DEPARTMENT OF CHEMISTRY
PROGRAMME: B.SC.

Statements of Programme Specific Outcomes (PSOs)

By the end of the course, the students will be able to:

1. Join school or junior college as Chemistry teacher.
2. Prepare for competitive exams like MPSC,SET,UPSC,NET,GATE,CAT.
3. Analyze and grasp abstract ideas to apply them to important practical problems.
4. Develop strong analytical skills and a broad-based background in the Chemistry sciences to join research and pharmaceutical industry.

Statement of Course Outcomes (COs)

M.SC. Course: SEM-1 CH-101: Paper I (Inorganic Chemistry)

By the end of this course,the students will be able to:

1. Understand Stereochemistry and bonding in main group compound and metal ligand bonding.
2. Understand Metal-ligand equilibria in solution.
3. Understand the reaction mechanism of Transition metal complexes.
4. Understand the Borohydride compounds and metal-metal bonds.

M.SC. Course:SEM-1 CH-102: Paper II (Organic Chemistry)

By the end of this course,the students will be able to:

1. Understand the nature and bonding and reactive intermediate in organic chemistry.
2. Study stereochemistry of organic compound.
3. Study the reaction mechanism and reactivity of organic compounds i.e. Aliphatic nucleophilic substitution reaction,aromatic nucleophilic and electrophilic substitution reaction.

M.SC. Course: SEM-1 CH-103: Paper III (Physical Chemistry)

By the end of this course, the students will be able to:

1. Understand the concept of classical thermodynamics.
2. Understand the concept of Gibbs function and phase equilibria.
3. Understand the surface phenomenon of macromolecules and chemical kinetics of reactions.

M.SC. SEM-1 CH-104: Paper IV (Analytical Chemistry)

By the end of this course, the students will be able to:

1. 1.To study statistical analysis of chemical reactions.
2. To understand separation techniques involved in purification process.
3. Students will be able to perform volumetric and gravimetric analysis.
4. To study the conceptual understanding of electrochemical analysis.

M.SC. SEM-1 CH-105: Practical-I (Inorganic Chemistry)

By the end of this course, the students will be able to:

1. Prepare inorganic complexes and their analysis.
2. Perform quantitative analysis of different metal salts.
3. Able to perform qualitative analysis of rare earth metals.
4. To understand gravimetric and spectrometric analysis of complexes.

M.SC. SEM-1 CH-106: Practical-II (Physical Chemistry)

By the end of this course, the students will be able to:

1. To determine molecular wt. of polymer by viscosity method.
2. To study the kinetics of chemical reactions.
3. To determination of heat of reaction, entropy change and equilibrium constant of the reaction between metallic zinc and Cu+2 ions in solution.
4. To determine equivalent conductance of weak electrolyte at infinite dilution by kaulrausch's Method.

M.SC. SEM-1 CH-107: Seminar-I

By the end of this course, the students will be able to:

1. Seminar of 30 minutes duration will be a part of internal assessment and helpful for students to improve their communication and presentation skills.
2. Students will gain knowledge of literature survey.

M.SC. SEM-1I CH-201: Paper V (Inorganic Chemistry)

By the end of this course, the students will be able to:

1. Understand electronic spectra of transition metal complexes.
2. Gain knowledge about magnetic properties of transition metal complexes
3. Understand reaction mechanism of transition metal complexres.
4. To study metal carbonyls and nitrosyls.

M.SC. SEM-1I CH-202: Paper VI (Organic Chemistry)

By the end of this course, the students will be able to:

1. Study reaction mechanisms for addition to carbon-carbon multiple bond and addition to carbon-hetero atom multiple bond.
2. Understand mechanism for molecular rearrangement and elimination reactions.
3. To gain knowledge of free radical reactions.
4. To study and understand importance of green chemistry

M.SC. SEM-1I CH-203: Paper VII (Physical Chemistry)

By the end of this course, the students will be able to:

1. Understand formulation of quantum mechanics.
2. Gain knowledge about chemical thermodynamics
3. Understand solid state chemistry.
4. Study the statistical thermodynamics and nuclear chemistry

M.SC. SEM-1I CH-204: Paper VIII (Analytical Chemistry)

By the end of this course, the students will be able to:

1. Understand Sampling and quantification.
2. Study modern separation techniques such as gas Chromatography, liquid chromatography, supercritical fluid chromatography.
3. To understand Optical methods of analysis.

M.SC. SEM-1I CH-205: Practical-III (Organic Chemistry)

By the end of this course, the students will be able to:

1. Perform organic qualitative analysis for structure determination.
2. Students will be able to perform single stage preparations.
3. Carry out purification of the compounds by crystallization, TLC and chromatographic techniques.

M.SC. SEM-1I CH-206: Practical-IV (Analytical Chemistry)

By the end of this course, the students will be able to:

1. To understand classical methods and separation techniques: calibration, validation and computers
2. To study instrumental techniques: electro analytical techniques.
3. To perform volumetric and gravimetric analysis.
4. To understand and perform Optical methods of analysis.

M.SC. SEM-1I CH-207: Seminar-II

1. Seminar of 30 minutes duration will be a part of internal assessment and helpful for students to improve their communication and presentation skills.
2. Students will gain knowledge of literature survey.

M.Sc. Semester III CH-301: Paper IX (Special I-Inorganic Chemistry)

By the end of this course, the students will be able to:

1. To understand importance of essential and trace metals in biological systems.
2. Gain knowledge about bio-energetics and atp cycle and electron transfer in biology.
3. To study the role of metallo enzymes.

M.Sc. Semester III CH-302: Paper X (Special II-Inorganic Chemistry)

By the end of this course, the students will be able to:

1. To understand crystal structure of some simple compounds
2. Understand chemistry of glasses, ceramics and composite.
3. Gain the knowledge about liquid crystals.

M.Sc. Semester III CH-305: Practical-V (Inorganic Chemistry Special)

By the end of this course, the students will be able to:

1. Perform experiments related to colorimetry and spectrophotometry.
2. Study Kinetics and mechanism of chemical reactions.
3. Perform experiment of extraction and absorption spectral study of chlorophyll from green leaves.
4. Separate chlorophyll and study their electronic spectra.

M.Sc. Semester III CH-301: Paper IX (Special I-Organic Chemistry)

By the end of this course, the students will be able to:

1. To study Photochemistry and pericylic reactios of organic compounds.
2. Understand oxidation and reduction methods in chemical methods.
3. Gain the knowledge about chemistry of P, S, Si,and Boron compounds.
4. Use of Organo silicon compounds in organic synthesis.

M.Sc. Semester III CH-302: Paper X (Special II-Organic Chemistry)

By the end of this course, the students will be able to:

1. Understand chemistry of natural products.
2. Importance of alkaloids and prostaglandins in biological systems.
3. To gain the knowledge about carbohydrate, amino acids, protein and peptides**.**

M.Sc. Semester III CH-305: Practical-V (Organic Chemistry Special)

By the end of this course, the students will be able to:

1. Perform quantitative analysis of vitamin "c" iodometry, glucose by benedict's solution, aldehyde by oxidation method.
2. To isolate organic compounds from natural source.
3. Perform separation of the components of a mixture of three organic compounds.

M.Sc. Semester III CH-301: Paper IX (Special I-Physical Chemistry)

By the end of this course, the students will be able to:

1. Understand the use of statistical thermodynamics.
2. To gain the knowledge about electrochemistry of interfaces.
3. To study the photo physical phenomenon and photochemical reactions.
4. To understand chemical dynamics of reactions.

M.Sc. Semester III CH-302: Paper X (Special II-Physical Chemistry)

By the end of this course, the students will be able to:

1. Understand applications of quantum mechanics.
2. To gain the knowledge about solid state reactions and nanoparticles.
3. To study and understand electrochemistry of solutions.
4. Know the applications of irreversible thermodynamics.

M.Sc. Semester III CH-305: Practical-V (Physical Chemistry Special)

By the end of this course, the students will be able to:

1. Determine partial molar volume of solute and solvents.
2. To study the effect of addition of an electrolyte such as NaCl, KCl,Na2SO4,K2SO4 etc. on the solubility of an organic acid.
3. To determine the activation energy of hydrolysis of an ester by acid.
4. Determine the eq. conductance of strong electrolyte (KCl, NaCl, HCl, KNO3) at several concentration and hence verify Onsager's equation.

M.Sc. Semester III CH-301: Paper IX (Special I-Analytical Chemistry)

By the end of this course, the students will be able to:

1. Understand use of radioanalytical chemistry.
2. Know about the Optical methods of analysis.

3. Gain knowledge about electrochemical methods of analysis such as stripping voltammetry, adsorptive stripping voltammetry, cyclic voltammetry.
4. To understand Fluorometry, phosphorimetry, Nephelometry and turbidimetry, Photoacoustic spectroscopy.

M.Sc. Semester III CH-302: Paper X (Special II-Analytical Chemistry)

By the end of this course, the students will be able to:

1. Know the use of organoanalytical chemistry.
2. Understand the procedure for analysis of ores and cement.
3. To gain the knowledge about water pollution and analysis.
4. To understand the air pollution and analysis.

M.Sc. Semester III CH-305: Practical-V (Analytical Chemistry Special)

By the end of this course, the students will be able to:

1. Determine percent Na2CO3 in soda ash by pH-metric titration.
2. Estimate Cl-, Br- and I- in a mixture.
3. Determine percent purity of phenol by potentiometric titration with NaOH.
4. Estimate nickel and cobalt by coulometric analysis at controlled potential.
5. Determine percentage of two optically active substances (d-glucose and d-tartaric acid) in mixture.

M.Sc. Semester III CH-303: Paper XI (Elective- Environmental Chemistry)

By the end of this course, the students will be able to:

1. To understand concept and scope of environmental chemistry.
2. Gain the knowledge about water and air pollution.
3. Understand the causes of soil pollution.
4. Study and understand causes and effect of radioactive pollution.

M.Sc. Semester III CH-303: Paper XI (Elective- Polymer Chemistry)

By the end of this course, the students will be able to:

1. Know about the basics of polymer chemistry.
2. Determine molar mass of polymers by various methods.
3. Understand the physical characteristics of polymers.
4. To gain the knowledge about Organic polymers: Commercial polymers, synthesis and and application of polyethylene, Cellulose Acetate, PMMA, polyaimdes, polyesters, Urea resins and eposy resins.

M.Sc. Semester III CH-303: Paper XI (Elective- Medicinal Chemistry)

By the end of this course, the students will be able to:

1. Understand the basics about drug design.
2. Gain the knowledge about pharmacokinetics and pharmacodynamics of drugs.
3. Study about the cardiovascular drugs, antineoplastic agent, psychoactive drugs, coagulant and anticoagulants.
4. Get knowledge about drugs absorption, distribution and disposition of drugs,

excretion and elimination, pharmacokinetics of elimination and pharmacokinetics in drug development process.

M.SC.: SEM-IV CH-401: Paper XIII (Special I-Inorganic Chemistry)

By the end of this course, the students will be able to:

1. 1.Understand nanoparticle and nanostructural material.
2. Learn coordination polymer and their characterization.
3. Understand organotransition metal inorganic chemistry and their reactions.
4. Understand catalysis and optical sensor for metal ions.

M.SC.: SEM-IV CH-402: Paper XIV (Special II-Inorganic Chemistry)

By the end of this course, the students will be able to:

1. 1.Understand basics of photochemistry.
2. Learn redox reactions by excited metal complexes.
3. Understand organotransition metal inorganic chemistry and their reactions.

M.SC.: SEM-IV CH-405: Practical-VII (Inorganic Chemistry Special)

By the end of this course, the students will be able to:

1. Preparation and characterization of complexes/organometallic compound including their structural elucidation by the available physical methods.
2. Separation and quantitative estimation of binary and ternary inorganic mixture.

M.SC.: SEM-IV CH-401: Paper XIII (Special I-Organic Chemistry)

By the end of this course, the students will be able to:

1. Study carbanion , organometallic in organic chemistry.
2. Understand use of organometallic reagents in organic chemistry.
3. Study stereochemistry and retrosynthetic analysis of organic compound.

M.SC.: SEM-IV CH-402: Paper XIV (Special II-Organic Chemistry)

By the end of this course, the students will be able to:

1. Understand enzyme chemistry, mechanism of enzyme action.
2. Study different heterocyclic compounds, their preparation and reactions.
3. Understand nuclic acids and lipids.
4. Study organic polymer.

M.SC.: SEM-IV CH-405: Practical-VII (Organic Chemistry Special)

By the end of this course, the students will be able to:

1. Do quantative analysis of Nitrogen,halogen and Sulpher based on classical and instrumental technique.
2. Estimation of streptomycin sulphate, vitamin B-12, amino acids etc by spectrophotometric technique.
3. Do Organic multi-step preparations (Two/Three steps).
4. Structure Elucidation of organic compounds on the basis of spectral data (UV, IR, 1H and 13CNMR and Mass)

M.SC.: SEM-IV CH-401: Paper XIII (Special I-Physical Chemistry)

By the end of this course, the students will be able to:

1. Understand chemical thermodynamics.
2. Understand corrosion and corrosion analysis.
3. Understand and uses of Radiation chemistry.
4. Learn electrical and thermal properties of solids.

M.SC.: SEM-IV CH-402: Paper XIV (Special II-Physical Chemistry)

By the end of this course, the students will be able to:

1. Study solid state of compound and their magnetic properties.
2. Do electrical properties of compound.
3. Study liquid states and interfaces.
4. Understand ionic liquid and battery technology.

M.SC.: SEM-IV CH-405: Practical-VII (Physical Chemistry Special)

By the end of this course, the students will be able to:

1. To verify Gibbs adsorption isotherm and to find surface excess concentration of solute.
2. Determination of pKa value of a weak acid by chemical kinetic method (formate-iodine reaction)
3. Transport number by potentiometry.
4. To determine the stability constant of reaction between Ferric ion solution and SCN- ion solution by Job's method.

M.SC.: SEM-IV CH-401: Paper XIII (Special I-Analytical Chemistry)

By the end of this course, the students will be able to:

1. Prepare radioisotopes and application of radioisotopes.
2. Learn optical method of analysis.
3. Do electrochemical and thermal method of analysis of all types of compounds.

M.SC.: SEM-IV CH-402: Paper XIV (Special II-Analytical Chemistry)

By the end of this course, the students will be able to:

1. 1.Study clinical and pharmaceutical analysis.
2. Do soil analysis and coal analysis.
3. 3.Study corrosion and corrosion analysis.
4. Learn automation in analytical chemistry.

M.SC.: SEM-IV CH-405: Practical-VII (Analytical Chemistry Special)

By the end of this course, the students will be able to:

1. Estimate different types of elements like P,S,C,N, halogen present in given organic compound.
2. Estimation of phenol and aniline.
3. Study different types of separation technique like solvent extraction, ion exchange, paper chromatography, thin layer chromatography.
4. Check different types of water parameters.
5. Understand uses and applicationsof HPLC and GC.

M.SC.: SEM-IV CH-403: Paper XV (Elective- Environmental Chemistry)

By the end of this course, the students will be able to:

1. 1.Study causes of water pollution and how to minimize it.
2. Study air pollution – causes and remedies.
3. Study Soil pollution – causes and remedies.

M.SC.: SEM-IV CH-403: Paper XV (Elective- Polymer Chemistry)

By the end of this course, the students will be able to:

1. Study different types of polymers.
2. Prepare different types of polymers.
3. Study different characterization method of analysis of polymer.

M.SC.: SEM-IV CH-403: Paper XV (Elective- Medicinal Chemistry)

By the end of this course, the students will be able to:

1. Study different types of drugs with their action.
2. Reactivity of drug with active sites.
3. Prepare different types of drugs.

M.SC.: CH-404: SEM-IV Paper XVI (Foundation-II)
Instrumental Methods of Analysis – II

By the end of this course, the students will be able to:

1. Study spectroscopical techniques for structure determination.
2. Study Nuclear magnetic Resonance Spectroscopy which is useful for structure determination.
3. Study diffraction technique which is useful for structure determination.

M.SC.: SEM-IV CH-406: Practical VIII- Project

By the end of this course, the students will be able to:

1. Learn different techniques of research used in anlaysis.
2. Perpare ppt presentation.
3. Improve presentation skill and teaching communication skill.