

Department of Chemistry

Program Outcome: The Chemistry program is the most important course for life science students and physical science students as it has multi disciplinary impact. The program imparts knowledge about basic chemical concept, analytical techniques, physical chemistry. Students understand the concepts of organic chemistry and drug synthesis. The course also covers emerging trends and environmental issues.

Program specific outcomes: **BSc Chemistry\FYIC (1st, 2nd, 3rd years)**

PSO1: To learn basic concepts of Chemistry with special emphasis on chemical properties, reaction mechanisms and analysis.

PSO2: Program imparts knowledge of extraction of metals, Synthesis of drugs and Organic compounds, physic-chemical concepts and analytical data evaluation.

PSO3: Students learn about Coordination Compounds, Organo Metallic Compounds, including Bioinorganic chemistry. Course imparts knowledge about environmental sustainability with green synthesis.

Course outcomes: **BSc Chemistry\FYIC (1st, 2nd, 3rd years)**

BSc Chemistry\FYIC-(1st year)

CO1: Basic concepts of periodic elements, Structure and reaction mechanism of Organic compounds, Laws governing physical state of matter (gas and solid state), Quantitative analysis.

CO2: Zero group and d-block elements study, reactivity of aromatic compounds and halogens. Student will learn laws related to solutions and colloids, concept of chemical bonding and Qualitative analysis and Non-aqueous solvents.

BSc Chemistry\FYIC-(2nd year)

CO3: Concepts of Metallurgy and f-block elements. Study of Hydroxy, Carbonyl compounds and their derivatives, phase rule, colligative properties, Knowledge of synthesis of drugs, usage of pesticides.

CO4 : Student learns about Analytical techniques like TLC, CC,GC,HPLC. Knowledge about Nitrogen compound and Carboxylic acid derivatives, Electrochemistry and spectral methods of characterization are learnt.

BSc Chemistry\FYIC-(3rd year)

CO5: Concepts of Coordination compounds, details about amino acids, proteins and heterocyclic compounds, basic concepts of chemical kinetics and photochemistry.

CO6: (E1) Organo metallic chemistry, Bioinorganic Chemistry importance in daily life, Enviromental sustainability with respected to conventional energy resources and Non-conventional resources.

CO7: (E2) Concepts and applications of Green chemistry for environmental protection.

CO8: Concepts of symmetry, reactivity of metal complexes, concepts of thermodynamics, carbohydrates and stereochemistry of carbon compounds

CO9: (E1) Metal carbonyls, synthetic strategies including pericyclic reaction including asymmetric synthesis, material science and catalysis.

CO10:(E2) polymers and polymeric compounds-preparation, properties and applications.

M.Sc. CHEMISTRY

Semester-I / FYIC -VII Semester

Paper I CH 101 T (Inorganic Chemistry)

Course designed to make the students to learn the concepts of symmetry, point group of molecules, theories which explain bonding in metal complexes, ligational aspects of diatomic molecules and carbonyl compounds.

Paper II CH 102 T (Organic Chemistry)

The students will have the basic foundation in organic chemistry. So that they can pursue the programme easily.

Paper III CH 103 T (Physical Chemistry)

Paper IV CH 104 T (ANALYTICAL TECHNIQUES and SPECTROSCOPY - I)

This paper gives an overview of separation techniques and also about various spectroscopic methods. It deals with chromatographic methods like Gas Chromatography and High Performance Liquid Chromatography and their applications in various fields. Also, the basics of Nuclear magnetic Resonance, Rotational, Vibrational, Raman and Electronic Spectroscopic techniques were dealt in detail to understand the nature and behavior of the molecules under different radiations.

Semester- II/ FYIC -VIII Semester

Paper I CH 201 T (Inorganic Chemistry)

In continuation of to the basic concepts of symmetry students get an exposure to extended concepts in coordination compounds, reaction mechanisms and role of metal ions in biological systems, types of cluster compounds and their stability.

Paper II CH 202 T (Organic Chemistry)

This course is designed such that the students can confidently solve problems in organic chemistry.

Paper III CH 203 T (Physical Chemistry)

Paper IV CH 204 T (ANALYTICAL TECHNIQUES and SPECTROSCOPY - II)

This paper covers the different Electro-Analytical techniques such as Polarography, Voltammetry and Amperometry where the electrical properties such as potential and current of an analyte are measured. It also deals with Thermal Methods such as Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA) and Differential Calorimetric Analysis (DSC) wherein a compound at different temperatures is studied with respect to changes in weight, differences in temperature and in heat energy. These studies help in understanding the composition of the compound based on their behavior at different temperatures. This paper also covers spectroscopic techniques like NMR, Mass and Photoelectron and Electron Spin resonance (ESR). These studies provide an insight in knowing the nature and composition of the molecules.

SPECIALISATION (INORGANIC CHEMISTRY)

Program Outcome:

After pursuing the programme the students can take up jobs in analytical laboratories, to pursue Ph.D., work as research assistants and to work as teachers.

Semester-III

CHIC-301T: paper-I; Bonding, Group theory and its applications

Students gain knowledge of elaborative symmetry concepts and its wide applications in terms of spectral characterization like – electronic, IR and Raman. In addition to this the applications of group theory applied to explain MOT of coordination compounds.

CHIC-302T: paper-II; OMC of transition metal complexes

To inculcate the research activity in modern era students are exposed to the area of OMCs with concepts of structural and chemical properties of transition metals, and different applications are also explained in the area of catalysis.

CHIC-303T: paper-IIIa; Analytical techniques-I

This paper gives the knowledge of statics, which has a crucial role in interpreting the obtained data as well as helps in validating the results. It also deals with the basic principles, instrumentation and application of AAS, XRD and Mass spectrometry which has applications research field.

CHIC-303T: paper-IIIb; Supramolecular chemistry, photo chemistry, green chemistry and nano technology

This course explains all research oriented topics in the area of supramolecular, photochemistry, green chemistry and nano technology. In each of its topics the basic principles and their wide applications in research have been explained.

CHIC-304T: paper-IVa: Analytical techniques-II

This course is designed to make students learn about various advanced and sophisticated Analytical techniques which has a key role in research field . This paper gives the knowledge of basic principles and Instrumentation of Thermal Methods, Surface Analysis Methods, Advanced Separation Techniques and Optical Methods. It demonstrates the importance of chemistry in understanding the physicochemical properties of various compounds.

CHIC-304T: paper-IVb: Nuclear Chemistry, Zeolites, Solid State, and Surface Chemistry

This course explains the role of nuclear reactions to produce energy , explain the functions of the major components of a nuclear reactor: fuel elements, control rods, moderator, and cooling liquid . It also deals with the fundamental concepts involved in nuclear weapons based solely on fission. It gives knowledge about zeolites and surface chemistry.

Semester-IV

CHIC-401T: paper-I: Molecular spectroscopy of inorganic compounds:

Students will gain knowledge in structural elucidation of metal complexes by using the theoretical principles of NMR, ESR, Mossbauer and NQR spectroscopy. This will give an exclusive idea of spectral analysis which can be applied further in research.

CHIC-402T: paper-II: Bioinorganic chemistry:

This course explain the role of metal ions in biological systems, metal interactions with DNA, RNA, metallo enzymes, electron transport proteins and its functions. This information provides a wide spectrum of biologically important proteins and the chemistry behind life to further explore the research idea.

CHIC-403T: paper-IIIa: Medicinal chemistry Spectroscopic Analysis of Drug/Metal Complexes and Applications of Nanomaterials:

The course is taught to bright up the knowledge of medicinal chemistry - chelation therapy, different metal complexes as anti cancer drugs, Analysis of drug DNA binding through spectral methods and applications of nano materials in biological systems.

CHIC-403T: paper-IIIb: Analytical techniques-III

This course explains the basic knowledge of electroanalytical techniques and radiochemical methods. It enlightens the role of chemistry and its applications in various field- Industrial analysis, Enviromental analysis and Radiochemistry in medical field.

CHIC-404T: paper-IVa: Interdisciplinary course (Environmental and Applied Analysis):

This paper bounces the basic theoretical principles and applications of classical, Instrumental and various separation methods employed in the routine assay of various pharmaceuticals. It enlightens the role of chemistry in clinical, food, agricultural and environmental analysis.

CHIC-404T: paper-IVb: Interdisciplinary Course (Inorganic Material Chemistry)

This paper gives the knowledge about the composite materials and Liquid Crystals and its importance. It deals with the explosives and its chemical properties. The student gets knowledge about fuels and combustion devices and also about the current research topics about rocket propulsion elements and principles involved in it.

SPECIALISATION (ORGANIC CHEMISTRY)

Program Outcome:

This program is designed to equip the students to work in the pharmaceutical industry, to pursue their Ph.D., to work as research assistants and to teach undergraduate and +2 levels.

Semester-III

Paper-1CH(OC)301T: Synthetic Reagents, Advanced NMR, Conformational Analysis and ORD

After the basic introduction to subject in 1st and 2nd semester. The students will have hold on reagents and conformational analysis useful for solving organic problems.

Paper II– CH (OC) 302T: Modern Organic Synthesis

The students are introduced to New techniques, methods, reactions and also strategies' so that they can use in medicinal chemistry for designing new drugs.

Elective-3A Paper-III CH (OC)303T (CB1): Bioorganic Chemistry

The students are introduced to the basics of biochemistry so that it will be helpful for studying mechanism of drug actions and metabolic processes in IV-Semester.

Elective-3B: Paper-III CH (OC) 303T (CB2): Forensic Chemistry and Toxicology

By studying this course the students get introduced to the basic principles and applications of forensic science.

Elective-4A Paper-IV CH (OC) 304T (CB3): Green chemistry and Organic materials

By this course students are educated about importance of saving and protecting the environment.

Elective-4B Paper-IV CH (OC) 304T (CB4): Pesticides

The course introduces the students to different pesticides, its usage, harmful effects and advantages of using natural pesticides over synthetic pesticides.

SEMESTER - IV

Paper-1 CH (OC) 401T: Drug Design and Drug Discovery

The students are introduced to the basic of drugs, drug discovery, SAR, QSAR, Advanced technics like CADD and Combinatorial synthesis.

Paper-II CH (OC) 402T: Drug synthesis and mechanism of action

The students study about the indepth mechanism of action of important drugs like Drugs acting on immune system, metabolic processes, ion channels, chiral drugs.

Elective-3A Paper-III CH (OC)-403T (CB1): Advanced Heterocyclic Chemistry

The students study about various heterocycles from 5 membered heterocycles to higher heterocycles helpful for their future programmes.

Elective-3B Paper-III CH (OC)-403T (CB2): Polymers , dyes and Pigments

The students study about the introduction and applications of polymers and dyes.

Elective-4A Paper-IV CH (OC) 404(CB3)T: Advanced Natural Products

The course introduces the students to natural products, its synthesis and stereochemistry of natural products and also about the stereoselective synthesis of natural products.

Elective-4B Paper-IV CH (OC) 404(CB4)T: Biopharmaceutics and Pharmacodynamics

These students are introduced to the pharmacokinetics, pharmacodynamics, principles of therapeutics and drug interactions. So that they are benefitted in drug designing in their future programmes.

SPECIALISATION (PHARMACONFORMATICS)

Program Outcome:

This program is designed to get the knowledge of computer operating systems, database management languages to improve query performance with the help of shell and perl scripting. Different methods used in the search of chemical information which are stored in the chemical databases, and how to do data mining and visualization by using machine learning techniques. This is developed to know the quantum/molecular mechanics calculations and how they are implemented in macro/micro molecular energy minimization/dynamics. To get the knowledge of different methods (Ligand based/Structure based) used in computer aided drug designing.

Program Specific Outcome:

Students will get the knowledge of basic fundamentals of drug designing tools and extent utilization of those.

Course Outcomes:

CH(CPI)301 T : Database Management, Sources and Scripting Languages

Knowledge about information sources and searching strategies. Ability to develop scripts to maintain database objects. Understand the methodology of Data mining and have the knowledge of machine learning techniques.

CH(CPI)302T:Computational Chemistry, Molecular Modeling & Its Applications.

Learning CADD methods to develop new chemical entities. Knowledge about the QM/MM calculations. Knowledge of different methods (Ligand based /Structure based) used in computer aided drug designing.

CH(CPI)303 T: ELECTIVE 3A: Synthetic Reagents, Advanced NMR, Conformational Analysis and ORD

The students will have hold on reagents and conformational analysis useful for solving organic problems in synthesis of chemical entities of designed.

CH(CPI)303 T:ELECTIVE 3B: Advanced Natural Products

The course introduces the students to natural products, its synthesis and stereochemistry of natural products and also about the stereo-selective synthesis of natural products.

CH(CPI)304 T:ELECTIVE 4A: Modern Organic Synthesis

Students will be able to understand new techniques, methods, reactions and also strategies' so that they can use in medicinal chemistry for designing new drugs.

CH(CPI)304 T:ELECTIVE 4B: Intellectual Property Rights

Students will be able to understand the basics of intellectual property rights. Ability to generate the IP report and knowledge about different types of patent search methods.

CH(CPI) 401 T: Pharmacokinetics

Knowledge about the importance of ADMET properties in drug designing and discovery. Ability to design the drugs which are synthetically feasible to avoid failures in clinical phase trials.

CH(CPI) 402T : Principles of Drug Discovery, Drug Targets and chemistry of Pharmacology

Students will get the knowledge of principles of pharmacology and different drugs acting on different drug targets.

CH(CPI) 403T: ELECTIVE 3A: Pharmaceutical Analysis

This paper gives an overview of applications of classical, spectro-photometric and separation methods employed in Assay of various pharmaceuticals. It deals with the basic theoretical principles of classical methods (acid-base titration, redox titration) and also the basic theoretical knowledge of separation techniques and instrumental methods employed in analysis of Drugs. It demonstrates the importance of chemistry in development as well as understanding the physicochemical properties of drugs .

CH(CPI) 403T: ELECTIVE 3B: Bio organic Chemistry

The students are introduced to the basics of biochemistry so that it will be helpful for studying mechanism of drug actions and metabolic processes.

CH(CPI) 404T: ELECTIVE 4A: Advanced Heterocyclic Chemistry

Learning about different types of heterocycles will help in drug designing programmes.

CH(CPI) 404T: ELECTIVE 4B: Green chemistry and Organic materials

By this course students are educated about importance of saving and protecting the environment.