

Department of Chemistry

Program Specific Outcomes (PSO)

B.Sc. (Chemistry):

PSO1: Students completing this course will have understanding of basic concepts and application of Physical Chemistry, Inorganic Chemistry, Organic Chemistry, Analytical Chemistry, Industrial Chemistry.

PSO2: Students completing this course will have understanding of biomolecules like carbohydrates, protein, lipids, nucleic acid their structure, function and metabolism.

PSO3: Skills of micro scale technique will be developed.

PSO4: Skill of handling various instruments like potentiometer, conductometer, pH-meter etc. will be developed.

PSO5: Able to solve problems in Chemistry.

M.Sc. (Chemistry):

PSO1: Broaden students' professional foundations through activities such as teaching, internship & fellowships.

PSO2: Enable students to communicate scientific results in writing & in oral presentation

PSO3: Acquire the basic tools needed to carry out independent research.

PSO4: Make students proficient in their specialized area of chemistry and successfully complete an advanced research project.

PSO5: Explain why chemistry is an integral activity for addressing social, economic & environmental problems.

PSO6: Develop skills in problem solving, critical thinking & analytical reasoning as applied to scientific problems.

Course Outcomes (CO)

F.Y. B.Sc. Chemistry

Term I:

CH111: Chemistry I: Physical and Inorganic Chemistry

CO1: Familiarize with states of matter, and

CO2: Familiarize with surface chemistry

CO3: Familiarize with chemical mathematics

CO4: Familiarize with mole concepts

CH112: Chemistry II: Organic and Inorganic Chemistry

CO1: Understanding of chemical bonding, structure and reactivity

CO2: Understanding of chemistry of hydrocarbons

CO3: Understand chemistry of s-block elements

Term II:

CH121: Chemistry I: Physical and Inorganic Chemistry

CO1: Understanding of atomic structure

CO2: Basic concepts of thermodynamics

CO3: Understanding of chemical bonding

CH122: Chemistry II: Organic and Inorganic Chemistry

CO1: Understanding of chemistry of functional groups

CO2: Knowledge of stereochemistry

CO3: Understanding of p-block elements

CH123: Chemistry Practical

- CO1: Acquire technical and manipulative skills in using laboratory equipments, tools and materials.
CO2: Understanding of lab procedures including safety and scientific techniques.
CO3: Practical skill development in chemistry.

S.Y. B.Sc. Chemistry

Term I:

CH211: Physical and Analytical Chemistry

- CO1: Understanding of chemical kinetics
CO2: Understanding of photochemistry and distribution law
CO3: Understanding of basic concepts of analytical chemistry
CO4: Errors in quantitative analysis
CO5: Familiarize with Inorganic qualitative analysis

CH212: Organic and Inorganic Chemistry

- CO1: Understanding of stereoisomerism
CO2: Understanding of organic reaction mechanism
CO3: Understanding of general principles of metallurgy
CO4: Understanding corrosion and passivity

Term II:

CH221: Physical and Analytical Chemistry

- CO1: Understanding of free energy and equilibrium
CO2: Understanding of solution chemistry
CO3: Understanding of volumetric analysis

CH222: Organic and Inorganic Chemistry

- CO1: Familiarize with reagents in organic synthesis
CO2: Familiarize with Chemistry of Heterocyclic compounds and Biomolecules
CO3: Familiarize with Chemistry of d-block elements
CO4: Familiarize with organometallic chemistry and chemical toxicology

CH223: Chemistry Practical

- CO1: Develop practical skill in organic and inorganic qualitative analysis
CO2: Familiarize with basic physical chemistry practical

T.Y. B. Sc. Chemistry

Term I:

CH331: Physical Chemistry

- CO1: Understanding the basic concepts of chemical kinetics
CO2: Understanding the basic concepts of electrolytic conductance
CO3: Understanding the basic concepts of molecular structure
CO4: Understanding the phase rule

CH332: Inorganic Chemistry

- CO1: Understanding of fundamentals of molecular orbital theory
CO2: Understanding of coordination chemistry and different theories of coordination chemistry

CH333: Organic Chemistry

- CO1: Understanding of concepts of acids and bases
CO2: Understanding of stereochemistry of cycloalkanes
CO3: Familiarize with nucleophilic substitution
CO4: Reactions of carbon-carbon and carbon-oxygen multiple bonds
CO5: Understanding elimination reactions

CH334: Analytical Chemistry

CO1: Understanding of gravimetric and thermal methods of analysis

CO2: Familiarize with Basic concepts of spectro-photometry

CO3: Familiarize with polarography technique

CH335: Industrial Chemistry

CO1: Familiarize with chemical industries such as Agro, Petro, Food, Cement and Glass

CH336C: Introduction to Biochemistry and Molecular biology

CO1: Familiarize with biochemistry and molecular biology

CO2: Understanding biomolecules such as proteins, carbohydrates, lipids, vitamins and hormones

CO3: Familiarize with enzymes, and biochemical techniques

Term II :**CH341: Physical Chemistry**

CO1: Understanding of electrochemical cell

CO2: Understanding of basic nuclear chemistry

CO3: Understanding of crystal structure

CO4: Familiarize with quantum chemistry

CH342: Inorganic Chemistry

CO1: Understanding of chemistry of f-block elements

CO2: Understanding of metals, semiconductors and super conductors

CO3: Familiarize with ionic solids

CO4: Familiarize with homogenous and heterogeneous catalysis

CO5: Understanding of basic concepts in Bioinorganic chemistry

CH343: Organic Chemistry

CO1: Understanding the generations and reactions of carbanions

CO2: Familiarize with retro synthetic analysis

CO3: Various rearrangement reactions in organic chemistry

CO4: Spectroscopic methods like IR, UV, NMR in structure determination

CO5: Understanding of natural products

CH344: Analytical Chemistry

CO1: Understanding of solvent extraction

CO2: Understanding of various chromatographic techniques such as gas, HPLC etc.

CO3: Knowledge of techniques like electrophoresis, nephelometry, turbidimetry

CH345: Industrial Chemistry

CO1: Understanding of polymer chemistry

CO2: Knowledge of sugar, fermentation, soap, detergent, dyes, paints industries

CO3: Understanding of pharmaceutical industries

CO4: Knowledge of pollution prevention and waste management.

CH346C: Introduction to Biochemistry and Molecular Biology

CO1: Understanding metabolism of carbohydrates, amino acids, fatty acids

CO2: TCA cycle, Electron transport chain and oxidative phosphorylation

CO3: Understanding of structure and functions of Nucleic acid

CO4: Molecular biology: replication, transcription and translation, post translational process

CO5: Applications of genetic engineering

CH347: Laboratory course I: Physical Chemistry Practicals

CO1: Understanding of non-instrumental techniques like Chemical kinetics, viscosity, adsorption etc.

CO2: Handling and understanding of instruments like colorimeter, potentiometer, pH meter, Conductometer.

CH348: Laboratory course I: Inorganic Chemistry Practicals

CO1: Understanding of gravimetric, colorimetric and volumetric estimations
CO2: familiarize with inorganic complex preparation
CO3: Separation techniques such as column chromatography
CO4: Inorganic qualitative analysis: Binary mixtures

CH349: Laboratory course I: Organic Chemistry Practicals

CO1: Separation of organic binary mixtures and qualitative analysis
CO2: Familiarize with organic preparations

M. Sc. (Chemistry)

Semester I:

CHP110: Fundamentals of Physical Chemistry

CO1: Understanding of Chemical Thermodynamics
CO2: Understanding of Quantum Chemistry.
CO3: Understanding of Chemical kinetics and reaction dynamics
CO4: Understanding of Statistical Thermodynamics

CHI130: Molecular symmetry and chemistry of p-block elements

CO1: Understanding of group theory, molecular symmetry its application and their uses in point groups and molecular orbital theory .
CO2: Understanding of Chemistry of main group elements and their important uses.

CHO150: Basic organic chemistry

CO1: Understanding of structure and reactivity.
CO2: Understanding of Stereochemistry
CO3: Familiarize with Substitution reaction.
CO4: Familiarize with aromatic electrophilic substitution.

CHA190: Safety in chemical laboratory and good laboratory practices

CO1: Familiarize with safety measures while working in laboratory
CO2: Understanding of good laboratory practices

Semester II:

CHP210: Fundamentals of Physical Chemistry

CO1: Understanding of spectroscopic techniques like microwave, infrared, Raman, and electronic spectroscopy
CO2: Understanding of ESR, Mossbauer and NMR Spectroscopy
CO3: Understanding of basic concepts of radiation chemistry and applications

CHI230: Coordination and Bio-inorganic Chemistry

CO1: Understanding of Ligand- field coordination theory
CO2: Understanding of electronic spectra of transition metal complexes
CO3: Magnetic properties of coordination complexes.
CO4: Understanding of basic principles in Bio-Inorganic Chemistry

CHO250: Synthetic Organic Chemistry and Spectroscopy

CO1: Understanding of oxidation, reduction, rearrangement, ylides.
CO2: Familiarize with addition reactions of carbonyl groups.
CO3: Familiarize with IR, UV, PMR, CMR, and Mass spectrometry
CO4: Able to solve structures of organic molecules using these techniques

CHA290: General Chemistry II:

Part A: Modern separation methods and hyphenated techniques

CO1: understanding of Mass spectrometry, gas chromatography and HPLC

Part C: Concepts of analytical chemistry

CO1: Understanding of data handling and spread sheets in analytical chemistry

CO2: Familiarize with Sampling, standardization and calibration

CO3: Understanding of analytical separation

CHP107: Physical Chemistry Practicals

CO1: Familiarize with conductometry, potentiometry, pH metry, polagraphy, colorometry, radioactivity and chemical kinetics techniques

CO2: Understanding of non-instrumental techniques like statistical treatment, steam distillation, viscosity etc.

CO3: Able to handle various instruments independently

CHI127: Inorganic Chemistry Practicals

CO1: Understand analysis of alloys and ores

CO2: Able to prepare various inorganic complexes and measure their purity

CO3: Understanding of ion exchange chromatography, spectrophotometry, conductometry and inorganic characterization techniques

CO4: Able to synthesize nano materials.

CHO247: Organic Chemistry Practicals

CO1: Use of chemistry softwares like MOPAC, ISIS draw, Chem office etc

CO2: Able to purify organic compounds

CO3: Able to separate ternary mixtures

CO4: Able to prepare organic compounds

M. Sc. (Analytical Chemistry)

Semester III:

CHA390: Electro analytical and radio analytical methods of analysis

CO1: Familiarize with the technique of coulometry, voltammetry and polarographic methods of analysis

CO2: Understand Amperometry

CO3: Understand radioanalytical method and thermal method of analysis including DTA, DSC

CHA391: Pharmaceutical analysis

CO1: Understanding of FDA role in analysis

CO2: Understanding of biological test and assay

CO3: Understanding of microbiological tests and assays

CO4: Understanding of physical test, determination, limit tests and sterilization

CO5: Applicative knowledge of vegetable drug analysis

CO6: Familiarize with the sources of impurities in pharmaceutical drugs, their shelf life and finished products

CO7: should be aware of standardization and quality control of different raw materials and dosage form

CHA392: Advanced Analytical Techniques

CO1: Able to carry out aqueous extraction

CO2: Awareness about solid phase extraction and solid phase micro-extraction

CO3: Get well acquainted with the concept of microwave assisted extraction/super-critical fluid extraction

CO4: Familiarize with spectroscopic techniques such as AAS, AES, mass spectroscopy, laser spectroscopy, ICPMS, Atomic fluorescence spectroscopy

CHA380:

Part I: Analytical Methods Development and Validation

CO1: Have a fair knowledge of errors and accuracy alongwith the statistical analysis

CO2: familiarize with worldwide regulations and rules

CO3: Knowledge about dissolution studies

Part II: Geochemical and alloy analysis

CO1: Geochemical content in the different minerals and ores

CO2: Aware of different types of alloys, their content and methods of analysis

CO3: Understand different types of soils and their chemical analysis and properties

CO4: Knowledge of Indicators, display systems and recorders.

Semester IV:

CHA481: Analytical Toxicology and Food Analysis

CO1: Understanding of diagnosis, treatment and role of acute poisoning

CO2: Isolation, identification and determination of narcotics, stimulants and depressants

CO3: Understanding of Narcotics and psychotropic substances

CO4: Understanding of carbohydrates, proteins, lipids, milk and food preservatives.

CHA490: Analytical Spectroscopy

CO1: Understanding principle, instrumentation of Electron spectroscopy and X-ray methods

CO2: Understanding of microscopy techniques.

CO3: : Understanding of chemiluminescence.

CO4: : Understanding of fluorescence, phosphorescence and NMR spectroscopy.

CHA491: Analytical Methods

CO1: Understanding of analysis of fertilizers, soaps and detergents

CO2: Understanding of water pollution and its analysis.

CO3: Analysis and testing of polymers.

CO4: Understanding of analysis of paints and pigments

CHA492: Method of Analysis and Applications

Part I: Pollution monitoring and Control

CO1: Understanding of removal of heavy toxic metals.

CO2: Understanding of removal of particulate matters

CO3: Understanding of removal of sulphur dioxide and nitrogenous materials

Part III: Carbon Nano structures and Applications of Nanotechnology

CO1: Understanding of carbon nanostructures

CO2: Understanding of biomedical applications

CO3: To know about environmental impacts of nanotechnology.

CHA387: Analytical Chemistry Practicals I

CO1: Understanding of analysis of alloys and ores

CO2: Able to analyze pigments, leaves, fertilizers.

CO3: Understanding of column and ion exchange chromatography.

CHA487: Analytical Chemistry Practicals II

CO1: Familiarize with conductometry, potentiometry, pH metry, polagraphy, colorometry, radioactivity and chemical kinetics techniques

CO2: Understanding of techniques like AAS. HPLC and GC.

CO3: Understanding of Nephelometry technique.

CO4: Able to handle various instruments independently

CHA488: Analytical Chemistry Practicals III

CO1: Able to analyze pharmaceutical samples by spectrophotometry and chromatography.

CO2: Able to estimate the food samples.

CO3: Able to estimate the bioanalytical samples.

M. Sc. (Organic Chemistry)

Semester III:

CHO350: Organic Reaction Mechanism

CO1: Understanding of carbanions and enamines formation and applications

CO2: Understanding of NGP

CO3: Understanding of reactions of carbenes, nitrenes and free radical

CO4: Understanding of mechanism in biological chemistry

CHO351: Spectroscopic methods in structure determination

CO1: Understanding of ^1H NMR, ^{13}C NMR spectroscopy.

CO2: Understanding of mass spectroscopy.

CO3 : Understanding of 2 D NMR techniques

CO4: Able to solve the problems based on joint applications of UV,IR,PMR,CMR and mass

CHO352: Organic stereochemistry

CO1: Understanding of stereochemistry of 6 membered and other than 6 membered rings.

CO2: Understanding of stereochemistry of fused bridge and caged rings.

CO3: Understanding of resolution of racemic modification, geometrical isomerism and olefins.

CO4: Understanding of CD and ORD

CO 5: Able to determine the stereochemistry of organic compound using NMR.

CHO353: Pericyclic reactions, photochemistry and heterocyclic chemistry.

CO1: Understanding of Photochemistry and its applications in synthesis.

CO2: Understanding of pericyclic reactions and its applications

CO3: Understanding of five and six member heterocycles

CO4: Understanding of condensed five and six membered heterocycles.

Semester IV:

CHO450: Natural Products

CO1: Understanding of structure and stereochemistry of hardwickiic acid, camptothecin and podophylotoxin.

CO2: Understanding of synthesis of natural products like taxol, estrone, etc.

CO3: Understanding of biogenesis of terpenoids and alkaloids and shikimate pathways

CHO451 : Advanced Synthetic Organic Chemistry

CO1: Understanding of transition metal complexes in organic synthesis

CO2: Understanding of carbon-carbon double bond formation reactions.

CO3: Understanding of ring formation reaction

CO4: Understanding of metathesis i.e. Grubbs generation catalyst, olefins cross coupling, etc

CHO452: Carbohydrate and Chiron approach / chiral drugs and medicinal chemistry

CO1: Understanding of structure, stereochemistry, reaction of carbohydrates like triose, tetrose, pentose, hexose.

CO2: Understanding of Chiron approach

CO3: Understanding of chiral drugs, eutomer, distomer and eudesmic ratio.

CO4: Understanding of action and discovery of medicinal compounds and its chemical and biological properties.

CHO453: Designing organic synthesis and asymmetric synthesis.

CO1: Able to design the organic synthesis

CO2: Understanding of retrosynthesis.

CO3: Understanding of principle and applications of asymmetric synthesis.

CO4: Understanding of stereo selectivity, enantio-selectivity, diastereo-selectivity.

CHO347: Single stage preparations

CO1: Able to prepare various derivatives by single stage method.

CO2: Able to isolate the various components from natural products

CO3: Able to handle soxhlet extraction and steam distillation unit for separation.

CO4: Understanding of micro scale technique.

CHO447: Two stage preparations

CO1: Able to prepare various derivatives by two stage method.

CO2: Understanding of micro scale technique.

CHO448: Project/industrial training / green chemistry and chemical biology experiments

CO1: Able to carry out a project independently.

CO2: Understanding of importance and use of green chemistry.

CO3: Understanding of chemical biology experiments.