

**TEACHING PLANS**  
**CHEMISTRY GENERIC ELECTIVE COURSE**  
**Under LOCF/NEP syllabus**

**Semester – III (Year 2023-24 onwards)**

Core Course: **CHEMISTRY-1**

**Paper Code: CHM-HG 601**

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	04 (Theory)	60	75 (Theory)
4	02 (Practical)	30	25 (Practical)

**Course Objectives:** This course aims at giving students theoretical understanding about the basic constituents of matter – atoms, ions and molecules in terms of their electronic structure and reactivity. Structure and bonding in/of these are to be dealt with basic quantum chemistry treatment. Reactivity of chemical species based on their electron transfer affinity is introduced. Further, The organic chemistry part contains fundamental of Organic Chemistry, and aliphatic hydrocarbon.

**Course Learning Outcomes:** On successful completion, students would have clear understanding of the concepts related to atomic and molecular structure, chemical bonding, Students are expected to learn basic ideas used in organic Chemistry, functional group, Alkanes, Alkenes, Alkynes etc.

**SECTION-A : INORGANIC CHEMISTRY-1**

Unit	Section	Topic	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
<b>Atomic Structure</b>	1	Bohr's theory, its limitations and atomic spectrum of hydrogen atom	2	The students will be exposed to the Postulates of Bohr's model of atoms and its limitation	Lecture/ Discussion/ PPT/ Demonstration/ Practical	Quiz/Class test / Seminar/ Group Discussion/ Q & A Session/ Assignment
	2	de-Broglie wave equation, Heisenberg's Uncertainty Principle and its significance, Schrodinger wave	3	The students will understand about the wave mechanics, the importance of Heisenberg's Uncertainty Principle	Lecture/ Discussion/ PPT/ Demonstration/ Practical	
	3	Quantum numbers and their significances	3	The students get exposed to the different energy, orbitals in which electron belongs to	Lecture/ Discussion/ PPT/ Demonstration/ Practical	
	4	Hund's rule, Pauli exclusion principle, Aufbau's Principle	2	The students will get knowledge about principle for the distribution of electrons in the atom	Lecture/ Discussion/ PPT/ Demonstration/ Practical	

Unit	Section	Topic	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
<b>Chemical Bonding</b>	1	Valence bond Theory and its limitations, hybridization	3	The students will be able to know about the bonding and hybridization of different compounds	Lecture , discussion	Quiz/Class test/Seminar/ Assignment

	2	VSEPR Theory and shapes of different molecules	3	The students will understand the shape and bond pair and lone pair of electrons present on central atom	Lecture , discussion	
	3	Molecular Orbital Theory	3	The students will be able to know about the bonding and electronic configuration, bond order, bond length, bond strength of covalent molecules	Lecture , discussion	
	4	Hydrogen bonding, metallic bonding and Vander Waal's interaction	3	The students will get the knowledge of two different types of H-bonding, metallic bonding and Vander Waal's interaction	Lecture , discussion	

### SECTION-B: ORGANIC CHEMISTRY-1

Unit	Section	Topic	Lecture hours	Learning outcome	Pedagogy	Assessment Evaluation
Fundamentals of Organic Chemistry	1	Electronic Displacement	3	The students will be able to know about the Inductive effect, Electromeric effect, Resonance and Hyper conjugation	Lecture, discussion	Quiz/Class test/Seminar/Assignment
	2	Reaction Intermediates	3	The students will understand the carbocation, carbanion, free radicals and their types	Lecture, discussion	

	3	Cleavage of covalent bond	2	The students will be able to know about the homolytic and heterolytic cleavage	Lecture , discussion	
	4	Nucleophiles and electrophiles	3	The students will know the definitions of Nucleophiles and electrophiles and their difference and reactions	Lecture , discussion	

Unit	Section	Topic	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
Chemistry of Aliphatic Hydrocarbons	1	Chemistry of alkanes	4	The students will be exposed to the preparation of alkanes, reactions	Lecture/ Discussion/ PPT/ Demonstration/ Practical	Quiz/Class test / Seminar/ Group Discussion/ Q & A Session/ Assignment
	2	Chemistry of alkene	4	The students will understand the process of preparation, reactions of alkenes and their name reactions	Lecture/ Discussion/ PPT/ Demonstration/ Practical	
	3	Alkynes	4	The students get exposed to the different reactions of alkyne ,their acidity and type	Lecture/ Discussion/ PPT/ Demonstration/ Practical	

**N.B.** The contact hours for tutorial classes will be 15 hours.

**Recommended Books:**

1. J. D. Lee: A new Concise Inorganic Chemistry, E L. B. S.
2. F. A. Cotton & G. Wilkinson: Basic Inorganic Chemistry, John Wiley.
3. Douglas, McDaniel and Alexander: Concepts and Models in Inorganic Chemistry, John Wiley.
4. James E. Huheey, Ellen Keiter and Richard Keiter: Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Publication.
5. T. W. Graham Solomon: Organic Chemistry, John Wiley and Sons.
6. Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman.
7. E. L. Eliel: Stereochemistry of Carbon Compounds, Tata McGraw Hill.
8. I. L. Finar: Organic Chemistry (Vol. I & II), E. L. B. S.
9. R. T. Morrison & R. N. Boyd: Organic Chemistry, Prentice Hall.
10. Arun Bahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand

**Course Teachers:**

1. Dr. M. Phalguni Singh
2. Dr. N. Ranita Devi
3. Dr. K. Inaomacha Singh
3. N. Surjit Singh

HOD.....

**Semester – IV (Year 2023-24 onwards)****Core Course: CHEMISTRY-2****Paper Code: CHM-HG 602**

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	04 (Theory)	60	75 (Theory)
4	02 (Practical)	30	25 (Practical)

**Course Objectives:** This course may be divided into two broad parts-inorganic and physical chemistry. Three units-main group elements and transition elements will be taught in the inorganic chemistry part. The physical chemistry part contains states of matter.

**Course Learning Outcomes:** After completion of this course the students will learn periodic properties in main group elements, transition metals (3d series). In physical chemistry part, the students are expected to learn kinetic theory of gases, ideal gas and real gases, surface tension, viscosity and basic solid state chemistry.

### SECTION-A : INORGANIC CHEMISTRY-2

Unit	Section	Topic	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
s- and p-block elements	1	s-block elements	3	The students will be able to know about the electronic configuration, size, I.E, electro-negativity, allotropes, oxidation states of Gr1 and Gr-2 elements	Lecture, discussion	Quiz/Class test/Seminar/Assignment
	2	p-block elements	4	The students will be able to know about the electronic configuration, size, I.E, electronegativity, allotropes, oxidation of different groups of p-block elements	Lecture, discussion	
	3	Inert pair effect and diagonal relationship	2	The students will know about the similarity of elements which have diagonal relationship and oxidation state due to inert pair effect	Lecture, discussion	
	4	Anomalous behaviour of first member of each group	2	The students will be able to know the difference of first element of each group from the remaining elements	Lecture, discussion	

Unit	Section	Topic	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
Transition elements	1	Electronic configuration and valency of transition elements	3	The students will be able to know about the electronic configuration of various transition elements	Lecture, discussion	Quiz/Class test/Seminar/Assignment
	2	Properties of transition elements	3	The students will get knowledge about the colour formation, magnetic and catalytic properties of various transition elements	Lecture, discussion	
	3	Complex formation and stability of oxidation state of transition metals	2	The students will be able to know about the Complex formation and stability of oxidation state of transition metals	Lecture, discussion	

## SECTION B: PHYSICAL CHEMISTRY-2

Unit	Section	Topic	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
Kinetic Theory of	1	Kinetic molecular model of a gas, postulates and derivation of the kinetic gas equation	6	The students will be able to understand the collision frequency; collision diameter; mean free path and viscosity of gases, relation between mean free path and coefficient of viscosity	Lecture/ Discussion/ PPT/Exercise	Quiz/Class test / Seminar/ Group Discussion/ Q & A Session/ Assignment
	2	Behaviour of real gases, Deviations from ideal gas behaviour	4	The students will have an idea of compressibility factor, causes of deviation from ideal behaviour. Van der Waals equation of state, virial equation of state.	Lecture/ Discussion/ PPT	
Liquids	1	Surface Tension & Viscosity	8	The students will get the knowledge of physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of temperature and addition of various solutes on surface tension and viscosity.	Lecture/ Discussion/ PPT/ Practical	



Unit	Section	Topic	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
Solids	1	Elementary ideas of symmetry, symmetry elements and symmetry operations	4	Students will learn the elementary ideas of symmetry, symmetry elements and symmetry operations	Lecture/ Discussion/ PPT	Quiz/Class test / Seminar/ Group Discussion/ Q & A Session/ Assignment
	2	Forms of solids, law of constancy of interfacial angles, law of rational indices, Miller indices, Bragg's law, Analysis of powder diffraction patterns	4	Students will learn the solid state, law of constancy of interfacial angles, rational indices, Miller indices; X-ray diffraction	Lecture/ Discussion/ PPT	

**N.B.** The contact hours for tutorial classes will be 15 hours.

#### Reference Books:

1. Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
2. Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
3. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi (2009).
4. Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
5. Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York (1985).
6. Cotton, F.A. & Wilkinson, G. Basic Inorganic Chemistry, Wiley.
7. Shriver, D.F. & Atkins, P.W. Inorganic Chemistry, Oxford University Press.
8. Wulfsberg, G. Inorganic Chemistry, Viva Books Pvt. Ltd.
9. Rodgers, G.E. Inorganic & Solid State Chemistry, Cengage Learning India Ltd., 2008

#### Course Teachers:

1. Dr. M. Phalguni Singh
2. Dr N. Ranita Devi
3. Th. Heramani Singh
4. Dr O. Gobin Singh

HOD.....