

Department of Chemistry:

Program Outcomes, Program Specific Outcomes

Programme Outcomes: B. Sc. Chemistry

Department of Chemistry	After successful completion of three year degree program in Chemistry a student should be able to;
Programme Outcomes	PO-1. Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry. PO-2. Solve the problem and also think methodically, independently and draw a logical conclusion. PO-3. Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions. PO-4. Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community. PO-5. Find out the green route for chemical reaction for sustainable development. PO-6. To inculcate the scientific temperament in the students and outside the scientific community. PO-7. Use modern techniques, decent equipments and Chemistry software's
Programme Specific Outcomes	PSO-1. Gain the knowledge of Chemistry through theory and practical's. PSO-2. To explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions. PSO-3. Identify chemical formulae and solve numerical problems. PSO-4. Use modern chemical tools, Models, Chem-draw, Charts and Equipments. PSO-5. Know structure-activity relationship. PSO-6. Understand good laboratory practices and safety. PSO-7. Develop research oriented skills. PSO-8. make aware and handle the sophisticated instruments/equipments.

Programme Outcomes: B. Sc. Analytical Chemistry

Department of Chemistry	After successful completion of three year degree program in Analytical Chemistry a student should be able to;
Programme Outcomes	PO-1. Demonstrate, solve and an understanding of major concepts in analytical chemistry. PO-2. Become professionally trained in the area of Industry, material science, PO-3. Apply modern methods of analysis to chemical systems in a

	<p>laboratory setting.</p> <p>PO-4. To study principle, construction and working of GC and HPLC.</p> <p>PO-5. To give an extended knowledge about chromatographic techniques used for separation of amino acids.</p> <p>PO-6. Discuss the problem based on distribution coefficient and extraction techniques.</p>
Programme Specific Outcomes	<p>PSO-1. Learn about the potential uses of analytical industrial chemistry.</p> <p>PSO-2. Carry out experiments in the area of organic analysis, estimation, separation, derivation process, conduct metric and potentiometric analysis.</p> <p>PSO-3. Understand good laboratory practices and safety.</p> <p>PSO-4. Make aware and handle the sophisticated instruments/equipments.</p> <p>PSO-5. Enhance students ability to develop mathematical models for physical systems..</p>

Programme Outcomes: M. Sc. Organic Chemistry

Department of Chemistry	After successful completion of two year degree program in chemistry a student should be able to;
Programme Outcomes	<p>PO-1. Determine molecular structure by using UV, IR and NMR.</p> <p>PO-2. Study of medicinal chemistry for lead compound.</p> <p>PO-3. Improve the Skill of student in organic research area.</p> <p>PO-4. Synthesis of Natural products and drugs by using proper mechanisms.</p> <p>PO-5. Study of Asymmetric synthesis.</p> <p>PO-6. Determine the aromaticity of different compounds.</p> <p>PO-7. Solve the reaction mechanisms and assign the final product.</p>
Programme Specific Outcomes	<p>PSO-1. Know the structure and bonding in molecules/ ions and predict the Structure of molecule/ions.</p> <p>PSO-2. Understand the various type of aliphatic, aromatic, nucleophilic substitution reaction.</p> <p>PSO-3. Understand and apply principles of Organic Chemistry for understanding the scientific phenomenon in Reaction mechanisms.</p> <p>PSO-4. Learn the Familiar name reactions and their reaction mechanisms.</p> <p>PSO-5. Understand good laboratory practices and safety.</p> <p>PSO-6. Study of organometallic reactions.</p> <p>PSO-7. Study of free radical, bicyclic compound, conjugate addition of Enolates and pericyclic reactions.</p> <p>PSO-8. Study of biological mechanisms using amino acids.</p>

Course Outcomes B. Sc. Chemistry

<u>F.Y.B.Sc.</u>	
Course Details	Outcomes of the Course On successful completion of the course, students will able to,
Paper I Inorganic Chemistry	<ul style="list-style-type: none"> • Understand the molecular structure • differentiate Nucleus, Neutron, Proton and electron • Will be able to write electronic configuration of element • Trends involved in periodic Table
Paper II Organic Chemistry	<ul style="list-style-type: none"> • Explain concepts like resonance, inductive effect and hyper conjugation. • Can be able to differentiate between electrophile and nucleophile • Predict reactive intermediates like carbocation's, carbanions and radicals • Predict geometrical isomer, optical isomers, relative and absolute configuration. • Can differentiate alkane, alkene, alkyne, aryl halides
Paper-IV Physical Chemistry	<ul style="list-style-type: none"> • Do logarithmic relations, linear graphs and calculations of slope • Understand Boyles law, Charles law and Graham's law • Explain catalysis and can differentiate homogenous and heterogeneous catalyst
Paper-V Inorganic Chemistry	<ul style="list-style-type: none"> • Students can predict hybridization and shape of molecules • Explain isotopes, isobars and carbon dating • Understands technique like titration, indicators used in titration • Understands oxidising and reducing reagents
<u>S.Y.B.Sc.</u>	
Course Details	On successful completion of the course, students will able to,
Paper – VII Organic Chemistry	<ul style="list-style-type: none"> • Differentiate primary, secondary and tertiary alcohol • Do rearrangement reactions like fries and claisen rearrangement • Explain reaction related to aldehyde and ketones like aldol condensation, bayervilliger etc. • Explain use of quaternary amines as phase transfer catalyst
Paper – VIII Physical Chemistry	<ul style="list-style-type: none"> • Understand heat and temperature and their relation to other forms of energy • Explains concepts like enthalpy, entropy, free energy • Can derive equations related to law of mass action, claapeyron, clausius-claapeyron equation

Paper – X Inorganic Chemistry	<ul style="list-style-type: none"> • Explain characteristic of transition metals and their trends • Differentiate Lanthanides and actinides based upon their electronic configuration and their unique properties • Understand acids, bases, aqueous and non-aqueous solvents
Paper – XI Physical Chemistry	<ul style="list-style-type: none"> • Explain the terms like phase, components and Degree of freedom • Understand the equilibrium which exists between different states of matter namely solid, liquid and gas. • Understand interaction between electrical energy and chemical change
<u>T.Y.B.Sc.</u>	
Course Details	On successful completion of the course, students will be able to,
Paper – XIII Physical Chemistry	<ul style="list-style-type: none"> • Understand black body radiation, photoelectric effect Compton effect • Explain basic features of different spectrometers • Explain Jablonski diagram and non-radiative process • Synthesize nano-materials by vapour deposition and chemical deposition methods
Paper – XIV Organic Chemistry	<ul style="list-style-type: none"> • Interpret various organic molecules by proton magnetic resonance spectroscopy • Have applicative knowledge of various organometallic reagents in chemical reactions • Prepare various organic molecules by enolate mechanism • Have detailed knowledge edible, industrial and vegetable oils
Paper – XVI Inorganic Chemistry	<ul style="list-style-type: none"> • Explain metal ligand bonding of metal complex valence bond theory, crystal field theory of octahedral complex and square planar complex • Interpret electronic spectra of transition metal complex by Orgel diagram • Prepare and characterize organometallic compounds • Understand the importance of various metal complex in bioinorganic chemistry
Paper – XVII Organic Chemistry	<ul style="list-style-type: none"> • Synthesize the heterocyclic compounds such as pyrrole, furan, thiophene and pyridine • Understand reaction subjected to carbohydrates such as glucose and fructose • Understand the synthesis of various polymers such as polystyrene, nylon 66, nylon 6 • Explain importance dyes and their application

Course Outcomes B. Sc. Analytical Chemistry

<u>F.Y.B.Sc.</u> (Analytical Chemistry)	
Course Details	Outcomes of the Course On successful completion of the course, students will able to,
ACH-101 Paper No. I: Fundamentals of Analytical Chemistry	<ul style="list-style-type: none"> • understands various techniques in analytical chemistry • do the chemical analysis of various solutions • do sampling preparation of sample solution • identify oxidizing, reducing, complexing, chelating and precipitating reagents • understand various rules associated with lab safety, chemical handling, analytical balance handling.
ACH-102 Paper No. II: Basic concepts of Analytical Chemistry	<ul style="list-style-type: none"> • handle analytical balance with precaution • find the sources of errors in weighing • understand applications of different grades of chemical • use of apparatus like volumetric flask, pipette, burette and graduated glasswares. • prepare solutions with different concentration concepts. • understand concepts of acids, bases and buffers and its application in biological and clinical measurement
ACH-201 Paper No. IV: Statistical treatment & modern methods of analysis	<ul style="list-style-type: none"> • Identify significant figure and rounding off figures. • explain the result of chromatography like TLC • understand the various statistical Terms • Understand the theory behind electrophoresis and its classification. • Predict the various factors affecting acid rain.
ACH-202 Paper No. V: Classical and spectral methods of Analysis	<ul style="list-style-type: none"> • do the titrations with skill of operations • explain the role of indicators in titrimetric analysis • explains the principles of quantitative techniques such as gravimetry • interpret the end point in redox, precipitation and complexometric titrations • do the analysis of spectral methods such as visible spectroscopy.
<u>S.Y.B.Sc.</u> (Analytical Chemistry)	
Course Details	On successful completion of the course, students will able to,
ACH-301 Paper No. VII: Laboratory Techniques: Inorganic and organic analysis	<ul style="list-style-type: none"> • interpret the oxidation states of various atoms • Estimate various metals using titration method. • explain the stability of complexes • estimate the functional groups in organic compounds

<p>ACH-302</p> <p>Paper No. VIII: Advanced Analytical Techniques</p>	<ul style="list-style-type: none"> • calculate the retention value in GC • explain the principle of adsorption chromatography • understand the extraction method • Understand the application of resin in analytical chemistry.
<p>ACH-401</p> <p>Paper No. XI: Instrumental Method of Analysis-I</p>	<ul style="list-style-type: none"> • explain the applications, advantages and limitations of Conductometric titration • understand the principles of potentiometric titrations • explain the advantages and disadvantages of high frequency method and applications • understand techniques like Nephelometry and Turbidimetry.
<p>ACH-402</p> <p>Paper No. XII: Instrumental Method of Analysis-II</p>	<ul style="list-style-type: none"> • understand instrumentation and applications of polarography • explain the properties like viscosity and surface tension in analytical chemistry. • understand the principles of potentiometric titrations • explain the advantages and disadvantages of high frequency method and applications
<p><u>T.Y.B.Sc.</u> (Analytical Chemistry)</p>	
<p>Course Details</p>	<p>On successful completion of the course, students will able to,</p>
<p>ACH-501</p> <p>Paper No. XV: Modern Techniques in Analysis</p>	<ul style="list-style-type: none"> • calculate the number of vibrations and frequency of vibration • interpret the NMR and Mass spectra of compounds • solve numerical based on NMR • explain the advantages and limitations of fluorescence spectroscopy.
<p>ACH-502</p> <p>Paper No. XVI: Industrial, Microbiological and Biochemical Analysis</p>	<ul style="list-style-type: none"> • understand chemistry behind paints, pigments and pesticides • estimate main constituents in steel, brass, solder and gun metal. • Understand the principle behind microbial analysis • predict the various factors affecting growth of microorganism
<p>ACH-601</p> <p>Paper No. XIX: Applied Analytical Chemistry – I</p>	<ul style="list-style-type: none"> • do analysis of minerals, ores, cements and coals • do the analysis of fertilizers • do the analysis of water, air and effluents • predict the various factors affecting acid rain
<p>ACH-602</p> <p>Paper No. XX: Applied Analytical Chemistry – II</p>	<ul style="list-style-type: none"> • do analysis of food stuffs • do analysis of milk, butter, wheat flour, coca, tea, honey and meat • explain the classification of drugs • estimate amount of glucose present in blood • estimate uric acid in serum • estimate blood chlorides, serum calcium, sodium and potassium.

Course Outcomes M. Sc Chemistry

Course Details	Outcomes of the Course After completion of these courses students should be able to;
CHE-101 Analytical Chemistry	CO-1. To provide an understanding of and skills in advanced methods of separation and analysis. CO-2. To understand the chromatographic techniques. CO-3. Study the instrumentation, sample injection system, columns for HPLC and GC, Solvent treatment system and choice of mobile phase. CO-4. To provide practical experience in selected instrumental methods of analysis
CHE-102 Inorganic Chemistry	CO-1. Understand the mechanism in transition metal complexes, Born Haber cycle to calculate lattices energy. CO-2. Learn the use of catalyst, radius ratio rule of coordination number 3,4 CO-3. Study the structure of atom, Hunds rule, term symbol, calculation of microstate and selection rule. CO-4. Understand the metal complexes in biological system.
CHE-103 Organic Chemistry	CO-1. Learn E and Z nomenclature in C,N,S,P containing compound, Stereo chemical principal, enantiomeric relationship R and S CO-2. Learn SN1, SN2 and SNi Mechanism and stereochemistry. CO-3. Study of carbanion-formation, stability and related name reaction, enemies and its applications. CO-4. Learn the carbines and nitrenes.
CHE-104 Physical Chemistry	CO-1. Realize the terms ionic strength, activity coefficient. CO-2. Learn the thermodynamic description of exact, inexact differential and state function. CO-3. Study the lindemann-hinshelwood reaction. CO-4. Know the thermodynamics and various partition functions.
CHE-205 Spectroscopic method of Analysis	CO-1. Understand the factors affecting UV-absorption spectra, Interpret IR spectra on basic values of IR-frequencies. CO-2. Study ¹ H NMR Spectroscopy: Chemical Shift, deshielding, correlation for protons bonded to carbon and other nuclei. CO-3. Discuss the problem of UV, IR and NMR.
CHE-206 Inorganic Chemistry	CO-1. Learn concept of symmetry elements in molecules. CO-2. Known the preparation and properties of transition metal carbonyls. CO-3. Find out the point group of inorganic molecules.
CHE-207 Organic Chemistry	CO-1. Understands the mechanism of nucleophilic substitution and elimination reactions. CO-2. Visualizes the aromatic electrophilic substitution mechanism. CO-3. Distinguish between type of addition, elimination and substitution reaction.
CHE-208 Physical Chemistry	CO-1. Perceives the postulates of quantum chemistry. CO-2. Gains the potential about photo and radiation chemistry. CO-3. Understands the importance of quantitative mechanics in electron filling.
CHE-301 Structural Elucidation by	CO-1. Study ¹ H NMR Spectroscopy: Chemical Shift, deshielding, correlation for protons bonded to carbon and other nuclei.

Spectral methods	CO-2. Study of ^{13}C NMR spectroscopy: FT- NMR, type of ^{13}C NMR spectra, proton decoupled, off resonance, APT, INEPT, DEPT, Chemical shift, nuclear and hetero nuclear coupling constant. CO-3. 2D NMR techniques: COSY, homo and hetero nuclear 2D resorts spectroscopy, NOESY and the applications.
CHEO-313 Structural Elucidation by Spectral methods	CO-1. Study ^1H NMR Spectroscopy: Chemical Shift, deshielding, correlation for protons bonded to carbon and other nuclei. CO-2. Study of ^{13}C NMR spectroscopy: FT- NMR, type of ^{13}C NMR spectra, proton decoupled, off resonance, APT, INEPT, DEPT, Chemical shift, nuclear and hetero nuclear coupling constant. CO-3. 2D NMR techniques: COSY, homo and hetero nuclear 2D resorts spectroscopy, NOESY and the applications.
CHEO-314 Organic Synthesis	CO-1. Study of transition metal complexes in organic synthesis. CO-2. Learn the mechanism of rearrangement reaction, use synthetic reagent of oxidation and reduction for solving the problems. CO-3. Appreciates the various steps involved in the molecular rearrangements
CHEO-315 Asymmetric Synthesis and Bioorganic Chemistry	CO-1. Understand the principle and application of asymmetric synthesis. CO-2. Study of Cram's rule, Felkin-Anh rule, Cram's chelate model asymmetric synthesis using chiral reagent. CO-3. To know the classification of enzymes
CHEO-316 Photochemistry, Free radical and Pericyclic reactions	CO-1. Study of photochemistry: Carbonyl compounds, alkenes, dienes, polyenes and aromatic compounds. CO-2. Study photo rearrangement Barton reaction, application of photochemical reaction. CO-3. Learn Pericyclic reaction: Electro cyclic, Cycloaddition, and Ene Reaction, analysis by correlation diagram, FMO approach and ATS concept
CHEO-417 Organic Synthesis: Retrosynthetic approach	CO-1. Study the design of organic synthesis, protection deprotection of hydroxyl, amino carboxyl, ketones and aldehyde. CO-2. Learn retrosynthesis.
CHEO-418 Advanced Organic and Heterocyclic Chemistry	CO-1. Study of heterocyclic chemistry: Five and six member heterocyclic with one or two hetero atoms. CO-2. Understand condensed five and six member's heterocyclic. CO-3. Study the synthesis, reactivity, aromatic character and importance of heterocyclic compounds.
CHEO-417 Chemistry of Natural Products	CO-1. Study structure and stereochemistry of hardwickiic acid, camptothecin and podophyllotoxin. CO-2. Study the synthesis of Ephedrine, (+)-coniine, nicotine, atropine, Quinine and Morphine. CO-3. Learn biogenesis terpenoides, alkaloids and shikimate pathway
CHEO-418 Medicinal Chemistry	CO-1. Learn medicinal chemistry, the action and discovery. CO-2. Study the structure activity and drug targets. CO-3. Study of antimicrobial drugs, antibacterial, antifungal, antiviral, antimalarial etc

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