair Repulsion Theory and to study the general characteristics of covalent and ionic compounds through theories of bonding. 3. To study the structures of cubic crystals and the laws governing them.		
Course Learning Outcome: **Students will be able to**		

1. Explain the trend of periodic properties of elements, geometry of molecules, and stability of ionic solids.
2. Construct and interpret the molecular orbital diagram of homonuclear and heteronuclear molecules.
3. Discuss and explain the structures of cubic crystals and the laws governing them.

Month	Lectures From	Lectures To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/Assignment	ICT Tools	Reference books
July	1/07/2024	6/07/2024	02	**Periodicity of the elements** The Origin of the periodic table, Mendeleev's Periodic table, Modern/Long form of Periodic table Periodic classification of elements into s, p, d, and f-block		Smart board	Ref 1 and 2
July	8/07/2024	13/07/2024	02	Periodicity, and magic numbers. Valence Electronic configurations. Periodic properties of the elements and their trends Atomic radii, van der Waal's radii, Ionic radii and Covalent radii,		Smart board	Ref 1 and 2
July	15/07/2024	20/07/2024	02	shielding or screening effect, Effective nuclear charge, Slater rules. Ionization Energy, Successive ionization energies and factors affecting ionization energy.		Smart board	Ref 1 and 2
July	22/07/2024	27/07/2024	02	Electron Affinity. Electronegativity: Pauling's and Allred-Rochow's scale. Calculation of electronegativity(Pauling's Method), Factors affecting electronegativity, applications of electronegativity (numerical	Assignment on periodic table	Smart board	Ref 1 and 2

				problems solving).			
July-August	29/07/2024	03/08/2024	02	2. **Chemical Bonding and Molecular Structure** Concept of electron density, Types of chemical bonds: a) Covalent bonding, Lewis theory, octet rule, the concept of Formal Charge.		Smart boar	Ref 1 and 2
August	05/08/2024	10/08/2024	02	Valence bond theory:Interaction between two hydrogen atoms and the Potential energy diagram of the resultant system. Corrections applied to the system of two hydrogen atoms. Resonance, Rules for Resonance or Canonical Structures.		Smart board	Ref 1 and 2
August	12/08/2024	17/08/2024	02	Bonding in Polyatomic Species: Promotion, Hybridization, (with reference to *sp3* hybridisation in CH4, NH3 and H2O) Equivalent and Non-Equivalent hybrid orbitals. Contribution of a given atomic orbital to the hybrid orbitals and series like NH3, PH3, AsH3, BiH3) Types of hybrid orbitals-sp, sp2, sp3, sp3d, sp3d2and sp3d3.		Smart board	Ref 1 and 2
August	19/08/2024	24/08/2024	02	b) Co-ordinate covalent bond:VSEPR Theory: Assumptions, Application of the theory to explain the geometry of molecules like H2O, NH3, TiCl4, ClF3, OF2,	Determinatio n of shapes of molecules	Smart board	Ref 1 and 2

				NH4+and ICl2-.			
August	26/08/2024	31/09/2024	02	Molecular Orbital Theory (MO) approach: Comparing Atomic Orbitals and Molecular Orbitals. Linear combination of atomic orbitals to give molecular orbitals, **15** Bonding and Antibonding MOs. LCAO-MO diagrams for diatomic homonuclear molecules (O2, N2).		Smart board	Ref 1 and 2
September	02/09/2024	05/09/2024	02	Heteronuclear diatomic molecules: With reference to mixing of orbitals CO, NO and NO+ and bond orders. Prediction of stability/reactivity and magnetic nature with special reference to O2, O2+, O2-, O22-. Comparison of VB and MO approaches.		Smart board	Ref 1 and 2
September	06/09/2024	12/09/2024		Ganesh Chaturthi break		Smart board	Ref 1 and 2
September	13/09/2024	21/09/2024	02	c) Ionic bonding**:**Energy considerations in ionic bonding; Types of Ionic Crystals, Radius Ratio Rules. Lattice energy, solvation energy and their importance in the context of stability and solubility of ionic compounds.Statement of Born-Landé equation for calculation of lattice energy; Born-Haber cycle and its applications; Polarizing power and			

				polarizability,			
September	23/09/2024	28/09/2024	02	Fajan's rules; ionic character in covalent compounds; bond moment; dipole moment and percentage ionic character. 3. **Solids** Forms of solids, symmetry elements,		Smart board	Ref 6
October	30/10/2024	05/10/2024	02	unit cells, crystal systems, Bravais lattice. Laws of crystallography -Law of constancy of interfacial angles, Law of rational indices.		Smart board	Ref 6
October	07/10/2024	12/10/2024	02	Miller indices, X–Ray diffraction by crystals, Bragg's law. Determination of lattice parameters using powder method. Structures of NaCl, KCl and CsCl		Smart board	Ref 6
October	14/10/2024	19/10/2024	02	Determination of lattice parameters using powder method. Structures of NaCl, KCl and CsCl Numerical problems		Smart board	Ref 6
October	21/10/2024	22/20/2024	01	Revision			

Reference Books:

1. Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, Advanced Inorganic Chemistry, Vol. I, 19th edn., S. Chand Publishers (2016)
2. P. L. Soniand Mohan Katyal, Textbook of Inorganic Chemistry by, Sultan Chand and Sons, 20thEdition (1997)
3. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, 33rdEdition,
4. Krishna Mohan Srivastava, Essentials of Inorganic Chemistry, Bio-Green Books (2023).
5. J. D. Lee, *Concise Inorganic* Chemistry, 5th Edn. Wiley India. 2003.
6. A. Bahl and G.D. Tuli, Essentials of Physical Chemistry by S. Chand Publication (2019, New Delhi, 26thEdn.

*** Assessment Rubrics**

Component	Max Marks
ISA 1	7.5
ISA 2	7.5
ISA 3	7.5
Practical	25
Semester End Exam	60
Total	100

*Best two ISA will be considered