JIWAJI UNIVERSITY, GWALIOR

School of Studies in Industrial Chemistry

The School of Studies in M.Sc. industrial chemistry, Jiwaji University, Gwalior came into existence in 2003 to develop manpower for Research and development, quality control laboratories, production department of pharmaceuticals and fine chemical industries. Students have good synthetic chemistry and analytical exposure in the laboratory. Students have industrial training in fourth semester.

Department is equipped with advanced microprocessor based instruments & equipment viz; UV-Visible Spectrophotometer, Gas Chromatograph, Karl Fisher Titrater, Polarimeter,Nephelometer, Conductivity Meter, pH Meters, Refractometer, Tablet Hardness Tester, FriabilityTestApparatus, Bulk Density Measurement, Dissolution Rate Apparatus etc.

Department has developed strong relations with industries all over India for mutual cooperation. It is encouraging that many industries in fine and pharmaceutical sector are coming every year for placements of industrial chemistry students. The department is able to provide placement to the students more than 90 percent.

The school is running following programme:

M.Sc. (Industrial Chemistry)

Programme Outcomes (POs)

The designing of the **M.Sc. (Industrial Chemistry)** program at the Jiwaji University is to provide knowledge of current theory and techniques of the general, pharmaceutical, fine chemicals as major disciplines, which prepares students for careers as professionals in the fine and

pharmaceutical industries. Program will exhibit the leadership capacity and teamwork skills for business decision making.

Our distinguishing features are:

- Up-to-date knowledge of broad range of disciplines of pharmaceutical, fine chemicals and management.
- Integrates tools and concepts from multiple functional areas (IPR, chemistry, biology etc.) to solve Industrial problems.
- To prepare competent and best suited chemistry executives with exposure to market conditions and academic area.

Programme Specific Outcomes (PSOs)

Curriculum of M.Sc. Industrial Chemistry, is designed to prepare post graduates to attain the following program specific outcomes:

PSO1: An ability to design or develop knowledge base and skill base with incorporating impact of economic, environmental, social, health, safety and sustainability .

PSO2: Enhancement of methodological independent & logical thinking skills in a wide range of industrial and professional employment areas.

PSO3: Display, solve and understanding for creating new ideas and design innovative pathways.

PSO4: Explore global level research opportunities for doctoral studies.

PSO5: Awareness about industrial environment with broad mindset in relation 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.

Course Outcomes (COs)

Course wise outcome will be as follows:

Analytical Chemistry

Students after studying Analytical Chemistry course are expected:

CO1: To learn data analysis including propagation of errors, significant figures, least square analysis, standard deviation T test, Q test, F test, average, stoichiometric calculations, acid base titrations, acid-base indicators, complexometric titrations, precipitation titrations adsorption indicator.

CO2: To learn gravimetric analysis, properties of precipitates, organic precipitation, solvent extraction, extraction equilibrium.

CO3: To understand ion exchange chromatography and chromatographic separation techniques.

CO4: To understand Gas chromatography GSC/GLC, GC/mass, GC/IR, HPLC, LC/MS.

CO5: To understand Nephelometry, turbidimetry, Flame photometry, Atomic absorption spectroscopy.

Advance Physical Chemistry

Students after studying Advance physical Chemistry course are expected:

CO1: To learn Surface Chemistry and Interfacial Phenomenon_Adsorption isotherm, estimation of surface area (BET), surface films of liquids, Sols, Gels, Emulsions etc.

CO2: To learn Catalysis types – homogeneous and heterogeneous, basic principles, mechanism, factor affecting the performance, industrially important reactions.

CO3: To understand method of determining rate laws unimolecular reactions, Dynamic chain photochemical and oscillatory reaction & study of fast reactions by different methods.

CO4: To understand Electrochemistry_classification, corrosion reactions, factors affecting corrosion & electroplating.

CO5: To understand Ionic Equilibrium.

Organic Chemistry-I

Students after studying organic Chemistry -I course are expected:

CO1: To learn_Reaction Mechanism Structure and Reactivity, Effect of structure and reactivity

CO2: To learn Aliphatic Electrophilic Substitution Aromatic Electrophilic Substitution.

CO3: To understand Aliphatic Nucleophilic Substitution, S_N2, S_N1, mixed S_N1 and S_N2 and S_NI mechanism Aromatic & Nucleophilic substitution Mechanism.

CO4: To understand addition to carbon – carbon multiple bond Addition to Carbon – Hetero Multiple bond.

CO5: To understand Elimination Reactions& Free Radical Reaction.

Paints & Pigments

Students after studying paints and pigments course are expected:

CO1: To learn general characteristics of pigments General properties and methods of preparations of white pigments.

CO2: To know about general characteristics, colour and constitution of Indigo dyes Reactive dyes Disperse dyes.

CO3: To learn properties and uses of printing inks, Raw materials ,General process of manufacture of printing inks.

CO4: To understand general characteristics, function and manufacture of Paints and Varnishes.

CO5: To understand. Paint & Varnish Formulations & testing of formulations paints.

Bio-chemicals

Students after studying Biochemicals are expected

CO1: To learn about Carbohydrates monosaccharide, Disaccharide and polysaccharide, disorders of carbohydrate metabolism.

CO2: To learn about Classification, structure & separation Biosynthesis of proteins.

CO3: To know about Classification of Enzymes Chemical kinetics and mechanism of enzyme – substrate complex Factors governing enzyme activity

.**CO4:** To understand classification of lipids, Biosynthesis & oxidation of fatty acids Disorders of lipid metabolism.

CO5: To understand classification of hormones. Hormone receptors, thyroid adrenal gonads & pituitary hormones.

Chemistry of Natural Products

Students after studying Chemistry of Natural products are expected

CO1: To learn about classification and industrial uses of Terpenoids and carotenoids ,citral, geraniol, Menthol, zingiberene, β-carotene etc.

CO2: To learn about Alkaloids; Conine, Nicotine, atropine, Quinine etc.

CO3: To know about Perfumes, Extraction of perfumes from plants, synthesis of some important synthetic chemicals used in perfume industry.

CO4: To understand about Carbohydrate and Fermentation Industries.

CO5: To understand Milk and Milk Products, Chemical Composition, Processing of milk, Types of milk& Analysis of Milk.

Organic chemistry II

Students after studying Chemistry of Natural products are expected

CO1: To learn about Stereo Chemistry

CO2: To learn about Asymmetric Synthesis, economic significance of asymmetric synthesis.

CO3: To know about pericyclic reactions & photochemistry

CO4: To understand about oxidation & different oxidative process.

CO5: To understand Reduction & different reductive processes.

Unit Operations

Students after studying unit operations are expected

CO1: To learn about Distillation & Absorption Batch and continuous distillation, Steam and extractive distillation.

CO2: To learn about Evaporation &Heat Exchanger Equipments.

CO3: To know about Crystallization & Extraction.

CO4: To understand about Filtration, Size Reduction and size Separation& mixing Equipment.

CO5: To understand about Drying and mixing.

Polymer Science-I

Students after studying polymer Science-I are expected

CO1: To learn about Concept of polymers, polymerization, definition, classification and types.

CO2: To learn about Chemical properties &Polymerization kinetics and Techniques.

CO3: To know about Molecular mass.

CO4: To understand about Rubber &Materials and Processing Technology.

CO5: To understand Plastics Materials, Introduction, Synthesis, properties and uses.

Medicinal Chemistry I

Students after studying these areas of knowledge are expected:

CO1: To gain an overall understanding of Pharmacological principles like pharmacodynamics & pharmacokinetics.

CO2: To learn about the antipyretics analgesics &NSAIDS.

CO3: To understand sulphonamides quinolones & anticancer drugs.

CO4: To study various Antbiotic ,tetracyclines,&macrolides.treatment of urinary tract infections.

CO4: To study of the various Antitubercular drugs, antileprotic and antiprotozoal drugs

Spectroscopy

Students after studying these areas of knowledge are expected:

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

CO2: To learn the involvement of selection rules in infrared-spectroscopy and Raman spectroscopy

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CO3: To know about the nuclear magnetic resonance spectroscopy.

CO4: To know about the Concept, instrumentation & use of ESR spectroscopy.

CO5: To know about the Mass Spectroscopy &Massbaur spectroscopy.

Organic Chemistry III

Students after studying these areas of knowledge are expected

CO1: To understand Reagents in organic synthesis.

CO2: To learn_Heterocyclic Chemistry_Synthesis and reactivity of furan, Thiophene, pyrrole, pyridine, Quinoline, Isoquinilone etc.

CO3: To know about Molecular Rearrangement & Protecting Groups.

CO4: To know about the Organic Reactions Aldol, Perkin, Stobbe, Rieckmann condensation etc,

CO5: To know about the Organic Synthesis - A disconnection approach, One group disconnection

Two Group disconnection.

Polymer Science II

Students after studying polymer science II are expected

CO1: To learn about Concept of Polymer Rheology and Morphology Physical & mechanical testing of Polymer.

CO2: To learn about Polymer Processing Compression molding, casting, extrusion, Fiber-spinning, injection molding, thermoforming Polymer Products, rubber footwear, Rubber to metal bonded components, cellular rubbers, sports goods, cables, latex products, rubber rollers.

CO3: To know about Functions and example of compounding ingredients Activator Accelerator Blowing Agents Softeners PigmentsTactifers Release Agents Reclaimed Rubber Tactics Ground crum Mineral& fillers.

CO4: To understand about Adhesives – Solvent based, water based and Dilutents and other additives and their applications .Blends: Preparation, processing, properties uses and Industrial aspects.

CO5: To understand concept of Chemical Testing, Identification by colour tests. Estimation of specific chemical characteristics like; acid number, saponification value and hydroxyl value. Thermal analysis of DSC, TGA, TMA, DTA

Medicinal Chemistry-II

Students after studying these areas of knowledge are expected:

CO1: To gain an overall understanding of Drugs acting on gastrointestinal disorders Emetics, Antiemetics and other Gastrointestinal drugs includingDrugs for constipation and Diarrheas.

CO2: To learn about. Cardiovascular Drugs: Hematopoietic Agents: Growth factors, minerals, anticoagulants, thrombolytic and antiplatelet drugs

CO3: To know about drugs acting on Kidney Diuretics & Antidiuretics:

CO4: To study of the various Drugs of Arthritides & Gout: Drugs of Cough and Bronchial Asthama& Treatment of drug allergies.

CO5: To study of the various Drugs acting on skins and mucous membrane Anti-Fungal Drugs& Antiviral Drugs.

Pesticide Chemistry

Students after studying Pesticide Chemistry course are expected:

CO1: To learn synthesis, mode of action and application of environmental impact of Insecticide of Plant Origin &Fungicide.

CO2: To learn Structure, synthesis, mode of action, application & environmental impact of Chlorinated hydrocarbons.

CO3: To know about Malathion, Structure, synthesis, mode of action, application & environmental impact of Dichlorovos, Paraoxon etc.

CO4: To understand Structure, synthesis, mode of action, application & environmental impact of Carbonate insecticides, Rodenticides.

CO5: To understand Dry formulations and Liquid formulations of Pesticides.

Pharmaceutics

Students after studying pharmaceutics are expected

CO1: To learn about the design of dosage forms and Preformulation.

CO2: To learn about Physiochemical Principles of Pharmaceutics.

CO3: To know about Disperse systems and Biopharmaceutics.

CO4: To understand about Study of Pharmaceutical Dosages Form Design Considerations.

CO5: To understand about Pharmaceutical Preparations, Suspensions, Emulsions.

IPR, TQM, &Technology Management

Students after studying this course are expected

CO1: To know about Role of patent in the pharmaceutical industries: Pharmaceutical legislation in India, Code of professional Ethics along with different acts &recent changes in law.

CO2: To have brief idea about various patent policies and practices, process &IPR management.

CO3: To know about concept of ISO, (TQM), Six Sigma, Kaizen, JIT, TQC, TWE, TPM.

CO4: To understand about Concepts and guidelines of USFDA, Good Manufacturing Practices GPC,ICH guidelines, research methodology used in CRO.

CO5: To understand about basic concepts of technology Management including technology forecasting.

Advance instrumental techniques

Students after studying this course are expected

CO1: To know about Thermo analytical Methods: thermo gravimetry, differential thermal analysis Differential scanning colorimetry (DSC)

CO2: To have brief idea about Electro analytical methods: Coulometry, apparatus and general techniques controlled potential coulometery.& Potentiometry

CO3: To know about concept of ISO, (TQM), Six Sigma, Kaizen, JIT, TQC, TWE, TPM.

CO4: To understand about Diffraction techniques General theory and instrumentation of neutron diffraction and X-Ray diffraction.

CO5: To understand about Refractrometry, Polarimetery, Flouroscence and Phosphorance spectrometery. Optical Rotatry dispersion (ORD) and circular dichroism (CD) theory, instrumentation

Organic Chemistry IV

Students after studying these areas of knowledge are expected

CO1: To understand nitrating agents, aromatic nitration, kinetics and mechanism of aromatic nitration Process equipment for technical nitration.

CO2: To learn Halogenations including typical industrial process.

CO3: To know about sulphonation in detail.

CO4: To know about the esterification & hydrolysis.

CO5: To know about the alkylation& esterification.

Petrochemicals, Oils and Soaps

Students after studying Petrochemicals oils and soaps are expected

CO1: To learn about Constituents of Petroleum, Processing or Refining of Petrochemicals.

CO2: To learn about edible and non-edible oils, chemical composition and physical properties of vegetable oils.

CO3: To know about Soaps and detergents.

CO4: To understand about Surfactant & Disinfectant.

CO5: To understand concept of Lubricants.

Medicinal Chemistry-III

Students after studying Medicinal chemistry-III are expected

CO1: To learn about. Drugs acting on CNS

CO2: To learn about Sedatives and hypnotics Tranquilizers or Antianxiety Agents.

CO3: To know about Anticonvulsants and Antiepileptic drugs CNS stimulants Hallucinogens.

CO4: To understand about Antiseptic and Disinfectants & Ectoparasiticides.

CO5: To understand anti-diabetic drugs and insulin.