Semester	2
Paper Code	C1CH230212T; C1CH230212P
Paper Title	CORE COURSE: INORGANIC CHEMISTRY
No. of Credits	Theory – 3 Practicals-1
Theory/Composite	Composite
No. of periods assigned	Th: 3 Pr: 3
Name of Faculty member(s)	Dr. Sanjib Ganguly Dr. Rahul Sharma Dr. Koushik Sarkar
Course description/objective	Theory: 1. To develop the concepts of several theories of acids and bases. 2. To understand the idea of lattice and to be able to find out the lattice energy by several methods. 3. To develop the basic idea of defects in lattices and the principles of solubility. 4. To have a grasp of the MOT of simple hetero and homo-nuclear diatomic molecules as well as some tri-atomic molecules (non-mathematical approach); understanding metallic bonding in a qualitative way Practical: 1. To develop skills and to understand the underlying principles in acid-base titrimetric analysis.
Syllabus	Annexure Core Course
Learning outcomes	Theory: Students will gain an understanding of: 1. the fundamentals of acid/base chemistry, including pH calculations, buffer behavior, and acid/base titrations 2. the bonding fundamentals for both ionic and covalent compounds, including electronegativities, bond distances and bond energies using MO diagrams and thermodynamic data 3. current bonding models for simple inorganic and organic molecules in order to predict structures and important bonding parameters 4. predicting geometries of simple molecules Practicals: Students will gain an understanding of: 1. the fundamentals of acid/base equilibria, including pH calculations, buffer behavior, acid/base titrations
Reading/Reference Lists	Theory: 1. Douglas, B.E. and McDaniel, D.H. Concepts & Models of Inorganic Chemistry Oxford, 1970.

	2. Atkin, P. Shriver & Atkins' Inorganic Chemistry, 5th Ed., Oxford University Press (2010). 3. Cotton, F.A., Wilkinson, G. and Gaus, P.L., Basic Inorganic Chemistry 3rd Ed.; Wiley India. 4. Sharpe, A.G., Inorganic Chemistry, 4th Indian Reprint (Pearson Education) 2005. 5. Huheey, J. E.; Keiter, E.A. &Keiter, R.L. Inorganic Chemistry, Principles of Structure and Reactivity 4th Ed., Harper Collins 1993, Pearson,2006. 6. Mingos, D.M.P., Essential trends in inorganic chemistry. Oxford University Press (1998). 7. Winter, M. J., The Orbitron, http://winter.group.shef.ac.uk/orbitron/ (2002). An illustrated gallery of atomic and molecular orbitals. 8. Burgess, J., Ions in solution: basic principles of chemical interactions. Ellis Horwood (1999). 9. Pfennig, B. W. (2015), Principles of Inorganic Chemistry. John Wiley & Sons. 10. Housecraft, C. E.; Sharpe, A. G., (2018), Inorganic Chemistry, 5th Edition, Pearson. 11. Wulfsberg, G (2002), Inorganic Chemistry, Viva Books Private Limited. Practical: 1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Harris, D. C.; Lucy,C. A.(2016), Quantitative Chemical Analysis, 9th Edition, Freeman and Company	
Evaluation	Theory: 60 Internal: 15 (CIA: 10; Other form of Assessment: 2; Attendance: 3) Semester Exam: 45	Practical: 40 CA: 30 ; Attendance:2 Semester Exam: 8
Paper Structure for Theory Semester Exam	Answer Three out of FOUR, 15 marks for each question.	

Annexure

Module 1:

Acid-Base theories (12 Lectures)

Acid-Base concept: Arrhenius concept, theory of solvent system (H_2O, NH_3, SO_2 and HF), Bronsted-Lowry's concept, relative strength of acids, Pauling's rules. Lux-Flood concept, Lewis concept, characteristics of Lewis acids, solvent levelling and differentiating effects; Thermodynamic acidity parameters, Drago-Wayland equation; superacids, Gas phase acidity and proton affinity; HSAB principle.

Module 2:

Ionic bonding (12 Lectures)

General characteristics, types of ions, unit cell, lattice and basis, crystal plane, Weiss and Miller indices, diffraction; size effects, radius ratio rule and its application and limitations. Packing of ions in crystals. Born-Landé equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation energy. Defects in solids (elememetary idea). Solubility energetics of dissolution process;

Module 3:

Covalent Bonding-II (12 Lectures)

Molecular orbital concept of bonding (The approximations of the theory, Linear combination of atomic orbitals (LCAO)) (elementary pictorial approach): sigma and pi-bonds and delta interaction, multiple bonding. Orbital designations: gerade, ungerade, HOMO, LUMO. Orbital mixing; MO diagrams of H_2, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2, and their ions wherever possible; Heteronuclear molecular orbitals: CO, NO, NO^+, CN^-, HF, HF_2^-, BeH_2, CO_2 and H_2O. Bond properties: bond orders, bond lengths.

Practicals:

Acid and Base Titrations:

1. Standardization of NaOH using oxalic acid.

2. Standardization of HCl/acetic acid using standardized NaOH.

3. Estimation of carbonate and hydroxide present together in mixture.

4. Estimation of carbonate and bicarbonate present together in a mixture.

5. Estimation of free alkali present in different soaps/detergents.

6. Determination of the amount of acid neutralized by antacid tablets.

7. Determination of the amount of acetic acid in vinegar.

8. Determination of the amount of citric acid in fruit juices.

9. Estimation of NH_4^+ by formol titration.