JIWAJI UNIVERSITY, GWALIOR

School of Studies in Chemistry

The School of Studies in Chemistry, Jiwaji University, Gwalior came into existence in 1971 as teaching and research centre. Over a period of time, it has acquired prestigious status at National level. Major area of research carried out in this department includes, Electro-analytical, environmental, organometallic, coordination, kinetics, water management, ion exchange chromatography, treatment of radioactive water, synthesis of chemotherapeutics, homogeneous catalysis, Fuel cells. There have been significant contributions in the frontier areas of chemical sciences by way of research publications in journals of repute. Various funding agencies is providing financial assistance. The department has been adopted by DST under its program for improvement of Science and Technology (FIST). Facilities available: FTIR Spectrophotometer, Gas Chromatography, Millipore water purifying system, UV-VIS Spectrophotometer, PARSTAT 2253 Advance Electrochemical system, Potentiostat, Versastat II, D. C. Polarograph, Pulse Polarograph. To prepare academicians and trained chemists scientists for professional and top position in R & D and Teaching including Industrial sector, the school is running following programmes:

M.Sc. Chemistry
M.Phil.
Ph.D.

Programme Outcomes (POs)

The designing of the chemistry program at the Jiwaji University is to provide the key knowledge base and laboratory resources to prepare students for careers as professionals in the field of chemistry, for further study in chemistry, biological chemistry and related fields.The faculty is committed to providing an environment that addresses the individual needs of each student and encourages them to develop their potential.

Our distinguishing features are:

- Up-to-date knowledge of broad range of disciplines of chemical sciences.
- Theoretical and practical knowledge of Analytical and Instrumental Techniques.
- Interpretation of various types of spectra viz., Nuclear Magnetic Resonance (NMR), Electron Spin Resonance (ESR), Infrared (IR), Ultraviolet-visible (UV-Visible),

Mossbauer, XPS and Mass Spectrometry including single crystal X-ray diffraction data.

Programme Specific Outcomes (PSOs)

Curriculum of Chemistry is designed to prepare post graduates to attain the following program specific outcomes:

PSO1: An ability to design or develop chemical processes incorporating impact of economic, environmental, social, health, safety and sustainability

PSO2: An ability to practice or apply chemistry principles, communication and other skills in a wide range of industrial and professional employment areas

PSO3: Display critical thinking for creating new ideas and design innovative pathways.

PSO4: Explore global level research opportunities for doctoral and post-doctoral studies.

PSO5: Demonstrate broad mindset with respect to knowledge penetration and accumulation in his/her professional activities**.**

PSO6: Display their true potential and get appropriate endorsement through qualifying NET/GATE/SLET/ State Civil Services and other competitive examinations.

PSO7: Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

Course Outcomes (COs)
For M.Sc. Programmes
Inorganic Chemistry I & II

Students after studying Inorganic Chemistry courses are expected:

CO1: To learn stereochemistry, bonding in main group compounds and Electronic Spectral Studies of Transition Metal Complexes.

CO2: To understand metal- ligand bonding, reaction mechanism of transition metal complexes and Magnetic Properties of Transition metal Complexes.

CO3: To learn Metal -Ligand Equilibrium in Solution electronic spectra and properties of Metal π complexes.

CO4: To understand Reaction Mechanism of Transition Metal Complexes bonding, structure and properties of Metal Clusters.

CO5: To understand Reaction Mechanism of Transition Metal Complexes - II and HSAB theory principles of Optical Rotatory Dispersion and Circular Dichroism and CD and unravel mystery of metal clusters with metal multiple bonds.

Organic Chemistry I & II

Students after studying these areas of knowledge are expected:

CO1: To recognize the sound knowledge of nature of bonding of Organic Molecules, Aromatic Electrophilic Substitution and Aromatic Nucleophilic Substitution.

CO2: To enrich various concepts such as those from Stereochemistry and Free Radical Reactions.

CO3: To study of conformation analysis and linear free energy relationship Addition Reactions of organic compounds.

CO4: To build a sound perception of a wide variety of chemical reactions of organic compounds, those Reaction Mechanism: Structure and Reactivity Addition to Carbon – Hetero Multiple bonds and Elimination Reactions.

CO5: To contribute meaningfully towards Aliphatic Nucleophilic Substitution and Pericyclic Reactions.

Physical Chemistry I & II

Students after studying these areas of knowledge are expected:

CO1: To enrich various concepts those from exact quantum mechanical results chemical dynamics.

CO2: To understand the approximate methods of molecular orbital theory and surface chemistry adsorption.

CO3: Having a sound knowledge of angular momentum and macromolecules.

CO4: To develop the understanding of the classical, statistical and non-equilibrium thermodynamics.

CO5: To have the knowledge of core concepts and principles of electrochemistry.

Group Theory & Spectroscopy

Students after studying these areas of knowledge are expected:

CO1: To learn the background knowledge of symmetry and group theory in chemistry.

CO2: To enrich the various concepts of spectroscopy such as microwave spectroscopy.

CO3: To learn the involvement of selection rules in infrared-spectroscopy and raman spectroscopy.

CO4: To get the considerable insight into electronic spectroscopy, molecular spectroscopy and photoelectron spectroscopy

Spectroscopy- II and Diffraction Methods

Students after studying these areas of knowledge are expected:

CO1: To know about the nuclear magnetic resonance spectroscopy

CO2: To understand about the electron spin resonance spectroscopy

CO3: To know about x-ray, x-ray tube, Bragg's law, theory of structure factors and Fourier synthesis, phase problem and its solution, structure solution and refinement

CO4: To apply and solve problem related to the derivation of X-rays results, determination of absolute configuration of the molecules, Types of disorder and their solution, solvent disorder, twining, Types of twining and their solution, Crystallographic database etc.

CO5: To have the deep knowledge of Electron Diffraction and Neutron Diffraction.

Application of Spectroscopy
(Organic and Inorganic Chemistry)

Students after studying these areas of knowledge are expected:

CO1: To promote the active use of ultraviolet, visible spectroscopy and vibrational spectroscopy.

CO2: To find out the structure of compounds with the help of Infrared Spectroscopy and Nuclear Magnetic Resonance.

CO3: To gain the knowledge of Electron Spin Resonance Spectroscopy, 13 NMR Spectroscopy and Nuclear Magnetic Resonance of Paramagnetic Substances in Solution.

CO4: To develop the proficiency in working with Mossbauer Spectroscopy.

CO5: To gain the elementary knowledge of Mass spectrometry and Electronic Spectroscopy.

Photochemistry

Students after studying these areas of knowledge are expected:

CO1: To learn the systemic knowledge of Photochemical Reactions

CO2: To know the determination of Reaction Mechanism

CO3: To gain knowledge of photochemistry of Alkene and Photochemistry of Aromatic Compounds

CO4: To understand and apply the knowledge of Photochemistry of Carbonyl Compounds and Miscellaneous Photochemical Reactions.

Analytical Chemistry

Students after studying these areas of knowledge are expected:

CO1: To gain a deep insight knowledge of analytical chemistry by developing qualitative, quantitative skills, Errors and Evaluation

CO2: To learn about Food analysis, Analysis of Water Pollution and analysis of soil, Fuel, Body Fluids and Drugs

CO5: To learn about the Clinical Chemistry and Drug analysis.

Medicinal Chemistry

Students after studying these areas of knowledge are expected:

CO1: To gain an overall understanding of Structure and activity various drugs in human life.

CO2: To learn about the Pharmacodynamics.

CO3: To contribute the value of Antibiotics and antibacterials in human life.

CO4: To study of the various Antifungal drugs like- polyenes, Antibacterial - Ciprofloxacin, Norfloxacin, Antiviral – Acyclovic and Antimalarials drugs like Chemotherapy of malaria. SAR. Chloroquine Chlorquanide and Mefloquine.

CO5: To understand Non - steroidal Anti – inflammatory Drugs : Diclofenac Sodium, Ibuprofen and Nefopam

Anti-histamic and anti-asthmatic agents : Terfenadine, Cinnarizine, Salbutamol and Beclomethasone dipropionate

Solid State Chemistry

Students after studying these areas of knowledge are expected:

CO1: To know about the current trends and diversities of Solid State Reactions

CO2: To understand the Crystal Defects and Non- Stoichiometry

CO3: To gain a deep insight about the Electronic properties and Band Theory

CO4: To explore the characteristics of Organic Solids and Liquid crystals.

Organotransition Metal Chemistry

Students after studying these areas of knowledge are expected:

CO1: To gain the deep knowledge of Alkyls, Aryls of Transition Metals and Compounds of Transition Metal-Carbon multiple bonds.

CO2: To build a sound perception of a wide variety of Transition Metal π – Complexes

CO3: To understand about the Stoichiometric reactions and Transition Metal Compounds with bonds to hydrogen, boron, silicon

CO4: To learn about the Homogeneous Catalysis and Fluxional Organometallic Compounds

Polymer

Students after studying these areas of knowledge are expected:

CO1: To understand the importance of polymer and basics of polymer chemistry.

CO2: To display the professional talent for the **c**haracterization of polymer.

CO3: To learn about Analysis and testing of Polymers.

CO4: To explore the knowledge of Inorganic Polymers

CO5: To learn about Structure, Properties and Applications of:

a. Polymers based on Phosphorous-Phosphazenes, Polyphosphates.

b. Polymers based on Sulphur-Tetrasulphur tetranitride and related compounds. Co-ordination and metal chelate Polymers

(II) For Ph.D. Course Work Program

Research Methodology

Students those are pursuing doctoral degree, after successfully finishing the course, will be capable

CO1: to develop innovative ideas related to various fields of chemistry such as nanotechnology, biochemistry and many more.

CO2: to having hands-on/operational experience of different sophisticated instruments.

CO3: to cultivate technologies, those are more effective and easy to use for society.

Review of Literature

Upon successfully completion of review of literature the student will be able:

CO1:to identification of key questions about a topic that need further research and determination of methodologies used in past studies of the same or similar topics.

CO2: to develop solid foundation of knowledge in the area and a good feel for the direction any new research should take.

Computer Applications

After successfully finishing the course, the student will be able:

CO1: to develop specialized computational skills;

CO2: to gain proficiency in working with different software, beneficial for them research studies

Advance Course: Interpretation of Spectra

After successfully finishing the course, the student will be able:

CO1: to acquire useful information and to make the most informed decisions possible.

CO2: to develop theoretical and practical knowledge of different instrumental techniques.

CO3: to apply the knowledge of interpretation skills in their research problems.