GOKHALE MEMORIAL GIRLS COLLEGE

CHEMISTRY

(4 YEAR UG COURSE)

Course Outcome (CO), Programme Outcome (PO), Programme Specific Outcome (PSO) (upto 6th semester)

(as per NEP curriculum)

PROGRAMME SPECIFIC OUTCOMES

PSO 1: Core Chemical Knowledge and Theoretical Proficiency

Graduates will demonstrate comprehensive knowledge in the core areas of chemistry — **organic, inorganic, physical, and analytical** — including essential theories such as molecular orbital theory, reaction mechanisms, quantum chemistry, thermodynamics, and kinetics, enabling them to analyze chemical phenomena and solve discipline-specific problems.

PSO 2: Laboratory Competence and Experimental Skills

Graduates will acquire strong **practical skills** in both qualitative and quantitative analysis, synthesis, separation techniques, spectroscopy, and use of modern instruments, while adhering to safe and precise laboratory practices.

PSO 3: Data Analysis, Problem Solving, and Scientific Communication

Graduates will be able to **design experiments, interpret data using computational and numerical methods**, draw logical conclusions, and effectively communicate scientific ideas both in written and verbal formats, preparing them for academic research, industry, or higher studies.

SEMESTER WISE COURSE DISTRIBUTION (1st to 6th SEMESTER)

SEM	COURSE CODE	COURSE NAME	COURSE DESCRIPTION
I	DSCC-1	Fundamentals of Chemistry-I	Extra nuclear structure of atoms and Basics of Organic Chemistry Bonding and Physical Properties, Stereochemistry – I, Thermodynamics –I, Chemical Kinetics-I.
	SEC-1	Quantitative Analysis and Basic Laboratory Practices	Introduction to Quantitative analysis and its interdisciplinary nature, Titrimetric analysis etc., Water analysis, Basic laboratory practices.
II	DSCC-2	Fundamentals of Chemistry-II	Kinetic Theory and Gaseous state, Chemical Bonding – I, Theoretical principles of inorganic qualitative analysis, Stereochemistry – II, General Treatment of Reaction Mechanism-I
	SEC-2	AI for Everyone	Introduction to Artificial Intelligence, Subfields and technologies, Applications of AI.
III	DSCC-3	Physical Chemistry - I	Thermodynamics -II, Applications of Thermodynamics – I, Electrochemistry-I.
	DSCC-4	Organic Chemistry – I	Aromatic Substitution Reaction. General Treatment of Reaction Mechanism-II, Stereochemistry – III, Conformation, Substitution, elimination, Addition to alkenes, dienes, alkynes.
	SEC-3	Introduction to Numerical Methods for Chemists	Linear Regression, Root Finding, Numerical Differential and Integration, Fourier Transform
IV	DSCC-5	Inorganic Chemistry – I	Chemical bonding- II, Acids and bases, Radioactivity.
	DSCC-6	Organic Chemistry – II	Stereochemistry – IV, Chemistry of Carbonyl Compounds, Organometallics.
	DSCC-7	Physical Chemistry - II	Transport processes and Liquid State, Solid State, Application of Thermodynamics– II, Electrochemistry-II.
	DSCC-8	Inorganic Chemistry – II	Coordination chemistry, Supramolecular Chemistry Redox reactions.
V	DSCC-9	Organic Chemistry – III	Organic Spectroscopy-I, Rearrangements, Nitrogen compounds.
	DSCC-10	Inorganic Chemistry – III	s and p block elements,d and f block elements, Nuclear Model and Radiotracer methods.
	DSCC-11	Physical Chemistry - III	Foundation of Quantum Mechanics, Exactly Solvable Systems-I, Surface Chemistry
	DSCC-12	Organic Chemistry – IV	OrganicSynthesis-I, Carbocycles, Stereochemistryand Reactions of Alicyclic Compound.
VI	DSCC-13	Physical Chemistry - IV	Exactly Solvable Systems-II, Molecular Spectroscopy, Photochemistry.
	DSCC-14	Organic Chemistry – V	Carbohydrates, Biomolecules-I, Concept of Aromaticity and Free Energy Relationship
	DSCC-15	Inorganic Chemistry – IV	Organometallic Chemistry-I, Bioinorganic Chemistry-I, Reaction kinetics and mechanism.

PROGRAMME OUTCOMES (PO) FOR DIFFERENT COURSES

COURSE CODE: DSCC-1

COURSE NAME: Fundamentals of Chemistry-I

CO1: Describe the quantum mechanical model of atoms and explain periodic properties such as ionization energy, electron affinity, and electronegativity to predict chemical behaviour.

CO2: Apply bonding theories (Valence Bond Theory and Molecular Orbital Theory) to interpret the structure, aromaticity, and stability of organic molecules.

CO3: Illustrate molecular chirality using projection formulas and determine stereoisomeric relationships such as enantiomers and diastereomers.

CO4: Solve problems related to the First Law of Thermodynamics and chemical kinetics, including calculations involving internal energy, enthalpy, and reaction rates.

CO5: Develop practical skills in volumetric analysis through the preparation of standard solutions, calibration of apparatus, and accurate estimation of analytes using acid-base and redox titration

PO-PSO-CO MAPPING

	Course Code: DSCC-1	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	-	-	-	-	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-2

COURSE NAME: Fundamentals of Chemistry-II

CO1: Explain the kinetic theory of gases and real gas behavior using Maxwell's distribution, van der Waals equation, and the virial equation, including calculations of molecular velocities and energy distributions.

CO2: Analyze the nature of chemical bonds (ionic and covalent) using concepts like lattice energy, VSEPR theory, hybridization, and molecular geometry to predict structure and stability.

CO3: Apply the principles of stereochemistry to assign configurations (R/S and E/Z), and evaluate optical activity, racemization, and resolution methods of chiral compounds.

CO4: Describe reactive intermediates (carbocations, radicals, carbanions), and explain reaction thermodynamics and kinetics including mechanisms of free radical substitution and the application of Hammond's postulate.

CO5: Identify cations and anions in inorganic mixtures through systematic semimicro qualitative analysis, demonstrating understanding of the underlying chemical principles and selective

PO-PSO-CO MAPPING

	Course Code: DSCC-2	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	-	-	-	-	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-3

COURSE NAME: Physical Chemistry-I

CO1: Apply the Second Law of Thermodynamics to analyze the efficiency of heat engines, entropy changes in physical and chemical processes, and criteria for spontaneity using Gibbs and Helmholtz free energies.

CO2: Evaluate thermodynamic equilibrium and chemical reactions using concepts like chemical potential, partial molar quantities, and Gibbs-Duhem relations; analyze the behavior of mixtures through fugacity and activity coefficients.

CO3: Solve problems involving chemical equilibrium using van't Hoff's isotherm and isochore, and apply Le Chatelier's principle to predict the effect of external conditions on equilibrium systems.

CO4: Explain ionic conductance and equilibrium in electrolyte solutions, apply laws such as Kohlrausch's and Debye-Hückel, and interpret conductometric data for titrations, solubility, and hydrolysis.

CO5: Determine rate constants and reaction orders for chemical reactions using experimental methods, and interpret kinetic data to understand reaction mechanisms.

PO-PSO-CO MAPPING

	Course Code: DSCC-3	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	H
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-4

COURSE NAME: Organic Chemistry-I

CO1: Explain the mechanisms and orientation effects of electrophilic and nucleophilic aromatic substitution reactions, including specialized transformations like Reimer-Tiemann, Vilsmeier-Haack, and Birch reduction.

CO2: Analyze the role of structure, substituents, and solvent in determining acidity, basicity, tautomerism, and conformational preferences in organic molecules.

CO3: Compare and contrast substitution (SN1, SN2, SN2', SNi) and elimination (E1, E2, E1cB) mechanisms based on evidence, stereochemistry, substrate structure, and reaction conditions.

CO4: Predict the products and stereochemistry of electrophilic and radical additions to alkenes and alkynes, including regioselectivity (Markovnikov/anti-Markovnikov), stereoselectivity, and reaction conditions.

CO5: Identify and characterize pure single organic compounds using physical and chemical properties, demonstrating proficiency in classical qualitative analysis techniques.

PO-PSO-CO MAPPING

	Course Code: DSCC-4	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-5

COURSE NAME: Inorganic Chemistry-I

CO1: Apply the Molecular Orbital Theory to construct MO diagrams of homo- and heteronuclear diatomic molecules and predict their bond order, magnetic properties, and stability.

CO2: Describe the nature of metallic bonding, band theory, and weak intermolecular forces (e.g., hydrogen bonding, halogen bonding), and explain their effects on physical properties such as melting and boiling points.

CO3: Compare and evaluate different acid-base theories (Arrhenius, Bronsted-Lowry, Lewis, HSAB) and apply these concepts to aqueous equilibria, buffer systems, and titration curves.

CO4: Explain the principles of nuclear stability and radioactivity, and apply the concepts of nuclear reactions to processes such as fission, fusion, and radiocarbon dating.

CO5: Perform complexometric titrations for the quantitative estimation of metal ions in mixtures and assess water hardness, demonstrating accurate titration skills and understanding of chelation chemistry.

PO-PSO-CO MAPPING

	Course Code: DSCC-5	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-6

COURSE NAME: Organic Chemistry-II

CO1: Analyze conformational stability and stereochemical properties of organic molecules using concepts such as dihedral angle, torsional strain, and prostereoisomerism, including chirality arising from stereoaxes.

CO2: Explain the mechanisms and stereoelectronic factors influencing nucleophilic addition, condensation, and oxidation/reduction reactions involving carbonyl compounds and α-hydrogens.

CO3: Apply principles of nucleophilic substitution and addition to α,β-unsaturated carbonyl compounds, including reactions such as Michael addition and Robinson annulation.

CO4: Describe the structure, reactivity, and synthetic applications of organometallic reagents (Grignard, organolithium, organocuprates) and their role in C–C bond formation and umpolung strategies.

CO5: Apply qualitative analysis techniques to identify special elements and functional groups in organic compounds using classical chemical tests, demonstrating proficiency in systematic identification and classification of organic solids.

PO-PSO-CO MAPPING

	Course Code: DSCC-6	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-7

COURSE NAME: Physical Chemistry-II

CO1: Apply principles of fluid mechanics and surface chemistry to explain and calculate transport properties such as diffusion, viscosity, and surface tension using appropriate physical laws and experimental techniques.

CO2: Analyze crystal structures using Bravais lattices, Miller indices, and X-ray diffraction methods, and relate unit cell parameters to physical and chemical properties of solids.

CO3: Evaluate thermodynamic principles governing colligative properties, phase transitions, and binary phase diagrams, and apply these concepts to determine molar masses and predict solution behavior.

CO4: Interpret and apply electrochemical principles, including EMF, standard electrode potentials, and the Nernst equation, to calculate thermodynamic quantities and solve problems involving concentration cells and potentiometric titrations.

CO5: Develop practical skills to measure and analyze physicochemical properties such as surface tension, viscosity, and conductance of solutions; apply these measurements to determine concentrations and study reaction kinetics using instrumental techniques like stalagmometer, Ostwald's viscometer, and conductometry.

PO-PSO-CO MAPPING

	Course Code: DSCC-7	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	H
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-8

COURSE NAME: Inorganic Chemistry-II

CO1: Explain the fundamental concepts of coordination chemistry including Werner's theory, ligand types, nomenclature, and isomerism in coordination complexes.

CO2: Analyze crystal field splitting, calculate crystal field stabilization energies (CFSE), and predict magnetic and electronic spectral properties of transition metal complexes using valence bond and crystal field theories.

CO3: Describe various non-covalent interactions in supramolecular chemistry, including hydrogen bonding, van der Waals forces, and π-interactions, and explain their role in molecular recognition.

CO4: Apply the principles of redox chemistry to balance redox reactions using ion-electron method, interpret standard and formal redox potentials, and analyze redox titrations and redox potential diagrams (Latimer and Frost) for chemical systems.

CO5: Acquire proficiency in quantitative analysis techniques for simultaneous estimation of multiple metal ions in mixtures using redox and complexometric titrations, enabling accurate determination of metal ion concentrations in diverse samples.

PO-PSO-CO MAPPING

	Course Code: DSCC-8	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-9

COURSE NAME: Organic Chemistry-III

CO1: Understand and apply the principles of UV, IR, and NMR spectroscopy to elucidate the structure of organic molecules.

CO2: Analyze spectral data (UV, IR, and NMR) to determine structural features and functional groups in simple organic molecules.

CO3: Explain and predict mechanisms of important organic rearrangements involving electron-deficient carbon, nitrogen, and oxygen centers.

CO4: Demonstrate knowledge of nitrogen-containing organic compounds and their synthetic transformations with mechanistic insights.

CO5: Develop practical skills in conducting key organic synthesis reactions, including nitration, condensation, hydrolysis, acetylation, and diazo coupling, with emphasis on product isolation, purification, yield calculation, and characterization through melting point determination.

PO-PSO-CO MAPPING

	Course Code: DSCC-9	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-10

COURSE NAME: Inorganic Chemistry-III

CO1: Understand the periodic trends, properties, and reactivity of s- and p-block elements including their oxides, oxoacids, and compounds.

CO2: Analyze the structure and reactivity of inorganic polymers and specialized compounds of non-metals.

CO3: Compare the chemical behavior and properties of d- and f-block elements including their oxidation states, bonding, and magnetic/spectral features.

CO4: Understand nuclear models and apply radiotracer techniques in chemical and medicinal investigations.

CO5: Acquire hands-on expertise in the quantitative analysis of industrially important materials through complexometric and volumetric methods, enabling accurate determination of metal ions and other key constituents in alloys, minerals, chemicals, and environmental samples.

PO-PSO-CO MAPPING

	Course Code: DSCC-10	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-11

COURSE NAME: Physical Chemistry-III

CO1: Understand the dual nature of matter and radiation, and apply quantum principles to microscopic systems.

CO2: Solve basic quantum mechanical problems using Schrödinger's equation and understand the mathematical formalism of quantum mechanics.

CO3: Apply quantum mechanics to model and analyze exactly solvable systems like the particle-in-a-box and finite potential barriers.

CO4: Understand and analyze concepts of surface chemistry and electrical properties of molecules

CO5: Develop proficiency in conductometric and potentiometric techniques for the quantitative determination of ionization constants, redox potentials, and solubility products of weak acids and sparingly soluble salts, enhancing skills in analytical titrations and electrochemical measurements.

PO-PSO-CO MAPPING

	Course Code: DSCC-11	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	H
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-12

COURSE NAME: Organic Chemistry-IV

CO1: Apply retrosynthetic analysis to devise synthetic routes for simple and complex organic molecules.

CO2: Understand and apply strategies for ring synthesis and ring contraction reactions.

CO3: Explain reactivity patterns and mechanisms of polycyclic aromatic and heterocyclic compounds and design their syntheses.

CO4: Analyze conformational and stereoelectronic effects in alicyclic compounds and predict their influence on reaction mechanisms.

CO5: Acquire practical skills in chromatographic techniques including Thin Layer Chromatography (TLC), paper chromatography, and column chromatography for effective separation and qualitative analysis of amino acids and dye mixtures.

PO-PSO-CO MAPPING

	Course Code: DSCC-12	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-13

COURSE NAME: Physical Chemistry-IV

CO1: Solve quantum mechanical problems of the harmonic oscillator, rigid rotator, and hydrogen-like atoms using Schrödinger's equation.

CO2: Understand the principles of molecular spectroscopy and interpret rotational, vibrational, and electronic spectra of molecules.

CO3: Analyze Raman spectra and correlate them with molecular structure and symmetry.

CO4: Understand and apply photochemical principles to analyze photophysical and photochemical reactions.

CO5: Develop proficiency in using spreadsheet software for numerical analysis, data fitting, and visualization to solve complex chemical problems including thermodynamic calculations, titration curve analysis, quantum mechanics, enzyme kinetics, and numerical methods.

PO-PSO-CO MAPPING

	Course Code: DSCC-13	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	H
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-14

COURSE NAME: Organic Chemistry-V

CO1: Understand the structure, stereochemistry, and reactivity of monosaccharides and disaccharides, and apply methods for their interconversion and derivatization.

CO2: Analyze the chemistry and synthesis of biomolecules including amino acids, peptides, and nucleic acids.

CO3: Apply molecular orbital (MO) theory and Hückel's rule to predict aromatic, antiaromatic, and homoaromatic behavior of π-conjugated systems.

CO4: Explain and predict the stereochemical and mechanistic outcomes of pericyclic reactions using the Frontier Molecular Orbital (FMO) approach.

CO5: Develop the ability to interpret and assign spectral data from ^{1}H NMR and IR spectroscopy for a variety of organic compounds, understanding chemical shifts, splitting patterns, functional group absorptions, and characteristic vibrations to deduce structural information.

PO-PSO-CO MAPPING

	Course Code: DSCC-14	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: DSCC-15

COURSE NAME: Inorganic Chemistry-IV

CO1: Understand the bonding, structure, and reactivity of transition metal organometallic complexes in terms of electron count and ligand behavior.

CO2: Analyze the synthesis, structure, and reactivity of key organometallic compounds and their role in catalysis.

CO3: Describe the biological role of metal ions in life processes and understand their function in metalloenzymes and bioinorganic systems.

CO4: Understand and apply principles of coordination reaction kinetics and mechanisms including substitution and electron transfer processes.

CO5: Acquire practical skills in synthesizing and characterizing various inorganic coordination complexes, understanding their structural features, ligand coordination behavior, and methods of preparation to strengthen knowledge of coordination chemistry principles.

PO-PSO-CO MAPPING

	Course Code: DSCC-15	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	M
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	L	L	L	L	M
PO4	Communication Skills	M	M	M	M	L
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	-	-	M
PO8	Environmental awareness and action	-	-	-	-	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	H	H	H	H	H
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: SEC-1

COURSE NAME: Quantitative analysis and basic laboratory practices

CO1: Explain the principles of quantitative analysis and apply statistical methods to evaluate the accuracy, precision, and reliability of analytical results.

CO2: Perform and interpret various types of titrimetric and gravimetric analyses, including acid-base, redox, complexometric, and precipitation titrations, with proper error handling and calculation.

CO3: Analyze water quality parameters (e.g., pH, hardness, TDS, BOD, COD) and describe standard water treatment processes used for domestic, industrial, and municipal purposes.

CO4: Demonstrate good laboratory practices including calibration of glassware, safe chemical handling, sampling, and implementation of safety measures in an analytical laboratory setting

CO5: Demonstrate foundational laboratory skills including safety practices, calibration of glassware and instruments, chromatographic techniques, and basic analytical experiments to support accurate and safe chemical experimentation.

PO-PSO-CO MAPPING

	Course Code: SEC-1	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	M	M	M	-	-
PO2	Critical thinking	M	M	M	-	L
PO3	Creativity	L	L	L	-	-
PO4	Communication Skills	-	-	-	-	-
PO5	Analytical reasoning/thinking	H	H	H	-	-
PO6	Digital and technological skills	-	-	-	-	-
PO7	Value inculcation (Ethical values)	-	-	M	M	M
PO8	Environmental awareness and action	-	-	H	H	H
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	-	-	-	-	-
PSO3	Data Analysis, Problem Solving, and Scientific Communication	H	H	H	H	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: SEC-2

COURSE NAME: AI for everyone

CO1: Understand and explain the foundational concepts of Artificial Intelligence, including its history, scope, and differentiation from human intelligence, as well as major subfields such as machine learning, deep learning, NLP, and computer vision.

CO2: Analyze real-world applications of AI across various domains such as healthcare, finance, transportation, education, and customer service, evaluating their impact on society and ethical considerations including bias, fairness, privacy, and workforce changes.

CO3: Assess ethical challenges and societal implications associated with AI technologies, and discuss responsible AI practices, ethical guidelines, and the role of AI in fostering innovation and creativity.

CO4: Explore emerging trends and future directions in AI, including generative models and creative applications, to anticipate and adapt to ongoing advancements in the field.

PO-PSO-CO MAPPING

	Course Code: SEC-2	CO1	CO2	CO3	CO4
PO1	Complex problem-solving	-	-	-	-
PO2	Critical thinking	M	M	M	M
PO3	Creativity	-	-	-	L
PO4	Communication Skills	-	-	-	-
PO5	Analytical reasoning/thinking	M	H	-	-
PO6	Digital and technological skills	M	M	M	M
PO7	Value inculcation (Ethical values)	-	-	H	-
PO8	Environmental awareness and action	-	-	-	-
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	-	-	-	-
PSO3	Data Analysis, Problem Solving, and Scientific Communication	-	-	-	-

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-

COURSE CODE: SEC-3

COURSE NAME: Introduction to numerical methods for chemists

CO1: Understand numerical representation of numbers, floating-point arithmetic, and analyze errors in computations.

CO2: Apply iterative methods such as Newton-Raphson for finding roots and perform regression and interpolation techniques.

CO3: Use numerical differentiation and integration methods to approximate derivatives and definite integrals accurately.

CO4: Solve ordinary differential equations numerically using Euler and Runge-Kutta methods and understand the basics of Fourier transforms.

CO5: Apply numerical and analytical methods to solve chemical problems involving linear and non-linear fitting, thermodynamic calculations using real gas equations, and evaluation of periodic trends through electronegativity correlations.

PO-PSO-CO MAPPING

	Course Code: SEC-3	CO1	CO2	CO3	CO4	CO5
PO1	Complex problem-solving	H	H	H	H	H
PO2	Critical thinking	H	H	H	H	H
PO3	Creativity	M	M	M	M	M
PO4	Communication Skills	-	-	-	-	-
PO5	Analytical reasoning/thinking	H	H	H	H	H
PO6	Digital and technological skills	-	-	-	-	H
PO7	Value inculcation (Ethical values)	-	-	-	-	-
PO8	Environmental awareness and action	-	-	-	-	-
PSO1	Core Chemical Knowledge and Theoretical Proficiency	H	H	H	H	H
PSO2	Laboratory Competence and Experimental Skills	-	-	-	-	-
PSO3	Data Analysis, Problem Solving, and Scientific Communication	H	H	H	H	H

Mapping Correlation:

High	Medium	Low	No correlation
H	M	L	-