Course	**Discipline Specific Core**
Semester	III
Paper Number	**MBTCR3072T & MBTCR3072P**
Paper Title	**CHEMISTRY 1**
No. of Credits	6
Theory/Composite	Composite
No. of periods assigned	4 Theory + 3 Practical
Course description/objective	The course aims to 1. introduce students to basic chemistry. 2. introduce students to the application of basic chemistry to the biological system. 3. enable students to understand stereochemistry and its applications. 4. provide knowledge about acid, base and buffer and their applications. 5. enable students to understand chemical bonding and its application. 6. enable students to qualitatively analyze solid organic compounds in the practical module.
Syllabus	Theory Unit I: Acid-base Concept and Ionic Equilibrium: Arrhenius concept, Theory of solvent system, Bronsted and Lowry's concept, Relative strength of acids, Lewis concept, HSAB principle. Ionization of water, Ionic product of water, pH scale, Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions, pH of buffer solutions, Henderson equation, Buffer capacity, Buffer solution in biological systems. Common ion effect, Solubility and solubility product of sparingly soluble salts– applications of solubility product principle. Unit II: Stereochemistry: Representation of molecules in Fischer, Flying-wedge, Sawhorse and Newman formulae and their interconversions. Asymmetry and Dissymmetry, Enatiomerism and diastereomerism, Concept of chirality. Elements of symmetry-rotational axis of symmetry, plane of symmetry, center of symmetry and alternating axis of symmetery. Optical activity, Specific rotation, Racemization, Optical purity. Stereogenic centres, Isomerism involving like/unlike chiral centres, Chirotopicity and achirotopicity. D/L, R/S, E/Z, syn/anti, cis/trans, meso/dl, threo/erythro nomenclature. Conformational nomenclature- dihedral angle, eclipsed/staggered and gauche/anti, energy barrier of rotation. Relative stability of conformers on the basis of steric effect, dipole- dipole interactions, H-bonding. Conformational analysis of ethane, propane, n-butane, 2-methylbutane. Unit III: Chemical Bonding I: Introduction to chemical bonding, Types of chemical bonds. Ionic bonding– General characteristics of ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Born-Lande equation and its applications, Born-Haber cycle and its applications, Solvation energy. Polarizing power and polarizability, Ionic potential, Fajan's rules, Ionic character in covalent compounds. Covalent bonding- Valence Bond theory (VBT), Hybridization involving s, p and d orbitals, Equivalent and nonequivalent hybrid orbitals, Bent's rule. Valence Shell Electron Pair Repulsion (VSEPR) Theory, Shapes of molecules, Bond moment and dipole moment. Hydrogen bonding and van der Waals forces. Molecular Orbital approach- Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-

	s, s-p and p-p combinations of atomic orbitals, bond order, MO diagrams of some homonuclear diatomic molecules of 1st period. Co-ordinate bonding and co-ordination compounds- Lewis acid base adducts, Double salts and complex salts. Warner theory of coordination, Ligand and its classifications, Co-ordination number. Chelate complexes, Inner metallic complexes, Chelate effect, Applications of co-ordination compounds (analytical application, industrial application, chelation therapy). IUPAC nomenclature (up to two metal centres). Structural and stereoisomerism in respect of coordination number 4 and 6. Determination of configurations of cis and trans-isomers by chemical methods. Stability constants of coordination complexes. No. of Classes: 4 Classes / week Practical Qualitative analysis of Single Solid Organic Compound: (i) Detection of special elements (N, Cl, Br, I and S). (ii) Detection of the following functional groups by systematic chemical tests: Amine (-NH2), Nitro (-NO2), Amide (-CONH2), Anilide (-CONHAr), Phenolic hydroxyl (–OH), Carboxylic acid (-COOH), Carbonyl (>C=O).
Readings	Theory: 1. R. P. Sarkar, General and Inorganic Chemistry (Part-I), New Central Book Agency (P) Limited, 3rd Revised edition, 2011. 2. S. Sengupta, Basic Stereochemistry of Organic Molecules, Oxford University Press, First edition, 2014. 3. E. L. Eliel, Stereochemistry of Carbon Compounds, Tata McGraw Hill education, 2000. 4. J. D. Lee, Concise Inorganic Chemistry, ELBS, 1991. Practical: A. K. Nad, B. Mahapatra and A. Ghosal, An Advanced Course in Practical Chemistry, New Central Book Agency (P) Limited, 2014.
Evaluation	Theory: Continuous Internal Assessment: 10 marks End-Semester Theory Examination: 50 marks Practical: Continuous Internal Assessment: 32 marks End-Semester Examination: 8 marks
Paper structure for End Sem	Section A: Compulsory Objective questions: 1×6 = 6 marks Section B: Any one from two subjective questions with subparts: 12×1 = 12 marks. Section C: Any one from two subjective questions with subparts: 12×1 = 12 marks. Section D: Any two from three subjective questions with subparts: 10×2 = 20 marks. (No subpart will be less than 1 mark or more than 5 marks)