JIWAJI UNIVERSITY, GWALIOR

School of Studies in Environmental Chemistry

The School of Studies in Environmental Chemistry, Jiwaji University, Gwalior came into existence in 1994 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, Electroanalytical, environmental, air, water, soil analysis, water management, ion exchange chromatography, treatment of waste water, corrosion, 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 are providing financial assistance. 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. Environmental Chemistry (1997)

M.Sc. Instrumentation and Commercial Methods of Analysis (1994)

M.Sc. Pharmaceutical Chemistry (2008)

Ph. D.

Programme Outcomes (POs)

The School of Studies in Environmental Chemistry emphasizes to prepare graduates from chemistry and other appropriate discipline for key environmental positions in industry, environmental organizations, pharmaceutical sectors, education and public services. In 1994 the department introduced employment oriented course viz, M.Sc. in Instrumentation and Commercial Methods of Analysis (ICA) to impart education for quality control, chemical and allied industries. In 1997 U.G.C. granted Environmental Chemistry (EC) under innovative programme. In 2008 M.Sc. in Pharmaceutical Chemistry (PC) was started with the aim to support pharmaceutical industries in particular. 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:

PO1: Up-to-date knowledge of inter-disciplines of chemical sciences, biological sciences and pharmaceutical sciences.

PO2: Theoretical and practical knowledge of Analytical and Instrumental Techniques.

PO3: Skilled students regarding environmental contaminant analysis, monitoring, pharmaceuticals and other chemicals analysis.

PO4: Identify, formulate, research literature, and analyse complex analytical problems reaching substantiated conclusions.

PO5: Create, select, and apply appropriate techniques, resources, and modern analytical tools including prediction and modelling to complex chemical activities with an understanding of the limitations.

Programme Specific Outcomes (PSOs)

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

PSO1: These courses provide a unique focus for addressing some of today's most pressing environmental and chemical problems.

PSO2: These courses provide major challenges in determining nature, quantity and various reactions of specific pollutants in the environment.

PSO3: It also provides a broad base of scientific knowledge while learning chemical and instrumental analysis methods and systemization technologies.

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

PSO5: The courses provide first hand exposure of the highly sophisticated instruments like HPLC, GC, FT-IR, CVS, AAS, ASV etc to the students for timely and accurate analysis and to meet the growing global environmental problems being faced in the 21st century.

PSO6: These courses are an exciting field which combines knowledge and expertise of many streams viz. analytical instrumentation, computers, electronics, biology, sociology, law, management and chemistry.

PSO7: Students are encouraged to take the go ahead in creating environmental awareness, career advancement and students can look forward for being absorbed in private / public sector / autonomous organizations.

PSO8: The mission of these courses is to provide students with the modern and comprehensive chemical education required to live and work in technologically advanced society.

PSO9: Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

PSO10: Demonstrate broad mindset with respect to knowledge penetration and accumulation in his/her professional activities.

Course Outcomes (COs)

For M.Sc. in

MICA /EC / PC Programmes

Fundamentals of Quantitative Analysis and Separation Methods

Students after studying Fundamentals of Quantitative Analysis and Separation Methods courses are expected:

CO1: To learn techniques for various safety in the analytical laboratory, calibration and detection limits, proficiency testing.

CO2: To understand various separation techniques for organic and inorganic compounds.

CO3: To recognize the sound knowledge of classification of analytical methods-classical and instrumental, types of instrumental analysis, selecting analysis method, neatness and cleanliness, laboratory operations and practices, good laboratory practices.

CO4: To study the techniques of weighing, errors, volumetric glassware, cleaning and calibration of glassware, sample preparation– dissolution and decompositions of organic and inorganic compounds.

Stereochemistry & Thermo-analytical Methods

Students after studying these areas of knowledge are expected:

CO1: To enrich various concepts of stereochemistry& thermo analytical Methods.

CO2: To study of conformation of n-butane, cyclohexane, stability of conformers and energy profile diagram.

CO3: To study of gravimetric methods of analysis.

CO4 : To study the concept of various thermo-analytical methods (DTG),

Spectro-analytical Methods of Analysis

Students after studying these areas of knowledge are expected:

CO1: To learn the background of colorimetry and spectrophotometry.

CO2: To get the knowledge of spectroscopic methods such as dispersion refrectometry and flame photometry polarometry, circular dichrosim (CD) and optical rotatory dispersion (ORD).

CO3: To study of various concepts of fluorescence and phosphorescence spectrophotometry.

CO4: To get the considerable knowledge of kinetics of slow and fast reactions.

Electro-analytical Methods of Analysis

Students after studying these areas of knowledge are expected:

CO1: To learn the background of fundamentals of electrochemical cell.

CO2: To get the basic knowledge principle and instrumentation of potentiometry, polarography, conductometry and coulometry.

Environmental Biotechnology

Students after studying these areas of knowledge are expected:

CO1: To learn the background of environment pollution.

CO2: To get the knowledge of cleaner technologies, solid waste treatment, anaerobic processes.

CO3: To study of biomedical waste and its management.

CO 4: To study of phytoremediation and global environment problems.

Spectro-analytical Methods of Analysis-II

Students after studying these areas of knowledge are expected:

CO1: To study of atomic absorption spectroscopy (AAS), inductively coupled plasma atomic emission spectroscopy (ICP-AES), instrumentation of ICP-AES, applications of ICP-AES, comparison of ICP-AES with AAS.

CO2: To understand the theory of infrared absorption, vibrational modes, vibrational coupling, near IR Spectroscopy.

CO3: To study, general principle of nuclear magnetic resonance spectroscopy and mass spectrometry.

Modern Trends in Instrumentation

Students after studying these areas of knowledge are expected:

CO1: To study the statistical treatment of data-i.

CO2: To get the Knowledge of quality control charts, relationship between variables, correlation & regression, principle of least squares.

CO3: To understand the knowledge of chi square, ANOVA-1 and ANOVA-2 way classification.

CO4: To understand knowledge of scanning electron microscopy (SEM), transmission electron microscopy (TEM).

Fundamentals of Organic Reactions

Students after studying these areas of knowledge are expected:

CO1: To learn the background of knowledge of mechanism of SN^1 and SN^2 reactions, SN^i and SET mechanism.

CO2: To get the knowledge of electrophilic substitution and elimination reactions.

CO3: To enrich various concepts of addition reaction and free radical reactions.

Pharmaceutical Analysis

Students after studying these areas of knowledge are expected:

CO1: To study the basic concept of structure activity relationship, process development in pharmaceutical industries.

CO2: To understand the toxicology acute and chronic toxicity, LD50 and ED50, routes of drug administration.

CO3: To study of general chemistry and mode of action of pharmaceutical drugs.

CO4: To enrich brief chemistry and mode of action of cardiac glycosides antihypertensive antileprotic and anticancer drugs.

Principles of Pharmacology

Students after studying these areas of knowledge are expected:

CO1: To learn the background of knowledge of pharmacokinetics of drugs.

CO2: To get the knowledge of pharmacodynamics of drugs.

CO3: To study of various membrane transportation therapeutic drug responds.

CO4: To enrich various concepts of pharmacokinetics interactions.

Principles of Drug Development

Students after studying these areas of knowledge are expected:

CO1: To learn the background of knowledge of classification of drug, types of drug action and factor modifying drug action.

CO2: To get the knowledge of introduction of pharmacopeia (IP, BP, USP).

CO3: To study of various structural features and pharmacologic activity.

CO4: To enrich various concepts of pharmacokinetics.

Advanced Instrumental Methods & Pharmaceutical Biotechnology

Students after studying these areas of knowledge are expected:

CO1: To learn the knowledge of neutron diffraction X-rays diffraction and application of X-rays diffraction.

CO2: To get the knowledge of analytical procedures for analysis of organic and inorganic material.

CO3: To study of the immunology and immunological preparation**:** immune system, cellular humoral immunity.

CO4: To enrich various concepts of fermentation technology & microbial transformation.

Basic Principles of Clinical Research

Students after studying these areas of knowledge are expected:

CO1: To learn the background of clinical research.

CO2: To get the knowledge of clinical trials & good clinical practices (GCP).

CO3: To study of generic drugs, herbal products, investigator in clinical trials.

CO4: To enrich various concepts of bioequivalence, bioavailability & pharmacovigilence.

Concepts of Industrial Management and Intellectual Property Rights

Students after studying these areas of knowledge are expected:

CO1: To learn the concepts of industrial management intellectual property rights.

CO2: To get the knowledge of intellectual property protections of living species.

CO3: To study of exercising and enforcing of intellectual property rights.

CO4: To enrich various concepts of role of patents in the pharmaceutical industry.

Industrial Water and Waste Treatment

Students after studying these areas of knowledge are expected:

CO1: To learn the introduction, source, characteristics and treatment of industrial waste.

CO2: To get the knowledge of treatment of industrial wastes.

CO3: To study of various advance water treatment of industrial waste.

CO4: To enrich various concepts of waste water reuse and recovery.

Environmental Toxicology and Environmental Impact Assessment

Students after studying these areas of knowledge are expected:

CO1: To learn the introduction of EIA, impact assessment methodologies.

CO2: To studies of environmental impact assessment and sustainable development.

CO3: To study of environmental toxicology-i.

CO4: To enrich various concepts of impact of toxic chemical on enzymes.

Energy and Environmental Geochemistry

Students after studying these areas of knowledge are expected:

CO1: To learn the knowledge of energy and energy science: law of conservation of energy.

CO2: To get the knowledge of biomass energy resources.

CO3: To study of energy sources and pollution control.

CO4: To enrich various concepts of mineral resources and environmental hazards.

Atmospheric Chemistry

Students after studying these areas of knowledge are expected:

CO1: to learn the chemical composition and meterological aspects of air pollutants.

CO2: To get the knowledge of photochemistry.

CO3: To study of ozone in earth's stratosphere.

CO4: To enrich various concepts of earth troposphere.

Environmental Laws and Management

Students after studying these areas of knowledge are expected:

CO1: To learn the background of knowledge of pollution control through laws.

CO2: To get the knowledge of environmental management [ISO 14000].

CO3: To study of natural resources and their conservation.

CO4: To enrich various concepts of hazardous waste management.

Organic Pollutants

Students after studying these areas of knowledge are expected:

CO1: To learn the basic concept of pesticides with classification.

CO2: To get the knowledge of polynuclear aromatic hydrocarbons.

CO3: To study of mutagenic pollutants.

CO4: To enrich various concepts of electrochemistry in pollution control.

Total Quality Management & ISO 9000

Students after studying these areas of knowledge are expected:

CO1: To learn knowledge of management of quality systems, ISO-9000 development in Pharmaceutical.

CO2: To get the knowledge of TOM, total employee involvement (TEI), total waste elimination (TWE).

CO3: To study of Implementation of TOM and management of change (MOC).

CO4: To enrich various concepts of quality assurance and TQM.

Industrial Analysis - II

Students after studying these areas of knowledge are expected:

CO1: To learn the principle of ore dressing, analysis of ores and alloys.

CO2: To get the knowledge of analysis of polymers and cosmetics.

CO3: To study of analysis of soaps and detergents.

CO4: To enrich various concepts of analysis of glass.

Advanced Instrumental Methods of Chemical Analysis

Students after studying these areas of knowledge are expected:

CO1: To learn the theory and instrumentation of neutron diffraction and X-rays diffractions.

CO2: To get the knowledge of – X-ray spectroscopy and photoacoustic spectroscopy.

CO3: To study of ESR spectroscopy.

CO4: To enrich various concepts of mossbauer spectroscopy.

Industrial Analysis – III

Students after studying these areas of knowledge are expected:

CO1: To learn the introduction to dyes, classification.

CO2: To get the knowledge of analysis of food and food products.

CO3: To study of analysis of pesticides and fertilizers.

CO4: To enrich various concepts of analysis of petroleum and petroleum products analysis of wood and pulp.

Concepts of Industrial Management and Intellectual Property Rights

Students after studying these areas of knowledge are expected:

CO1: To learn the general concepts of industrial management.

CO2: To get the knowledge of intellectual property rights.

CO3: To study of intellectual property protections of living species.

CO4: To enrich various concepts of role of patents in the pharmaceutical industry.

(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

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 research studies

Advance Course: Research Skills

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.