

M.Sc. Chemistry

Programme outcome

After completing M.Sc. Chemistry programme, students will be able to:

Knowledge Outcomes:

PO1: Demonstrate and apply the fundamental knowledge of the basic principles in various fields of Chemistry

PO2: Create awareness and sense of responsibilities towards environment and apply knowledge to solve the issues related to Environmental pollution.

PO3: Apply knowledge to build up small scale industry for developing endogenous product.

PO4: Apply various aspects of chemistry in natural products isolations, pharmaceuticals, dyes, textiles, polymers, petroleum products, forensic etc. and also to develop interdisciplinary approach of the subject.

Skill Outcomes: It would help students to

PO4: collaborate effectively on team-oriented projects in the field of Chemistry or other related fields.

PO5: communicate scientific information in a clear and concise manner both orally and in Writing.

PO6: inculcate logical thinking to address a problem and become result oriented with a positive attitude.

PO7: Explain environmental pollution issues and the remedies thereof.

PO8: apply the knowledge to develop the sustainable and eco-friendly technology in Industrial Chemistry.

Generic Outcomes:

PO9: Have developed their critical reasoning, judgment and communication skills.

PO10: Augment the recent developments in the field of green and eco-friendly reactions, pharmaceutical, Bioinorganic Chemistry and relevant fields of research and development.

PO11: Enhance the scientific temper among the students so as to develop a research culture and implementation of the policies to tackle the burning issues at global and local level.

Course outcomes

M.Sc. part I (organic chemistry) (2014 pattern)

COURSE: CHP – 110 SEMESTER I

Course Name: Fundamentals of Physical Chemistry I

After successfully completing this course, students will be able to:

CO1: Represent of the rate law of the elementary and chain reaction

CO2: Understand of the theories for the determination of the rate of the reactions

CO3: Understand of the kinetics of the explosive photochemical and unimolecular reactions

CO4: Understand of the laws of thermodynamics and their applications

CO5: know the phase diagram of single component systems and binary mixtures

CO6: Understand of the applications statistical thermodynamics

CO7: Understand of the quantum chemistry of free electron and H- atom

Course: CHP – 210 Semester II

Course Name: Fundamentals of Physical Chemistry II

After successfully completing this course, students will be able to:

CO1: Understand of the principle of Microwave, IR, Raman, Electronic, NMR, ESR and Mossbauer spectroscopy

CO2: Draw of the schematic Microwave, IR and Raman spectrum of di and triatomic molecules based on the selection rules.

CO3: Understand of decay kinetics and measurement of radioactivity

CO4: get knowledge of types of nuclear reactors

CO5: study the applications of radioactivity, Understand Radiolysis and radicals

Course: CHP – 107

Course Name: Physical Chemistry Practical

After successfully completing this course, students will be able to:

CO1: prepare the solution of the desired concentration and the desired volume

CO2: Know the principle and handling of pH meter, Potentiometer, conductivitymeter, colorimeter, viscometer, etc.

CO3: Plot accurate graphs of the desired scale for the calculations

CO4: Maintain laboratory ethics, safety and cleanliness

CO5: Understand waste management of the laboratory

Course: CHI – 130 Semester I

Course Name: Molecular Symmetry and Chemistry of p-block elements

After successfully completing this course, students will be able to:

- CO1: Able to visualize molecule in 3-D, understand the concept of symmetry elements and symmetry operations.
- CO2: know the point groups of molecules and understand symmetry considerations for optical activity and dipole moment.
- CO3: Understand the group multiplication table, character table and representations of group.
- CO4: Apply the projection operator for constructing SALCs.
- CO5: correlate application of symmetry to spectroscopy and find IR active modes of vibration.
- CO6: Understand the detail chemistry of s- and p- block elements w.r.t. their compounds, reactions and applications.
- CO7: learn the advance chemistry of boranes, fullerenes, zeolites, carbon nanotubes, Polymers, etc.
- CO8: Understand the organometallic chemistry of some important elements of s- and p-block.
- CO9: understand how to derive the SALCs for molecules using the Projection Operators and also how to construct molecular orbitals using various symmetry operations and their representations.

Course: CHI – 230 Semester II

Course Name: Coordination and Bioinorganic Chemistry

After successfully completing this course, students will be able to:

- CO1: Understand the effect of various ligand field strengths on d-metal ions and find out ground state terms with their energies, microstates, degeneracy and microstate table for different transition metal ions and complexes.
- CO2: Understand electronic spectra of complexes w.r.t. spin and orbital selection rules, various transitions, charge transfer spectra and luminescence spectra with LASER application.
- CO3: know the magnetic properties of complexes and understand spin-only and effective magnetic moments, Zeeman effect, properties of complexes with A, E, and T terms.
- CO3: Understand of Bioinorganic Chemistry: Use of metals in biological systems, various aspects of coordination chemistry related to bioinorganic research, metallobiopolymers, their structure, function, role of metal ion, etc.
- CO4: Get the knowledge of Biochemistry of metals like Na, K, Fe, Ca and Mn.

Course: CHI – 127

Course Name: Inorganic Chemistry Practical

After successfully completing this course, students will be able to:

CO1: prepare the exact solutions for quantitative analysis.

CO2: Apply the knowledge of quantitative analysis for the determination of metals from ores/alloys.

CO3: synthesize Inorganic complexes and also find their purity.

CO4: Understand Ion-exchange chromatography for separation of metal ions.

CO5: Understand the principle and working of different instruments like colourimeter, conductometer, spectrophotometer, etc.

Course: CHO – 150 Semester I**Course Name: Basic Organic Chemistry**

After successfully completing this course, students will be able to:

CO1: understand chemical bonding and reactivity, various effects in organic molecules.

CO2: understand Acidity and Basicity as well as aromaticity.

CO3: understand concepts of stereochemistry and will be able to stereochemical aspects in organic chemistry.

CO4: develop knowledge of substitution (electrophilic, nucleophilic), addition and elimination reactions.

Course: CHO – 250 Semester II**Course Name: Organic Reaction mechanism and Spectroscopy**

After successfully completing this course, students will be able to:

CO1: understand various reactions and rearrangements.

CO2: understand and write mechanism of reactions and their applications.

CO3: understand how to convert one molecule into another by using oxidising and reducing reagents.

CO4: apply theoretical knowledge in practicals for various conversions.

Course: CHO – 247**Course Name: Organic Chemistry Practical**

After successfully completing this course, students will be able to:

CO1: understand different purification techniques in organic chemistry like recrystallization, distillation, steam distillation and extraction.

CO2: get awareness of safety techniques and handling of chemicals..

CO3: understand how to carry out different types of reactions and their workup methods.

CO4: become aware of green chemistry and role of green chemistry in pollution reduction.

Course: CHA – 190 Semester I

Course Name: Safety in Chemical Laboratory and good lab practices

After successfully completing this course, students will be able to:

CO1: know meaning of safety signs on container of chemicals, safety in handling of chemicals, MSDS sheets.

CO2: understand detailed explanation of at least four different types of substances (e.g. nitric acid, benzene, potassium dichromate, bromine, etc.),

CO3: know handling of glasswares and care to be taken, handling of organic flammable as well as toxic solvents in laboratory

CO4: know use of safety goggles, shoes and gloves, fire extinguisher and its use and action to be taken in accidental cases

Course: CHA – 290 Semester II

Course Name: General Chemistry

After successfully completing this course, students will be able to:

CO1: understand the Principles of mass spectroscopy, gas chromatography and HPLC

CO2: apply the techniques for structure determination of organic molecules.

CO3: perform statistical analysis of chemical data by developing analytical mind.

Course outcomes

M.Sc. part I (organic chemistry) (2014 pattern)

COURSE: CHO – 350 SEMESTER I

Course Name: Organic Reaction mechanism

After successfully completing this course, students will be able to:

CO1: understand various methods of Carbanion generation and their applications in Organic Synthesis.

CO2: correlate the reaction mechanisms with practical procedures.

CO3: understand mechanisms in biological reactions that will help students to understand Nature better

CO4: differentiate between various organic reactive intermediates.

CO5: develop interest in writing and finding mechanisms of new reactions.

Course: CHO – 351 Semester I

Course Name: Spectroscopic Methods in Structure Determination

After successfully completing this course, students will be able to:

- CO1: understand how to interpret nuclear magnetic resonance spectrum.
- CO2: know how to solve problems based on H^1 and C^{13} NMR
- CO3: know applications of mass spectroscopy in determination of structures.
- CO4: understand methods of solving combines problems on all spectroscopic techniques.

Course: CHO – 352 Semester I

Course Name: Organic Stereochemistry

After successfully completing this course, students will be able to:

- CO1: understand various terminologies in stereochemistry.
- CO2: will be able to draw the stereochemical structures of different molecules.
- CO3: understand the isolation of racemic mixtures.
- CO4: draw various organic reactive intermediates with stereochemistry.

Course: CHO – 353 Semester I

Course Name: Pericyclic reactions, Photochemistry and Heterocyclic Chemistry.

After successfully completing this course, students will be able to:

- CO1: understand various Pericyclic and photochemical reactions and rearrangements.
- CO2: understand and write mechanism of reactions and their applications.
- CO3: understand how to synthesize five, six and seven-membered heterocycles.
- CO4: utilize their knowledge in practicals for various heterocyclic and photochemical conversions.

Course: CHO – 450 Semester II

Course Name: Chemistry of Natural products

After successfully completing this course, students will be able to:

- CO1: understand different Secondary metabolites and their importance.
- CO2: become familiar with many reagents used in organic synthesis.
- CO3: understand nature better by studying mechanisms in biological reactions.
- CO4: understand various laboratory methods to determine structure of unknown organic sample.
- CO5: develop interest in Biogenesis of naturally occurring essential compounds.

Course: CHO – 451 Semester II

Course Name: Advanced Synthetic Organic Chemistry

After successfully completing this course, students will be able to:

- CO1: Industrial applications of organometallic compounds in organic reactions.

CO2: Mechanisms of organometallic reactions.

CO3: Stereochemistry of the organometallic reactions.

Course: CHO – 452 Semester II

Course Name: Carbohydrate and Chiron approach / Chiral Drugs and Medicinal Chemistry

After successfully completing this course, students will be able to:

CO1: understand the stereochemistry of carbohydrates and their reactions.

CO2: understand the concept of chiral templates and chiral drugs

CO3: understand the synthesis of various drugs.

CO4: understand the mode of action of different anti-fungal, anti-bacterial and anti-viral drugs.

Course: CHO – 453 Semester II

Course Name: Asymmetric Synthesis

After successfully completing this course, students will be able to:

CO1: understand various ways of attack on electrophilic species by a nucleophile

CO2: to predict enantioselective product.

CO3: understand mechanisms in asymmetric reaction.

CO4: visualise 3D structure of molecules.

CO5: develop interest in Asymmetric synthesis of naturally occurring essential compounds.

Course: Organic Chemistry Practicals: CHO-347, CHO-447, CHO-448

After successfully completing this course students will know,

CO1: How to synthesize organic molecules.

CO2: How to maintain reaction conditions.

CO3: Arrangement of assembly.

CO4: How to follow reaction by using thin layer chromatography

CO5: Methods of purification of samples.
