Course Code	Course Name	Credits
26CH001	GENERAL CHEMISTRY-I	04

Course Objectives

- To provide foundational knowledge of Chemistry, including core principles of Physical, Organic, and Inorganic Chemistry.
- To develop understanding of fundamental concepts and theories across major branches of Chemistry.
- To build a strong base for applying chemical principles in academic and practical contexts.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Explain atomic structure, quantum numbers, electronic configuration, and periodic properties.
- Apply qualitative analysis, acid–base, and redox principles in chemical systems.
- Describe covalent bonding, hybridization, isomerism, and electronic effects in organic molecules.
- Explain preparation, properties, and reactions of alkanes and cycloalkanes.
- Interpret the dual nature of matter and radiation using basic quantum concepts.

Unit 1 - Atomic Structure and Periodic Properties of Elements (12 Hrs.)

Atomic orbitals; quantum numbers including principal, azimuthal, magnetic, and spin quantum numbers and their significance; principles governing the occupancy of electrons in various quantum levels; Pauli's exclusion principle; Aufbau principle; Hund's multiplicity rule; electronic configuration of elements; effective nuclear charge; shielding or screening effect; periodic classification of elements; salient characteristics of s-, p-, d-, and f-block elements; periodic trends of atomic radii, ionic radii, ionization potential, electron affinity, and electronegativity; variation of metallic and non-metallic properties; factors influencing periodic properties.

Unit 2 – Qualitative Analysis (12 Hrs.)

Solubility product; principle of elimination of interfering anions; common ion effect; complexation reactions including spot tests in qualitative analysis; reactions involved in separation and identification of cations and anions in analysis; semi-micro techniques; acids and bases including Arrhenius, protonic, and Lewis theories; relative strengths of acids and bases; dissociation constants of acids and bases; levelling effect of water; hard and soft acids and bases (HSAB); oxidation and reduction reactions; oxidation number concept; balancing redox equations by oxidation number method and ion–electron method; equivalent weight of oxidizing and reducing agents.

Unit 3 - Covalent Bonding and Organic Basics (12 Hrs.)

Concept of hybridization; sp^3, sp^2, and sp hybridization with examples; covalent bond properties of organic molecules including bond length, bond angle, bond energy, bond polarity, dipole moment, inductive effect, mesomeric effect, electromeric effect, resonance, and hyperconjugation; naming of simple organic compounds; hydrocarbons; monofunctional compounds; bifunctional compounds; isomerism; types of isomerism including structural and stereoisomerism with suitable examples.

Unit 4 – Source of alkanes (12 Hrs.)

Alkanes; methods of preparation including Wurtz reaction, hydrogenation of alkenes, hydrolysis of Grignard reagents, and Kolbe's method; physical and chemical properties of alkanes; cycloalkanes; preparation using Wurtz reaction; Dieckmann ring closure; reduction of aromatic hydrocarbons; substitution and ring-opening reactions of cycloalkanes; Baeyer's strain theory; theory of strain-free rings.

Unit 5 - Dualism of light (12 Hrs.)

Dual nature of light; wave nature of radiation; classical theory of electromagnetic radiation; classical expression for energy in terms of amplitude; particle nature of radiation; black body radiation; Planck's quantum theory; photoelectric effect; Compton effect; dual nature of matter; de Broglie hypothesis; Davisson and Germer experiment; Heisenberg's uncertainty principle; Schrödinger's wave equation (statement); particle in a box; eigenvalues; eigenfunctions; significance of ψ, ψ^2; radial and angular distribution functions; concept, shapes of orbitals.

Reference Books:

1. Principles of Inorganic Chemistry, B.R. Puri, L.R. Sharma, K.K. Kalia, (23rd edition), Shoban Lal Nagin Chand & Co., New Delhi. (1993).
2. Concise Inorganic Chemistry, J.D. Lee, UK, Black well science, (2006).
3. Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., (23rd edition), New Delhi, (1993).
4. Organic Chemistry, R.T. Morrison, R.N. Boyd, Allyn & Bacon Ltd., (6th edition), New York, (1976).
5. Advanced Organic Chemistry, Bahl, Arun Bahl,Sultan Chand. (1996).

Websites and eLearning Sources:

1. nptel.ac.in/courses/104103071
2. Hybridisation in Chemistry: Types, Examples & Shortcut Guide
3. https://youtu.be/byDNBfPaehg?si=vpMgPEx86g1NGwll

COs and Bloom's Taxonomy Mapping – 26CH001		
Course Outcomes	**On completing U.G. program the students will be able to**	**BTL**
CO1	Explain atomic orbitals, quantum numbers, electronic configuration, and periodic properties.	K1, K2
CO2	Apply principles of qualitative analysis, acid–base theories, and redox reactions.	K3
CO3	Analyze covalent bonding, hybridization, isomerism, and electronic effects in organic compounds.	K4
CO4	Evaluate preparation methods, properties, and reactions of alkanes and cycloalkanes.	K5
CO5	Apply quantum mechanical concepts to interpret the dual nature of matter and radiation.	K6

BTL K1 and K2 – remembering and understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6- Create

Relationship Matrix – 26CH001													
Course Outcomes	**Programme Outcomes (POs)**						**Programme Specific Outcomes (PSOs)**						**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	2	2	1	1	1	3	2	2	1	1	3	1.83
CO2	2	3	2	1	1	1	2	3	2	2	1	2	1.83
CO3	2	2	3	2	1	1	2	3	3	2	2	2	2.08
CO4	2	2	3	2	2	1	2	2	3	3	2	1	2.08
CO5	2	2	3	2	2	3	2	2	3	3	3	2	2.41
												Total	2.04

Mean Score: 3- High, 2- Medium/Moderate, 1-Low