Curriculum Plan (Odd Semester 2025-26)

Teacher Name: **Dr. Sajid Iqbal**
Course: B.Sc. (H) Chemistry, UGCF-NEP-2020, Sem I
Paper Name: DSC1: Atomic Structure & Chemical Bonding (Inorganic Chemistry -I) (3 periods per week)

S. No.	Contents	Allocation of Lectures	Month wise schedule to be followed	Assignments/ Presentations etc
1.	**Unit 1: Atomic Structure** Recapitulation of concept of atom in ancient India, Bohr's theory & its limitations, atomic spectrum of hydrogen atom. de Broglie equation, Heisenberg's Uncertainty Principle and its significance. Postulates of wave mechanics, Time independent Schrödinger's wave equation, well behaved wave function, significance of ψ and ψ^2. Quantum mechanical treatment of H- atom, Quantum numbers and their significance. Normalized and orthogonal wave functions. Sign of wave functions. Radial and angular wave functions for hydrogen atom. Radial function plots, radial probability distribution plots, angular distribution curves. Shapes of s, p, and d orbitals, Relative energies of orbitals. Pauli's Exclusion Principle, Hund's rule of maximum spin multiplicity, Aufbau principle and its limitations.	15	1st August -1st week of September	• Overview of Syllabus • Understanding of the concept • Numerical Problem Solving • Doubt Session
2.	**Unit 2: Periodic properties of Elements & Periodic Trends** Brief discussion of the following properties of the elements, with reference to s- & pblock andtheir trends: (a) Effective nuclear charge, shielding or screening effect and Slater's rules (b) Atomic and ionic radii (c) Ionization enthalpy (Successive ionization enthalpies) (d) Electron gain enthalpy (e) Electronegativity, Pauling's scale of electronegativity. Variation of electronegativity with bond order and hybridization.	6	2nd week of September – 3rd week of September	• Numerical Problem Solving • Doubt Session • Class Test

3.	**Unit 3: Ionic bond** General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Lattice energy, Born-Landé equation with derivation, Madelung constant, importance of Kapustinskii equation for lattice energy. Born-Haber cycle and its applications. Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization.	12	4th week of September – 3rd week of October	• Numerical Problem Solving • Doubt Session • Assignment Distribution
4.	**Unit 4: Covalent bond** Valence shell electron pair repulsion (VSEPR) theory, shapes of the following simple molecules and ions containing lone pairs and bond pairs of electrons: H_2O, NH_3, PCl_3, PCl_5, SF_6, ClF_3, I_3, BrF_2^+, PCl_6^- , ICl_2^- ICl_4^- , and SO_4^{2-}. Application of VSEPR theory in predicting trends in bond lengths and bond angles. Valence Bond theory (Heitler-London approach). Hybridization, equivalent and nonequivalent hybrid orbitals, Bent's rule. Ionic character in covalent compounds: Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference. Molecular orbital diagrams of homo & hetero diatomic molecules [N_2, O_2, C_2, B_2, F_2, CO, NO] and their ions; HCl (idea of s-p mixing and orbital interaction to be given).	12	4th week of October – 14th week of November	• Numerical Problem Solving • Doubt Session • Class Test • Previous year paper discussion