

MAHISAHDAL RAJ COLLEGE
Affiliated to Vidyasagar University
Govt. Sponsored, Estd- 1946
NAAC Accredited 'A' Grade College
Website: mahishadalrajcollege.com

PROGRAMME OUTCOME (PO)

B. Sc. (MAJOR) in INDUSTRIAL CHEMISTRY

PO1: This program helps in understanding of the fundamental concepts and application in all areas of Industrial Chemistry.

PO2: It offers the students a platform for introduction to the different areas of theoretical and applied Chemistry. It creates the skills to operate various chemicals, apparatus and instruments used in chemical industry.

PO3: The students will be able to understand knowledge about fertilizers, pesticides, nature of soil etc. for betterment of agriculture.

PO4: It will provide students key knowledge in critical thinking and self- directed learning aptitude to study the subjects in its depth and apply thoughts for solving the problems in various fields in applied Chemistry.

PO5: It aims to provide students with a solid foundation in the research& jobs in different industries.

PROGRAMME SPECIFIC OUTCOME (PSO)

B. Sc. (MAJOR) in INDUSTRIAL CHEMISTRY

This program is designed in such a way that the students can get a comprehensive idea on the basic concepts of theoretical and applied Chemistry & chemical engineering. It will provide students to demonstrate knowledge in various fields of applied chemistry e.g. industrial chemistry, pharmaceutical chemistry, fuel chemistry, cosmetic chemistry, polymer chemistry etc. for betterment of our daily life. The students will be able to understand knowledge for betterment of environment through the study of waste management, environmental chemistry and green chemistry with sustainable development.

The course will provide students a logical progression through the key elements of fundamental & industrial research. This program is expected to inculcate the ability to find jobs in different academic institutions as well as research institutes. Through this program students get job opportunity in different chemical, pharmaceutical, oil, petrochemical and many other industries This program may help the students to develop moral and ethical mindset to acquire the ability of unbiased approach and trueness of action.

COURSE OUTCOME (CO)

B. Sc. (Major)) in INDUSTRIAL CHEMISTRY

Semester	Paper code & Name	Outcomes
I	CC1 (Unit Process for Organic Synthesis and Industrial Applications) C1T	a) Learn about Nomenclature, Generic name, trade name, Raw Material Resources. b) Students will be able to gather knowledge on the Unit Process in Organic Chemical Manufacture –Nitration, Halogenation & Sulphonation. c) Acquire knowledge about Unit Processing in Organic Synthesis-Oxidation, Hydrogenation, Alkylolation, Esterification& Amination.
	CC2 (Inorganic Materials for Chemical Industries and Industrial Waste Management) C2T	a) Understand the basic idea of material science and its development. b) Acquire knowledge about Inorganic Materials for Chemical Industries e.g; cement, ceramic, polymeric materials c) Understand the various types of corrosion relevant to chemical industry mechanism & preventive methods. d) Enhances the knowledge about Effluent Treatment and Waste Management. e) Learn about Industrial Aspects of Inorganic Chemistry, Basic Metallurgical Operations, Materials of Industrial Importance.
II	CC3 (Material and Energy Balance) C3T	a) Understand the dimensions and units, basic chemical calculations. b) Know about Material Balance without Chemical Reactions c) Learn about Material Balance involving Chemical Reactions d) Energy Balance
	CC4 (Industrial aspects of Physical Chemistry) C4T	a) Understand the basics of Surface Chemistry and Interfacial phenomenon. b) Know the concepts of chemical kinetics in different chemical processes. c) Understand the basic concept of thermodynamics and different thermodynamic properties. d) Learn the mechanism of catalytic action, phase transfer catalysis and enzyme catalysis.

Semester	Paper code & Name	Outcomes
III	CC5 (Chemo metrics and industrial chemical analysis techniques) C5T & C5P	a) Understand the basic concept of Chemo metrics b) Assess the knowledge of STANDARDS: ISI, BTS, ISO, EURO, ASTM. c) Explain the Modern instrumental methods of analysis – Principle, methods, instrumentation, interference and application. d) Assess the knowledge of Mass Spectrometry – Principle, instrumentation, ionization methods. e) Enhances the knowledge about Neutron diffraction analysis: principle and applications, Basic principle of electrophoresis. f) Provide practical knowledge on uv-visible spectrophotometer. g) Students will get informed about the Structural characterisation of compounds by infrared spectroscopy.
	CC6 (Chromatography) C6T & C6P	a) Provide basic concept of chromatographic techniques, types of Chromatography.. b) Acquire knowledge about Purification, extraction, separation, sample preparation for chromatography techniques. c) Students will be familiarize with the importance of various types of Chromatography e. g; Column, paper, TLC, GLC, GC, ion exchange & HPLC. d) Provide practical knowledge on Separation and identification of the monosaccharides present in the given mixture (glucose & fructose) by paper chromatography e) Provide practical knowledge on Paper chromatographic separation of amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) and mixture of metal ions.
	CC7 (Electro analytical and Thermo analytical techniques) C7T & C7P	a) Acquire knowledge about Electro analytical techniques- Potentiometry, Voltammetry, Colorimetry, Amperometry, Coulometry and Conductometry b) Acquire knowledge about Polarography, Ion-selective electrodes. c) Enhance knowledge about Thermo analytical techniques-TGA,DSC,DMA. d) Provide practical knowledge on Potentiometric titration of (a) a strong acid by a strong base (b) a weak acid by a strong base (c) Mohr's salt by potassium dichromate e) carry out Conductometric titrations for (i) strong acid - strong base (ii) weak acid - strong base f) Determine pKa value of weak acid by pH meter
	SEC-1 (Chemical process economics and Entrepreneurship) SEC-1T	a) Students will get to know about the economics of a chemical industrial process. b) Learn about Quality control, quality assurance and testing of the product. Packaging and advertising. c) Understand cause of Sickness in small scale industries and their remedial measures.

Semester	Paper code & Name	Outcomes
IV	CC8 (Introduction to Chemical Engineering and Mass Transfer Operations) C8T & C8P	a) Understand the basic concept of Chemical Engineering. b) Know about distillation, gas absorption, evaporation and filtration. c) Understand the process sedimentation, mixing, separation, extractions, drying & crystallisation. e) Provide practical knowledge on organic preparation Nitration, oxidation Sulphonation, , esterification, hydrolysis f) Investigate the partition co-efficient.
	CC9 (Fluid Mechanics and Heat Transfer) C9T & C9P	a) Learn the basic concept and theory of fluid Mechanics. b) Know about Utilities - Fuel, Air, Boilers, Steam, Pumps, Fluid moving machineries, equipments. c) Acquire knowledge about heat transfer. d) Provide practical knowledge on Determination of Physical constants: Refractive index, surface tension, Effect of surfactants on surface tension, viscosity. e) Study on working of laboratory centrifuge.
	CC10 (Industrial Instrumentation and Process Control) C10T & C10P	a) Acquire knowledge about instrumentation- temperature, pressure, liquid level direct. b) Acquire knowledge about Flow measurement. Process Control system. c) Provide practical knowledge on Ore analysis: Dolomite, Limestone. d) Provide practical knowledge on Water Analysis: Solid content, hardness, COD etc.
	SEC2 (Management, Costing and Plant Design) SEC2T	a) Know about Financial management & Marketing management b) Learn on Project cost estimation, Plant location. c) Provide knowledge on development of the project, plant design factors.

Semester	Paper code & Name	Outcomes
V	CC11 (Advanced Numerical Analysis and Advanced Reaction kinetics) C11T & C11P	a) Understand the basic concept of advanced numerical analysis b) Acquire knowledge on data acquisition and processing, matrices, solution, numerical solution. c) Gain the Fundamental aspects of Reaction Kinetics, theory & mechanism. d) Understand the Kinetics of homogeneous and heterogeneous catalytic reactions e) Provide practical knowledge on analysis of Cement.
	CC12 (Petroleum Chemistry) C12T & C12P	a) Gain the fundamental knowledge about composition of Petroleum. processing and Refinery Products b) Acquire knowledge on Basic operations in petrochemical industry c) Provide practical knowledge on Determination of Fire Point, cloud point, pour point, Kinetic Viscosity of oil. d) Proximate analysis of coal, Calorific value of Solid Fuel.
	DSE - 1 (Green Chemistry) DSE1T & DSC 1P	a) Acquire knowledge on the principles of green chemistry. b)) Focus on alternative solvent media for chemical process. c) Tell the future trends in green chemistry. d) Learn the synthesis of any type of organic compounds with green chemistry. e) Understand the principle of atom economy. f) Sketch an experiment by Safer starting materials.
	DSE - 2 (Analytical Methods in Chemistry) DSE2T & DSE 2P	a) Gain the fundamental knowledge on spectroscopic instrumentation b) Understand different types of electroanalytical methods. c) Acquire knowledge on various separation techniques in chromatography. d) Understand thermal methods of analysis. e) Apply chromatographic separation techniques of mixtures of compounds. f) Estimate the metal present in given compound.

Semester	Paper code & Name	Outcomes
VI	CC13 (Pharmaceutical Chemistry) C13T & C13P	a) Acquire knowledge about drug analysis and synthesis. b) Know the various green techniques for drug synthesis. c) Understand the pharmaceutical chemistry. d) Knowledge about antibiotic drugs. e) Design the preparation of drug and its analysis. f) Provide practical knowledge on the drug preparation procedure.
	CC14 (Polymer Chemistry) C14T & C14P	a) Acquire knowledge on different aspects of polymer chemistry. b) Understand how different polymers are synthesized and characterized. c) Assess kinetics and mechanism of polymer. d) Know the structure and properties of polymers. e) Construct a free radical solution polymerization reaction. f) Provide practical knowledge on the quality of polymer by Instrumental techniques.
	DSE - 3 (Pesticide Chemistry) DSE3T & DSE3P	a) Gain the fundamental knowledge about Pesticide Chemistry. b) Understand different types of Botanical insecticides. c) Acquire knowledge on Pesticide formulations. d) Carryout market survey of potent pesticides with details. e) Provide practical knowledge to calculate acidity & alkalinity in given sample of pesticide formulations as per BIS specifications.
	DSE - 4 (Renewable Energy and Solar Photovoltaics) DSE4T	a) Understand Global Energy Scenario- Energy Resources, Future Energy Options, and Energy Policy Issues. b) Assess Solar Energy, Solar Radiation. c) Acquire knowledge on First Generation Solar Cells, Second Generation Solar Cells, d) Gain the fundamental knowledge on Solar Technologies, Photovoltaic systems e) Acquire knowledge on Third Generation Solar Cells