DEPARTMENT OF CHEMISTRY

<B.Sc. Chemistry>

VISION

- To advance knowledge through innovative research and education
- To empower students to excel across scientific fields
- To contribute to global well-being through sustainable chemistry

MISSION

- To empower students with a strong conceptual foundation across all branches of chemistry, foster genuine interest through engaging coursework and hands-on learning, and nurture holistic growth by cultivating scientific curiosity, analytical thinking, ethical responsibility, leadership, and lifelong learning.
- To advance research and innovation by providing access to cutting-edge laboratories, promoting interdisciplinary exploration—especially in organic, bioorganic, inorganic, and physical chemistry—and strengthening industry collaborations for real-world impact.
- To contribute to global well-being by integrating emerging fields such as green chemistry, nanotechnology, polymer science, and environmental chemistry into education and research, and by developing sustainable chemical solutions that address societal and environmental challenges.

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1: To enable the graduates demonstrate comprehensive theoretical and practical knowledge across all disciplines of Chemistry, and to solve problems methodically, independently, and with logical conclusions.

PEO2: To empower the graduates in applying modern technologies, operating advanced instruments, and using chemistry-related software for chemical analysis, material characterization, and separation techniques.

PROGRAM SPECIFIC OUTCOME (PSOs)

PSO1: Demonstrate a thorough understanding of the fundamental concepts, principles, and processes of chemistry, covering its major branches—analytical, inorganic, organic, and physical—and their interconnections with related scientific disciplines.

PSO2: Apply chemical knowledge and technical skills to design, perform, and analyze experiments using the scientific method, while understanding the environmental and societal impacts of chemistry and adhering to safety and sustainability principles.

PSO3: Develop professional competencies, problem-solving abilities, and practical expertise through hands-on laboratory work, preparing for diverse careers or higher studies in chemistry-related fields such as pharmaceuticals, industry, research, education, environmental monitoring, and product quality management.

PROGRAMME OUTCOMES:

PO1: **Disciplinary knowledge and skill:** A graduate student will acquire considerable knowledge in all disciplines of chemistry and expected to develop skills in all aspects of theoretical and practical chemistry.

PO2: **Skilled communicator:** The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

PO-3: **Critical thinker and problem solver:** The course curriculum also includes components that can be helpful to graduate students to develop critical thinking and to design, carry out, record and analyse the results of chemical reactions. Students will develop inquisitive characteristics and sense of inquiry and be able to think and apply evidence based comparative chemistry approach to explain chemical synthesis and analysis.

PO-4: **Skilled project manager with Digital proficiency:** The course curriculum has been designed in such a manner as to enabling a graduate student to become a skilled project manager by acquiring knowledge about chemistry project management, writing, planning, study of ethical standards and rules and regulations pertaining to scientific project operation. They will also acquire working knowledge in understanding and carrying out data analysis, use of library search tools, use of chemical simulation software and related computational work.

PO-5: **Ethical awareness:** A graduate student requires understanding and develop ethical awareness or reasoning which is adequately provided through the course curriculum. Students

can also create an awareness of the impact of chemistry on the environment, society, and also make development outside the scientific community.

PO-6: **Environmental awareness:** As an inhabitant of this green planet a Chemistry graduate student should have many social responsibilities. The course curriculum is designed to teach a Chemistry graduate student to follow the green routes for the synthesis of chemical compounds and also find out new greener routes for sustainable development. The course also helps them to understand the causes of environmental pollution and thereby applying environmental friendly policies instead of environmentally hazard ones in every aspect.

PO-7: **Lifelong learner:** The course curriculum is designed to inculcate a habit of learning continuously through use of advanced ICT technique and other available e- techniques, e-books and e-journals for personal academic growth.

PO-8: **Analytical skill development and job opportunity:** The course curriculum is designed in such a way that Chemistry graduate students can handle many Chemistry based software, decent instruments and advanced technologies to synthesize, characterize and analyse the chemical compounds very skilfully. They can also act as a team player by contributing in laboratory, field based situation and industry. Such a wonderful practice in the graduate level will bring a good opportunity to the students for getting job in industries besides academic and administrative works. Moreover, in-depth understanding of chemistry together with societal needs for chemical solutions will encourage them to build start-ups and become job creators themselves.

Credit Definition

Type	Duration (in hours)	Credit
Lecture (L)	1	1
Tutorial (T)	1	1
Practical (P)	2	1

Total Credit Distribution for the Entire Programme

Semester	Credits										Credits/Semester
	MC	ME	Project	NM	NV	MDC	AEC	SEC	VAC	INT	
1	8	0	0	4	2	0	2	3	2	0	21
2	8	0	0	0	2	4	2	2	2	0	20
3	10	0	0	4	2	4	2	0	0	0	22
4	10	0	0	4	2	4	2	0	0	0	22
5	14	0	0	0	2	0	0	3	2	0	21
6	12	0	0	4	2	0	0	0	0	3	21
7	16	0	0	4	0	0	0	0	0	0	20
8	8	12/0	0/12	0	0	0	0	0	0	0	20
Credits/Course	**86**	**12/0**	**0/12**	**20**	**12**	**12**	**8**	**8**	**6**	**3**	**167**

Category Definition

Definition of Category/Type	Abbreviation
Major Compulsory	**MC**
Major Elective	**ME**
Non-Major Specific Subject Course	**NM**
Non-major Vocational Education and Training	**NV**
Multidisciplinary Courses	**MDC**
Ability Enhancement Courses	**AEC**
Skill Enhancement Courses	**SEC**
Value Added Courses	**VAC**
Internship	**INT**

FIRST YEAR

SEMESTER-I

Sl No	Course Title	Code	Type	Credit	Type		
					L	T	P
1	Fundamentals of Chemistry		MC	2	2	0	0
2	Fundamentals of Chemistry LAB		MC	2	0	0	4
3	Inorganic Chemistry-I		MC	2	2	0	0
4	Inorganic Chemistry-I LAB		MC	2	4	0	4
5	Set by the Department		NM	4	4	0	0
6	Vocational - EAA I (Yoga/ Sports/ NCC/ NSS)		NV	0	0	2	2
7	Vocational – Soft Skill Development I		NV	1	0	0	0
8	Communicative English I		AEC	2	2	0	0
9	Environmental Science I		VAC	2	2	0	0
10	Computer Application I		SEC	3	3	0	0
Total Credits				21 Credits			

SEMESTER-II

Sl No	Course Title	Code	Type	Credit	Type		
					L	T	P
1	Physical Chemistry-I		MC	2	2	0	0
2	Physical Chemistry-I LAB		MC	2	0	0	4
3	Organic Chemistry-I		MC	2	2	0	0
4	Organic Chemistry-I LAB		MC	2	0	0	4
5	Vocational - EAA II (Yoga/ Sports/ NCC/ NSS)		NV	1	0	0	2
6	Vocational – Soft Skill Development II		NV	1	0	0	2
7	Selected by the candidate (Elective)		MDC	4	4	0	0
8	Communicative English II		AEC	2	2	0	0
9	Environmental Science II		VAC	2	2	0	0
10	Computer Application II		SEC	2	0	0	2
Total Credits				20 Credits			

SECOND YEAR

SEMESTER-III

Sl No	Course Title	Code	Type	Credit	Type		
					L	T	P
1	Inorganic Chemistry-II		MC	3	3	0	0
2	Inorganic Chemistry-II LAB		MC	2	0	0	2
3	Organic Chemistry-II		MC	3	3	0	0
4	Organic Chemistry-II LAB		MC	2	0	0	2
5	Selected by the Candidate		NM	4	4	0	0
6	Vocational - Mentored Seminar I		NV	1	1	0	0
7	Vocational – Soft Skill Development III		NV	1	1	0	0
8	Selected by the candidate (Elective)		MDC	4	4	0	0
9	Logical Ability I / Foreign Language I		AEC	2	2	0	0
Total Credits				22 Credits			

SEMESTER-IV

Sl No	Course Title	Code	Type	Credit	Type		
					L	T	P
1	Physical Chemistry-II		MC	3	3	0	0
2	Physical Chemistry-II LAB		MC	2	0	0	2
3	Organic Chemistry-III		MC	3	3	0	0
4	Organic Chemistry-III LAB		MC	2	0	0	2
5	Selected by the Candidate		NM	4	4	0	0
6	Vocational - Mentored Seminar II		NV	1	1	0	0
7	Vocational – Soft Skill Development IV		NV	1	1	0	0
8	Selected by the candidate (Elective)		MDC	4	4	0	0
9	Logical Ability II / Foreign Language II		AEC	2	2	0	0
Total Credits				22 Credits			

THIRD YEAR

SEMESTER-V

Sl No	Course Title	Code	Type	Credit	Type		
					L	T	P
1	Inorganic Chemistry-III		MC	3	3	0	0
2	Inorganic Chemistry-III LAB		MC	2	0	0	4
3	Physical Chemistry-III		MC	3	3	0	0
4	Physical Chemistry-III LAB		MC	2	0	0	4
5	Organic Chemistry-IV		MC	4	4	0	0
6	Vocational - Mentored Seminar III		NV	1	1	0	0
7	Vocational – Soft Skill Development V		NV	1	1	0	0
8	Selected by the candidate (Elective)		SEC	3	3	0	0
9	Ethics Study and IPR / Elective		VAC	2	2	0	0
Total Credits				21 Credits			

SEMESTER-VI

Sl No	Course Title	Code	Type	Credit	Type		
					L	T	P
1	Inorganic Chemistry-IV		MC	2	2	0	0
2	Inorganic Chemistry-IV LAB		MC	2	0	0	4
3	Physical Chemistry-IV		MC	2	2	0	0
4	Physical Chemistry-IV LAB		MC	2	0	0	4
5	Organic Chemistry-V		MC	2	2	0	0
6	Organic Chemistry-V LAB		MC	2	0	0	4
7	Selected by the Candidate		NM	4	4	0	0
8	Vocational-Mentored Seminar IV		NV	1	1	0	0
9	Vocational – Soft Skill Development VI		NV	1	1	0	0
10	Internship / In-house Mini Project		INT	3	0	0	6
Total Credits				21 Credits			

FOURTH YEAR

SEMESTER-VII (Sample)

Sl No	Course Title	Code	Type	Credit	Type		
					L	T	P
1	Physical Chemistry-V		MC	4	4	0	0
2	Organic Chemistry-VI		MC	4	4	0	0
3	Inorganic Chemistry-V		MC	4	4	0	0
4	Industrial Chemistry		MC	2	2	0	0
5	Industrial Chemistry LAB		MC	2	0	0	4
6	MINOR- IV-Selected by the Candidate		NM	4	4	0	0
Total Credits				20 Credits			

SEMESTER-VIII (Sample)

Sl No	Course Title	Code	Type	Credit	Type		
					L	T	P
1	Physical Chemistry-VI		MC	4	4	0	0
2	Inorganic Chemistry-VI		MC	4	4	0	0
3	Project/ (Special Course-Organic Chemistry + Special Course-Inorganic Chemistry + Special Course-Physical Chemistry)		ME Project/ Courses)	12/ (4+4+4)	0/ (4+4+4)	0	24/0
Total Credits				20 Credits			

COURSE CO-PO-PSO MAPPING

SEMESTER-I

MC1: Fundamentals of Chemistry

COURSE OUTCOMES:

CO1: Recall fundamental principles of thermodynamics and kinetics.

CO2: Construct molecular structures and mechanisms and types of organic reactions.

CO3: Evaluate acidity, basicity, and reactivity of organic compounds and elements.

CO4: Distinguish types of atomic orbitals, reaction intermediates and their stability.

CO5: Apply atomic, molecular, periodic principles to reactions.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	2	1	1	2	1
CO2	3	3	3	2	3	1	2	1	2	2	2
CO3	3	3	3	3	3	1	2	3	3	2	2
CO4	3	3	2	2	3	1	2	2	2	3	1
CO5	3	3	3	3	3	2	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-2: Inorganic Chemistry I

COURSE OUTCOMES:

CO1: Design environmentally sustainable polymeric materials and energy storage systems.

CO2: Assess the purity, stability, and environmental impact of consumer products like edible oils, soaps, dyes, and polymers.

CO3: Recognize ionic size, acid-base, crystal and polymer concepts in inorganic and industrial chemistry.

CO4: Differentiate bonding, acid-base, material properties in the light of structural, energetic, compositional factors.

CO5: Implement lattice energy models, buffer systems, and qualitative tests in inorganic chemistry

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	1	2	2	3	3	2	2	3	3	3
CO2	3	2	3	2	3	3	2	3	3	3	3
CO3	3	1	2	2	2	2	1	2	3	2	2
CO4	3	1	3	2	2	2	1	2	3	2	2
CO5	3	1	3	2	2	2	1	2	3	2	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

SEMESTER-II

MC-3: Physical Chemistry-I

Course Outcomes:

CO1: Interpret thermodynamic functions like enthalpy, entropy, and free energy.

CO2: Implement thermodynamic and electrochemical equations to solve real-life chemical problems.

CO3: Differentiate between strong and weak electrolytes based on conductance and ionization behavior.

CO4: Judge the feasibility and efficiency of chemical reactions and electrochemical cells.

CO5: Design conductometric and potentiometric experiments to assess different physical properties and physical constants.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	3	2	2
CO2	3	2	3	3	2	3	2	3	3	3	3
CO3	3	2	3	2	2	2	1	2	3	2	2
CO4	3	2	3	3	3	3	2	3	3	3	3
CO5	3	2	3	3	3	3	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-4: Organic Chemistry I

Course Outcomes:

CO1: Identify configuration of organic molecules.

CO2: Demonstrate various chirality, types of Isomerism and sigma and pi bonds in aliphatic compounds

CO3: Examine various reactions in aliphatic organic molecules.

CO4: Appraise electrophilic additions to alkenes and alkynes.

CO5: Design the mechanism of chemical reactions related to aliphatic compounds.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	3	2	2
CO2	3	2	3	2	2	2	1	2	3	2	2
CO3	3	2	3	2	3	2	2	3	3	3	3
CO4	3	2	3	2	3	2	2	3	3	3	3
CO5	3	2	3	3	3	3	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

SEMESTER-III

MC-5: Inorganic Chemistry II

Course Outcomes:

CO1: Construct inorganic models, reactions for main-group compounds.

CO2: Critique reactivity, acidity, bonding in p-block elements.

CO3: Differentiate behavior, structure of s- and p-block compounds.

CO4: Utilize bonding, periodicity for properties of main-group compounds.

CO5: Explain the classification, properties and bonding features via chemical theories.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	3	3	2
CO2	3	2	3	2	3	2	1	2	3	3	3
CO3	3	2	3	2	2	2	1	2	3	2	2
CO4	3	2	3	3	3	2	2	3	3	3	3
CO5	3	2	3	3	3	3	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-6: Organic Chemistry II

Course Outcomes:

CO1: Demonstrate the concept of aromaticity and related properties for aromatic compounds.

CO2: Illustrate different types of aliphatic nucleophilic substitution and elimination reactions.

CO3: Appraise aromatic electrophilic and nucleophilic substitution reactions with their mechanisms.

CO4: Apply organometallic reagents in the synthesis of organic compounds.

CO5: Examine the laboratory methods of qualitative analysis of known and unknown organic compounds.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	3	2	2
CO2	3	2	3	2	3	2	1	2	3	3	2
CO3	3	2	3	3	3	2	2	3	3	3	3
CO4	3	2	3	3	3	3	2	3	3	3	3
CO5	3	2	3	3	3	3	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

SEMESTER-IV

MC-7: Physical Chemistry-II

Course Outcomes:

CO1: Explain the postulates of different physical models related to characteristics of solids, liquids and gases.

CO2: Implement kinetic gas equations and van der Waals equations to solve various physical problems.

CO3: Distinguish between ideal and real gas behavior and different types of solids.

CO4: Judge the suitability of theoretical models like the kinetic theory or van der Waals equation in predicting properties of gases and liquids.

CO5: Design experiments to determine viscosity, surface tension and X-ray diffraction patterns.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	3	2	2
CO2	3	2	3	3	2	3	2	3	3	3	3
CO3	3	2	3	2	2	2	1	2	3	2	2
CO4	3	2	3	3	3	3	2	3	3	3	3
CO5	3	2	3	3	3	3	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-8: Organic Chemistry III

Course Outcomes:

CO1: Illustrate methods of preparation and chemical properties of alcohols, Phenols, Ethers and Epoxides.

CO2: Interpret nucleophilic addition-elimination reactions of carbonyl compounds and α-substitution reactions.

CO3: Formulate oxidation-reduction and addition reactions of carbonyl compounds with their mechanism.

CO4: Evaluate preparation and typical reactions of carboxylic acids and their derivatives.

CO5: Design one-step synthesis and reactions of common organic molecules using traditional methods.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	3	2	2
CO2	3	2	3	2	3	2	2	3	3	3	3
CO3	3	2	3	3	3	2	2	3	3	3	3
CO4	3	2	3	3	2	3	2	3	3	3	3
CO5	3	2	3	3	3	3	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

SEMESTER-V

MC-9: Inorganic Chemistry III

Course Outcomes:

CO1: Recall periodic, electronic, nuclear properties of transition elements.

CO2: Formulate orbital diagrams, reactions for coordination bonding.

CO3: Evaluate redox, coordination chemistry of transition elements.

CO4: Compare bonding, interactions, redox across chemical types.

CO5: Apply orbital theory, redox, coordination chemistry concepts.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	3	2	2
CO2	3	2	3	3	3	2	2	3	3	3	3
CO3	3	2	3	3	3	3	2	3	3	3	3
CO4	3	2	3	3	2	3	2	3	3	3	3
CO5	3	2	3	3	3	3	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-10: Physical Chemistry-III

Course Outcomes:

CO1: Interpret the temperature dependence of reaction rates and other thermodynamic parameters of chemical reactions.

CO2: Practice the application of rate laws, Arrhenius and Michaelis-Menten equations in complex chemical reactions.

CO3: Differentiate between various kinetic models, reaction mechanisms and types of catalysis and adsorption.

CO4: Judge the feasibility, efficiency, and spontaneity of chemical reactions.

CO5: Design experimental strategies to study fast reactions and develop mechanistic models.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	3	2	2
CO2	3	2	3	3	2	3	2	3	3	3	3
CO3	3	2	3	3	2	3	2	3	3	3	3
CO4	3	2	3	3	3	3	2	3	3	3	3
CO5	3	2	3	3	3	3	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-11: Organic Chemistry IV

Course Outcomes:

CO1: Describe synthesis, reactions and reactivity of nitro, nitrile and isonitrile containing organic compounds.

CO2: Demonstrate classification, nomenclature, synthesis and reactions of heterocycles.

CO3: Evaluate different types of rearrangement reactions involving amine substrates.

CO4: Examine complex organic frameworks utilizing several miscellaneous rearrangement reactions.

CO5: Compile different aspects of pericyclic reactions with detailed mechanistic studies.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	1	0	2	3	2	2
CO2	3	3	3	3	2	3	1	3	3	2	2
CO3	3	2	3	2	2	0	0	3	3	2	3
CO4	3	1	3	3	3	0	1	3	3	2	3
CO5	3	2	3	1	3	2	0	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

SEMESTER-VI

MC-12: Inorganic Chemistry IV

Course Outcomes:

CO1: Construct orbital diagrams, crystal field models for coordination.

CO2: Judge bonding, solubility, group theory in complexes.

CO3: Differentiate transitions, symmetry, bonding using theory tools.

CO4: Apply solubility, CFSE, character tables to coordination analysis.

CO5: Explain bonding, symmetry, spectra in coordination complexes.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	1	0	2	3	2	2
CO2	3	2	2	1	3	0	2	3	3	2	2
CO3	3	2	3	2	2	1	0	3	3	2	3
CO4	3	1	2	2	3	0	1	3	3	3	3
CO5	3	2	3	1	3	2	0	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-13: Physical Chemistry-IV

Course Outcomes:

CO1: Recall key definitions and principles such as Raoult's law, colligative and other properties of solutions.

CO2: Use colligative property data and other models to assess properties in various physical systems.

CO3: Differentiate between types of phase equilibria, adsorption isotherms and colloidal systems.

CO4: Judge the suitability of different laws and surface models involving solutions and colloids.

CO5: Construct triangular phase diagrams and adsorption profiles using experimental data.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	0	0	2	3	1	1
CO2	3	1	2	1	2	0	1	3	3	2	2
CO3	3	2	2	2	2	1	0	3	3	2	2
CO4	3	3	3	2	1	2	1	2	3	2	3
CO5	3	2	2	1	3	2	0	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-14: Organic Chemistry V

Course Outcomes:

CO1: Illustrate axial chirality of Biphenyls, Allenes and spiro compounds.

CO2: **Interpret** energy diagrams and relative stability of conformers of cyclohexane.

CO3: Evaluate occurrence, classification, biological importance and reactions of carbohydrates.

CO4: Analyze preparation and reactions of polynuclear aromatic hydrocarbons.

CO5: Design various qualitative methods for identification of amino acid and carbohydrates.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	1	3	2	1	0	0	3	3	2	2
CO2	3	1	3	1	2	0	1	3	3	2	2
CO3	3	2	3	1	1	1	0	2	3	3	3
CO4	3	2	2	2	1	3	2	3	3	3	3
CO5	3	3	3	2	3	3	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

SEMESTER-VII

MC-15: Physical Chemistry-V

Course Outcomes:

CO1: Describe the foundational principles of quantum mechanics, photochemical laws, and classification of polymers.

CO2: Solve quantum mechanical problems such as the particle in a box and hydrogen atom models.

CO3: Distinguish between different types of operators, quantum states and polymer structures.

CO4: Judge the validity of wave functions and efficiency of photochemical processes.

CO5: Design quantum mechanical models and synthetic schemes for polymers like Nylon-6 and others.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	1	3	2	1	0	1	3	3	1	1
CO2	3	1	3	3	1	0	1	3	3	1	2
CO3	3	2	3	3	1	0	1	2	3	1	1
CO4	3	2	2	2	1	2	0	2	3	2	2
CO5	3	3	3	3	1	3	0	2	2	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-16: Organic Chemistry VI

Course Outcomes:

CO1: Explain concept of UV-Visible Spectroscopy for structural analysis of organic molecules.

CO2: **Demonstrate** IR Spectroscopic technique for identification of functional groups in organic molecules.

CO3: Generate the structure of complex organic molecules using nuclear magnetic resonance (NMR) spectroscopy.

CO4: Appraise the classification, structure and properties of amino acids, peptides and proteins.

CO5: Evaluate the chemistry of nucleic acids, nucleosides, nucleotides.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	1	0	0	3	**3**	2	1
CO2	3	2	3	3	1	0	1	3	**3**	**3**	1
CO3	3	2	2	3	1	1	0	3	**3**	**3**	**2**
CO4	3	2	2	2	2	3	1	3	**3**	1	**2**
CO5	3	3	3	2	3	1	2	3	**3**	1	**2**

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-17: Inorganic Chemistry V

Course Outcomes:

CO1: Define classification, bonding and biological relevance of organometallics.

CO2: Design synthesis and apply 18-electron rule for organometallic reactivity.

CO3: Assess the stability, reactivity and bonding in metal complexes.

CO4: Differentiate substitution mechanisms in ferrocene and metalloporphyrin.

CO5: Utilize rules, frameworks to explain organometallic functions.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	1	3	2	1	0	0	3	3	1	1
CO2	3	2	2	3	1	1	3	3	3	3	2
CO3	3	2	3	2	1	0	1	3	3	2	2
CO4	3	1	3	2	1	1	1	2	3	1	2
CO5	3	3	3	3	1	0	0	3	3	2	2

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC-18: Industrial Chemistry

Course Outcomes:

CO1: List processes, raw materials and chemicals for industrial production.

CO2: Design models and layouts using scalable clean technologies.

CO3: Assess safety, efficiency and impact in industrial handling.

CO4: Differentiate processing methods by properties, techniques in different industries.

CO5: Implement operations, selection and design in industrial applications.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	3	1	3	3	1	1
CO2	3	3	3	3	2	3	1	3	2	3	3
CO3	3	3	3	2	3	3	1	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	2	2
CO5	3	3	3	3	3	3	2	3	2	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

SEMESTER-VII

MC-19: Physical Chemistry-VI

Course Outcomes:

CO1: Define key terms and principles in the context of statistical mechanics and molecular spectroscopy.

CO2: Analyze molecular thermodynamic properties, spectral properties and entropy changes.

CO3: Illustrate different types of spectroscopies and selection rules through point group classification.

CO4: Appraise the applicability and limitations of models like Boltzmann distribution, Born-Oppenheimer approximation, and Morse potential.

CO5: Construct symmetry-based predictions of molecular spectra using character tables, Great Orthogonality Theorem, Jablonsky diagrams and Franck-Condon principles.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	0	1	3	2	1
CO2	3	3	2	2	1	1	0	1	3	3	2
CO3	3	2	2	1	2	0	1	1	3	3	3
CO4	3	3	2	2	1	0	1	1	3	3	2
CO5	3	2	2	2	2	1	0	1	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

MC 20: Inorganic Chemistry-VI

Course Outcomes:

CO1: Formulate EPR, UV-Vis, IR strategies for characterization.

CO2: Critique reliability and limitations in different techniques of molecular analysis.

CO3: Differentiate transitions, magnetism, vibrations using spectral data.

CO4: Utilize susceptibility, spectroscopy to predict chemical bonding and properties.

CO5: Describe the principles of magnetism, molecular spectroscopy and spectral effects.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	0	1	3	2	1
CO2	3	3	2	2	1	1	0	1	3	3	2
CO3	3	2	2	1	2	0	1	1	3	3	3
CO4	3	3	2	2	1	0	1	1	3	3	2
CO5	3	2	2	2	2	1	0	1	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

Special Course-Organic Chemistry

Course Outcomes:

CO1: Interpret retrosynthesis of organic molecules and total synthesis of important complex organic molecules.

CO2: **Illustrate** olefin Metathesis for Grubbs Reaction, Schrock Carbene and Fischer Carbene.

CO3: Appraise the Biosynthesis of some important natural products.

CO4: Evaluate classification and mechanism of action of different drugs and pro-drugs.

CO5: Design the method of synthesis for analgesic, antipyretic, anti-inflammatory drugs and antibiotics.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	1	0	0	3	3	2	2
CO2	3	2	3	3	1	0	1	3	3	3	3
CO3	3	2	2	3	1	1	0	3	3	3	3
CO4	3	2	2	2	2	3	1	3	3	3	3
CO5	3	3	3	2	3	1	2	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

Special Course- Inorganic Chemistry

Course Outcomes:

CO1: List concepts, definitions, domains in applied chemistry areas.

CO2: Develop strategies using recognition, catalysis and forensic principles.

CO3: Assess assemblies, reactions and procedures by structural criteria.

CO4: Differentiate mechanisms in supramolecular, catalytic and forensic systems.

CO5: Apply host-guest chemistry, catalysis, forensics and corrosion concepts.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	0	1	3	2	1
CO2	3	3	2	2	1	1	0	1	3	3	2
CO3	3	2	2	1	2	0	1	1	3	3	3
CO4	3	3	2	2	1	0	1	1	3	3	2
CO5	3	2	2	2	2	1	0	1	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

Special Course-Physical Chemistry

Course Outcomes:

CO1: Describe the structures, properties, and classifications of different biomolecules and nanoparticles.

CO2: Use thermodynamic and structural concepts such as isoelectric point and others to explain the behavior of biological macromolecules and colloidal systems.

CO3: Classify amino acids, proteins, and nanoparticles and their behavior in biological and material systems.

CO4: Assess the impact of nanoscale dimensions on the properties of materials such as gold and carbon nanostructures.

CO5: Develop synthetic strategies for nanoparticles using top-down and bottom-up approaches, and explain their structure-property relationships.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	1	3	2	1	0	0	3	3	2	2
CO2	3	2	2	3	1	1	3	3	3	3	3
CO3	3	2	3	2	1	0	1	3	3	3	3
CO4	3	1	3	2	1	1	1	2	3	3	3
CO5	3	3	3	3	1	0	0	3	3	3	3

1. LOW 2. MODERATE 3. SUBSTANTIAL

Bloom's Taxonomy Verbs:

Remember (BT1)	Understand (BT2)	Apply (BT3)	Analyze (BT4)	Evaluate (BT5)	Create (BT6)
Cite	Add	Acquire	Analyze	Appraise	Abstract
Define	Approximate	Adapt	Audit	Assess	Animate
Describe	Articulate	Allocate	Blueprint	Compare	Arrange
Draw	Associate	Alphabetize	Breadboard	Conclude	Assemble
Enumerate	Characterize	Apply	Break down	Contrast	Budget
Identify	Clarify	Ascertain	Characterize	Counsel	Categorize
Index	Classify	Assign	Classify	Criticize	Code
Indicate	Compare	Attain	Compare	Critique	Combine
Label	Compute	Avoid	Confirm	Defend	Compile
List	Contrast	Back up	Contrast	Determine	Compose
Match	Convert	Calculate	Correlate	Discriminate	Construct
Meet	Defend	Capture	Detect	Estimate	Cope
Name	Describe	Change	Diagnose	Evaluate	Correspond
Outline	Detail	Classify	Diagram	Explain	Create
Point	Differentiate	Complete	Differentiate	Grade	Cultivate
Quote	Discuss	Compute	Discriminate	Hire	Debug
Read	Distinguish	Construct	Dissect	Interpret	Depict
Recall	Elaborate	Customize	Distinguish	Judge	Design
Recite	Estimate	Demonstrate	Document	Justify	Develop
Recognize	Example	Depreciate	Ensure	Measure	Devise
Record	Explain	Derive	Examine	Predict	Dictate
Repeat	Express	Determine	Explain	Prescribe	Enhance
Reproduce	Extend	Diminish	Explore	Rank	Explain
Review	Extrapolate	Discover	Figure out	Rate	Facilitate
Select	Factor	Draw	File	Recommend	Format
State	Generalize	Employ	Group	Release	Formulate
Study	Give	Examine	Identify	Select	Generalize
Tabulate	Infer	Exercise	Illustrate	Summarize	Generate
Trace	Interact	Explore	Infer	Support	Handle
Write	Interpolate	Expose	Interrupt	Test	Import
	Interpret	Express	Inventory	Validate	Improve
	Observe	Factor	Investigate	Verify	Incorporate
	Paraphrase	Figure	Layout		Integrate
	Picture graphically	Graph	Manage		Interface
	Predict	Handle	Maximize		Join
	Review	Illustrate	Minimize		Lecture
	Rewrite	Interconvert	Optimize		Model
	Subtract	Investigate	Order		Modify
	Summarize	Manipulate	Outline		Network
	Translate	Modify	Point out		Organize
	Visualize	Operate	Prioritize		Outline
		Personalize	Proofread		Overhaul
		Plot	Query		Plan
		Practice	Relate		Portray
		Predict	Select		Prepare
		Prepare	Separate		Prescribe

		Price	Subdivide		Produce
		Process	Train		Program
		Produce	Transform		Rearrange
		Project			Reconstruct
		Provide			Relate
		Relate			Reorganize
		Round off			Revise
		Sequence			Rewrite
		Show			Specify
		Simulate			Summarize
		Sketch			
		Solve			
		Subscribe			
		Tabulate			
		Transcribe			
		Translate			
		Use			