

## M.Sc Chemistry

### Programme Educational Objectives (PEOs)

PEO	<i>Upon completion of M.Sc. degree programme, the graduates</i>
PEO - 1	apply scientific and computational technology to solve social issues and pursue research
PEO - 2	continue to learn and advance their careers in industry both in public and private sectors, government and academia
PEO - 3	imbibe ethical standards, teamwork, leadership, communication skills and professionalism with global competencies addressing chemistry related issues to the society

### Programme Outcomes (POs)

PO	<i>Upon completion of M.Sc. degree programme, the graduates will be able to:</i>
PO-1	acquire scientific skills and innovative ideas in their own discipline
PO-2	identify, formulate, perform research and contribute to the developmental needs of the society
PO-3	develop a multidisciplinary perspective and contribute to the knowledge capital of the globe
PO-4	emerge as expressive, ethical and responsible citizens with proven expertise

### Programme Specific Outcomes (PSOs)

PSO	<i>Upon completion of M.Sc Chemistry programme, the graduates will be able to:</i>
PSO-1	impart in-depth knowledge about various aspects of chemistry within an environment committed to excellence
PSO-2	develop critical thinking, technical skills and innovative ideas in analysing and solving problems in the field of chemistry
PSO-3	explore and expedite the recent avenues in chemistry research across the globe with professional competency
PSO-4	inculcate positive approach towards environment and ecology from the chemistry perspective
PSO-5	promote entrepreneurial skills and become self-reliant

**Semester I**  
**Structure and Bonding (Core I)**  
**Subject Code: PG2011**

No. of hours per week	Credit	Total no. of hours	Marks
6	5	90	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the structure and bonding in inorganic compounds	PSO-1	U
CO-2	apply the concepts of chemical bonding to predict the structure of compounds	PSO-2	A
CO-3	analyze the types of bonding, crystal lattices and crystal defects	PSO-2	Y
CO-4	evaluate bond energy, lattice energy and properties of inorganic compounds	PSO-2	E

**Semester I**  
**Reaction Mechanism and Stereochemistry (Core II)**  
**Subject Code: PG2012**

No. of hours per week	Credit	Total no. of hours	Marks
6	5	90	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the basic concepts of reaction mechanisms, stereochemistry and conformation in organic compounds	PSO-1	U
CO-2	apply the reaction mechanism, stereochemistry and conformation for the synthesis of organic compounds	PSO-2	A
CO-3	analyse the types of reaction mechanisms involved in synthetic organic transformation.	PSO-2	Y
CO-4	create novel organic compounds	PSO-3,4	C

**Semester I**  
**Chemical Kinetics and Electrochemistry (Core III)**  
**Subject Code: PG2013**

No. of hours per week	Credit	Total no. of hours	Marks
6	5	90	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the concepts of chemical kinetics, catalysis, photochemistry and electrochemistry	PSO-1	U
CO-2	apply the mechanism of kinetics and catalysis to chemical reactions	PSO-2,3	A
CO-3	analyze the principles and applications of kinetics, catalysis, photochemistry and electrochemistry	PSO-2,3	Y
CO-4	evaluate the kinetics and mechanism of chemical reactions	PSO-4	E

**Semester I**  
**Analytical Chemistry (Elective I (a))**  
**Subject Code: PG2014**

No. of hours per week	Credit	Total no. of hours	Marks
4	3	60	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the principle and instrumentation of various analytical techniques	PSO-1	U
CO-2	apply the principle of analytical techniques to predict the purity, stability and concentrations of compounds	PSO-2,4	A
CO-3	analyse chemical compound using various analytical techniques	PSO-2,3	Y
CO-4	evaluate the quality and quantity of chemical compounds	PSO-3	E

**Semester I**  
**Electrochemistry (Elective I (b))**  
**Subject Code: PG2015**

No. of hours per week	Credit	Total no. of hours	Marks
4	3	60	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the principle of electrochemistry	PSO-1	U
CO-2	apply the concepts of electrochemistry in industries	PSO-2	A
CO-3	analyze the different electrochemical processes	PSO-3	Y
CO-4	create fuel cells	PSO-3,5	C

**Semester II**  
**Coordination Chemistry (Core IV)**  
**Subject Code: PG2021**

No. of hours per week	Credit	Total no. of hours	Marks
6	5	90	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the various theories and reaction mechanisms related to coordination compounds	PSO-1	U
CO-2	apply the theories and reaction mechanisms to determine the properties of complexes	PSO-2	A
CO-3	analyze the reaction mechanism of coordination compounds	PSO-2,3	Y
CO-4	evaluate the magnetic and spectral properties of complexes	PSO-2,3	E
CO-5	create novel complexes and catalyst	PSO-4,5	C

**Semester II**  
**Reaction Mechanism and Molecular Rearrangements (Core V)**  
**Subject Code: PG2022**

No. of hours per week	Credit	Total no. of hours	Marks
6	5	90	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the mechanisms of organic reactions	PSO-1	U
CO-2	apply the reaction mechanisms to synthesize organic compounds	PSO-2,3	A
CO-3	analyze the type of reactions in organic compounds	PSO-2,3	Y
CO-4	evaluate nucleophilic, electrophilic substitution and elimination reactions in aromatic and aliphatic compounds	PSO-2	E
CO-5	create novel organic compounds	PSO-3,4	C

**Semester II**  
**Quantum Chemistry and Spectroscopy (Core VI)**  
**Subject Code: PG2023**

No. of hours per week	Credit	Total no. of hours	Marks
6	5	90	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the concepts of quantum chemistry, spectroscopy and surface chemistry	PSO-1	U
CO-2	apply the principles of quantum mechanics to simple systems, spectroscopy to characterize compounds and surface chemistry to determine the surface area of surface films and liquids	PSO-2	A
CO-3	analyse molecules using quantum mechanics and spectroscopic techniques	PSO-2,3	Y
CO-4	evaluate eigen values, bond angles, electron density and surface area of simple molecules	PSO-2,3	E

**Semester II**  
**Research Methodology (Elective II (a))**  
**Subject Code: PG2024**

No. of hours per week	Credit	Total no. of hours	Marks
4	3	60	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the sources of literature survey and analytical techniques for documentation of research and cheminformatics for molecular representation	PSO-1	U
CO-2	apply the features of literature survey in research and analytical techniques to characterize compounds	PSO-2,3	A
CO-3	analyse the sources of research information and chemical compounds	PSO-2,3	Y
CO-4	evaluate the results using analytical techniques	PSO-2,3	E
CO-5	create a journal article	PSO-3	C

**Semester II**  
**Nuclear Chemistry (Elective II (b))**  
**Subject Code: PG2025**

No. of hours per week	Credit	Total no. of hours	Marks
4	3	60	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the principles of radioactivity and nuclear reactions	PSO-1	U
CO-2	apply radioactivity in industries and daily life	PSO-3,4	A
CO-3	analyze the types of nuclear reactions and nuclear reactors	PSO-2	Y
CO-4	evaluate radioactivity of chemical compounds	PSO-2,3	E

**Semester I and II**  
**Inorganic Chemistry - I (Practical I)**  
**Subject Code: PG20P1**

No. of hours per week	Credit	Total no. of hours	Marks
4	4	60	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the methods for the separation and estimation of inorganic compounds	PSO-1	U
CO-2	apply the theoretical concepts to identify inorganic compounds	PSO-2	A
CO-3	analyze inorganic compounds using semi-micro qualitative analysis and paper chromatography	PSO-2,3	Y
CO-4	evaluate the quantity of inorganic compounds	PSO-2,3	E

**Semester I and II**  
**Organic Chemistry (Practical II)**  
**Subject Code: PG20P2**

No. of hours per week	Credit	Total no. of hours	Marks
4	4	60	100

**Course Outcomes (COs)**

CO No.	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	Cognitive Level
CO-1	understand the methods for the separation and estimation of organic compounds	PSO-1	U
CO-2	apply the theoretical concepts to identify and synthesise organic compounds	PSO-2	A
CO-3	analyse the elements and functional groups using microscale analysis	PSO-2	Y
CO-4	evaluate the quality and quantity of organic compounds	PSO-2,3	E
CO-5	create organic compounds using various rearrangement reactions	PSO-4,5	C

**Semester III**  
**Organic Spectroscopy (Core VII)**  
**Subject Code: PG2031**

Hours per week	Credits	Total Hours	Marks
6	5	90	100

**Course Outcomes (COs)**

CO	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	CL
CO-1	understand the principle and applications of various spectroscopic techniques	PSO-1	U
CO-2	apply the spectroscopic concepts to determine the structure of organic compounds	PSO-2,3	A
CO-3	analyze the functional groups, molecular formula, structure and spectral data of compounds	PSO-2,3	Y
CO-4	evaluate the purity, structure and molecular mass of compounds using various spectroscopic methods	PSO-2,3	E
CO-5	create and characterize novel organic compounds	PSO-3,4	C

**Semester III**  
**Thermodynamics and Group Theory (Core VIII)**  
**Subject Code: PG2032**

Hours per week	Credits	Total Hours	Marks
6	5	90	100

**Course Outcomes (COs)**

CO	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	CL
CO-1	understand the concepts and applications of thermodynamics and group theory	PSO-1	U
CO-2	apply thermodynamics and group theory to determine thermodynamic parameters, vibrations and hybrid orbitals	PSO-2	A
CO-3	analyze the thermodynamic functions, point groups and normal mode of vibration of molecules	PSO-2	Y
CO-4	evaluate the thermodynamic parameters and delocalization energy in molecules	PSO-2	E



**Semester III**  
**Advanced Topics in Chemistry (Elective III (a))**  
**Subject Code: PG2033**

Hours per week	Credits	Total Hours	Marks
4	4	60	100

**Course Outcomes (COs)**

CO	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	CL
CO-1	understand the principles and application of advanced areas in chemistry	PSO-1	U
CO-2	apply the principle of nanochemistry and green chemistry to design and synthesise novel compounds	PSO-2,3	A
CO-3	analyze the properties of nanoparticles, supramolecular interactions, therapeutic action of drugs and reactions in biomolecules	PSO-2,3	Y
CO-4	evaluate atom economy in green synthesis, structure and therapeutic action of various drugs and role of singlet oxygen in biology	PSO-2,4	E
CO-5	create novel nanoparticles and compounds using green chemistry techniques	PSO-3,4	C

**Semester III**  
**Medicinal Chemistry (Elective III (b))**  
**Subject Code: PG2034**

Hours per week	Credits	Total Hours	Marks
4	3	60	100

**Course Outcome (COs)**

CO	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	CL
CO-1	understand the classification, nomenclature and therapeutic action of drugs	PSO-1	U
CO-2	apply the therapeutic values of drugs	PSO-2	A
CO-3	analyze the chemical constituents and its therapeutic values of drugs	PSO-2	Y
CO-4	evaluate the role of metals in drugs	PSO-2	E

**Semester IV**  
**Inorganic Spectroscopy, Photochemistry and Organometallics (Core IX)**  
**Subject Code: PG2041**

Hours per week	Credits	Total Hours	Marks
6	5	90	100

**Course Outcomes (COs)**

CO	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	CL
CO-1	understand the principles and concepts of inorganic spectroscopy, photochemistry and organometallics.	PSO-1	U
CO-2	apply the principles of spectroscopy, photochemistry and organometallic chemistry to inorganic compounds.	PSO-2	A
CO-3	analyse the structure, reactions and functions of inorganic compounds.	PSO-2	Y
CO-4	evaluate the spectral data and properties of inorganic compounds	PSO-3	E

**Semester IV**  
**Photochemistry and Natural Products (Core X)**  
**Subject Code: PG2042**

Hours per week	Credits	Total Hours	Marks
6	5	90	100

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**Course Outcomes (COs)**

CO	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	CL
CO-1	understand various organic reactions and their mechanism	PSO-1	U
CO-2	apply the reaction mechanism in organic synthesis	PSO-2	A
CO-3	analyze the structure and mechanism of reactions	PSO-2	Y
CO-4	evaluate the synthetic utility of reactions	PSO-2	E

**Semester IV**  
**Polymer chemistry (Core XI)**  
**Sub Code: PG2043**

Hours per week	Credits	Total Hours	Marks
6	5	90	100

**Course Outcome (COs)**

CO	Upon completion of this course, the students will be able to:	PSO Addressed	CL
CO -1	Understand the concept of polymer chemistry	PSO - 1	U
CO -2	Apply the processing techniques in the manufacture of synthetic polymer	PSO - 5	A
CO -3	Analyze glass transition temperature, crystallinity and degradation in polymers.	PSO - 3	Y
CO -4	Evaluate molecular weight and size of the polymer	PSO - 3	E

**Semester IV**  
**Energy for Future (Elective IV (a))**  
**Subject Code: PG2044**

Hours per week	Credits	Total Hours	Marks
4	3	60	100

**Course Outcomes (COs)**

CO	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	CL
CO-1	understand the importance of various sources of non-conventional energy	PSO-1	U
CO-2	apply the principle of energy conversion to the production of energy for the future	PSO-2,3,4	A
CO-3	analyze the advantages and disadvantages of different non-conventional energy sources	PSO-2,3	Y
CO-4	evaluate solar energy radiation, wind energy data and conversion efficiency of fuel cells	PSO-2,3	E
CO-5	create fuel cells	PSO-3,5	C

**Semester IV**  
**Nanochemistry (Elective IV (b))**  
**Subject Code: PG2045**

Hours per week	Credits	Total Hours	Marks
4	3	60	100

**Course Outcomes (COs)**

CO	<i>Upon completion of this course, the students will be able to:</i>	PO Addressed	CL
CO-1	understand the basic concept of nanochemistry and its applications	PSO-1	U
CO-2	apply the principle of nanotechnology for the synthesis and characterization of nanomaterials in various fields	PSO-2,3	A
CO-3	analyze the physical and chemical properties of nanoparticles	PSO-2,3	Y
CO-4	evaluate the properties of nanoparticles using various analytical techniques	PSO-2,3	E
CO-5	create and characterize novel nanomaterials	PSO-3,4	C

**Semester III and IV**  
**Inorganic Chemistry (Practical III)**  
**Subject Code: PG20P3**

Hours per week	Credits	Total Hours	Marks
4	4	40	100

**Course Outcomes (COs)**

CO	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	CL
CO-1	understand the principle for the separation, estimation and preparation of inorganic compounds	PSO-1	U
CO-2	apply the principle of volumetric and gravimetric analysis for the separation and estimation of metal ions in a mixture	PSO-2,3	A
CO-3	analyze the procedure for the estimation and preparation of inorganic compounds	PO-2	Y
CO-4	evaluate the amount of metal ions present in a mixture	PSO-2,3	E
CO-5	create novel inorganic complexes	PSO-3,4	C

**Semester III and IV**  
**Physical Chemistry (Practical IV)**  
**Subject Code: PG20P4**

Hours per week	Credits	Total Hours	Marks
4	4	40	100

**Course Outcomes (COs)**

CO	<i>Upon completion of this course, the students will be able to:</i>	PSO Addressed	CL
CO-1	understand the principle of conductometric and potentiometric titrations	PSO-1	U
CO-2	apply the principles of conductometry and potentiometry to determine the strength of unknown solutions.	PSO-2	Ap
CO-3	analyze the strength of acids by adsorption method	PSO-3	Y
CO-4	evaluate conductance ,dissociation constant and heat of solution	PSO-5	E