NARAJOLE RAJ COLLEGE

(NAAC Accredited 'B' Grade Govt. Aided College)
NARAJOLE: PASCHIM MEDINIPUR: WEST BENGAL: Pin-721211
E-mail: narajolerajcollege@rediffmail.com
Website: https://www.narajolerajcollege.ac.in

Programme Specific Outcomes (PSOs)

Chemistry (Hons.)

The students of Chemistry (Hons) will acquire their theoretical and experimental basic knowledge about the different branches of Chemistry like Organic Chemistry, Inorganic Chemistry, Physical Chemistry, Analytical Chemistry, Pharmaceutical Chemistry, Green Chemistry, Polymer Chemistry, Fuel Chemistry, Analytical Clinical Biochemistry, Quantum Chemistry, Spectroscopy, Organometallics, Bioinorganic Chemistry, Polynuclear hydrocarbons, etc. by studying this programme. They will attain the quantitative and qualitative understanding of Chemistry in different experimental phenomena. This programme also opens up the career paths to select in many related and sub-related areas like academics, scientific laboratories, instrumentation and industries etc.

After end of the programme, the students will be capable of-

PSO 1. Create the skills to operate various chemicals, apparatus and instruments.

PSO 2. Produce problem solving skills in application of chemical principles.

PSO 3. Gains the ability to synthesise, separate and characterize compounds using instrumentation techniques.

PSO 4. Have information about the fundamentals and applications of chemical and scientific theories.

PSO 5. Produce scope to shine in academics, research or Industry.

PSO 6. Learn better laboratory practices and safety.

NARAJOLE RAJ COLLEGE

((NAAC Accredited 'B' Grade Govt. Aided College)
NARAJOLE: PASCHIM MEDINIPUR: WEST BENGAL: Pin-721211
E-mail: narajolerajcollege@rediffmail.com
Website: https://www.narajolerajcollege.ac.in

Programme Specific Outcomes (PSOs)

Chemistry (General)

The students of Chemistry (Gen or DSC) will acquire their theoretical and experimental basic knowledge about the different branches of Chemistry like Organic Chemistry, Inorganic Chemistry, Physical Chemistry, Analytical Chemistry, Pharmaceutical Chemistry, Green Chemistry, Polymer Chemistry, Fuel Chemistry, Analytical Clinical Biochemistry, Quantum Chemistry, Spectroscopy, Organometallics, Bioinorganic Chemistry, Polynuclear hydrocarbons, etc. by studying this programme. They will attain the quantitative and qualitative understanding of Chemistry in different experimental phenomena. This programme also opens up the career paths to select in many related and sub-related areas like academics, scientific laboratories, instrumentation and industries etc.

After end of the programme, the students will be capable of-

PSO 1. Create the skills to operate various chemicals, apparatus and instruments.

PSO 2. Produce problem solving skills in application of chemical principles.

PSO 3. Gains the ability to synthesise, separate and characterize compounds using instrumentation techniques.

PSO 4. Have information about the fundamentals and applications of chemical and scientific theories.

PSO 5. Produce scope to shine in academics, research or Industry.

PSO 6. Learn better laboratory practices and safety.

NARAJOLE RAJ COLLEGE

(NAAC Accredited 'B' Grade Govt. Aided College)
NARAJOLE: PASCHIM MEDINIPUR: WEST BENGAL: Pin-721211
E-mail: narajoleracollege@rediffmail.com
Website: https://www.narajolerajcollege.ac.in

Course Outcome

Chemistry (Hons.)

Semester	I
Title of Course	Organic Chemistry-I (CC-1)
Paper Code	C1T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-I will acquire the knowledge about the Valence Bond Theory, Electronic displacements, MO theory, Mechanistic classification of ionic, radical and pericyclic, Bonding geometries of carbon compounds and representation of molecules, Concept of chirality and symmetry, Relative and absolute configuration and Optical activity of chiral compounds by studying this course.

The theory paper (C1T) of this course (CC-1) provides the student with-

CO 1. Know the basic of structure, bonding, reactivity and reaction mechanisms of molecules.

CO 2. Identify the aromatic, anti aromaticity and non-aromatic compounds.

CO 3. Identify electrophile, nucleophiles, free radicals and intermediates along the reaction pathways.

CO 4. Understand stability of organic molecules, structure & stereochemistry.

Semester	I
Title of Course	Chemistry Lab- I (CC-1)
Paper Code	C1P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-I will acquire the practical knowledge about the Separation & purification of the organic mixture, Determination of boiling point of common organic liquid compounds, Identification of a pure Organic Compounds by hands on practical experiment.

The lab paper (C1P) of this course (CC-1) provides the student with-

CO 1. Judge the solubility of the mixture of compounds.

CO 2. Identify the pure organic compounds.

Semester	I
Title of Course	Physical Chemistry-I (CC-2)
Paper Code	C2T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-I will acquire the knowledge about the Kinetic Theory of gases, Maxwell's distribution of speed and energy, Real gas and virial equation, Zeroth and 1st law of Thermodynamics, Thermochemistry, Second Law of Thermodynamics, Thermodynamic relations, Rate law, order and molecularity, Role of Temperature and theories of reaction rate, Autocatalysis and Homogeneous catalysis by studying this course.

The theory paper (C2T) of this course (CC-2) provides the student with-

CO 1. Understand the Kinetic model of gas and its properties.

CO 2. Understand the laws of thermodynamics and concepts.

CO 3. Understand the concept of system, variables, heat, work, and laws of thermodynamics.

CO 4. Understand the concept of entropy; reversible, irreversible processes.

CO 5. Know the concepts of chemical kinetics in different chemical processes.

CO 6. Solve the numerical problems on chemical kinetics.

CO 7. Learn the mechanism of catalytic action and enzyme catalysis.

Semester	I
Title of Course	Physical Chemistry-I (CC-2)
Paper Code	C2P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-I will acquire the practical knowledge about the determination of pH of unknown solution (buffer), heat of neutralization of a strong acid by a strong base, kinetics of acid-catalyzed hydrolysis of methyl acetate, kinetics of decomposition of H_2O_2 and Heat of solution of oxalic acid from solubility measurement by hands on practical experiment.

The lab paper (C2P) of this course (CC-2) provides the student with-

CO 1. Carry out kinetics of decomposition of unknown solution.

CO 2. Determine heat of solution of organic acid from solubility measurement.

Semester	II
Title of Course	Inorganic Chemistry-I (CC-3)
Paper Code	C3T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-II will acquire the knowledge about Extra nuclear Structure of atom, Chemical periodicity, Chemical periodicity and Redox Reactions and precipitation reactions by studying this course.

The theory paper (C3T) of this course (CC-3) provides the student with-

CO 1. Understand the atomic theory and its development.

CO 2. Learn the theory of atoms, concept of wave function.

CO 3. Explain the quantum numbers and its significance.

CO 4. Understand modern periodic law to explain periodic properties.

CO 5. Knowledge on Pauling and Milliken scales to measure electronegativities.

CO 6. Understand the acid-base behaviors of different organic and inorganic compounds.

CO 7. Understand the redox phenomenon of redox active substances.

Semester	II
Title of Course	Physical Chemistry-I (CC-3)
Paper Code	C3P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-II will acquire the practical knowledge about Acid and Base Titrations e.g., mixture of carbonate and hydroxide, carbonate and bicarbonate, Oxidation-Reduction Titrimetric (e.g. Estimation of Fe(II) using standardized $KMnO_4$ solution, Estimation of oxalic acid and sodium oxalate in a given mixture, Estimation of Fe(II) and Fe(III) in a given mixture using $K_2Cr_2O_7$ solution, Estimation of Fe(III) and Mn(II) in a mixture using standardized $KMnO_4$ solution and Estimation of Fe(III) and Cr(III) in a mixture using $K_2Cr_2O_7$) by hands on practical experiments.

The lab paper (C3P) of this course (CC-3) provides the student with-

CO 1. Design Acid and Base Titrations of mixture of compounds.

CO 2. Produce the results of mixture of compounds by Oxidation-Reduction Titraton.

Semester	II
Title of Course	Organic Chemistry-II (CC-4)
Paper Code	C4T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-II will acquire the knowledge about the Chirality arising out of stereoaxis, Concept of prostereoisomerism, Conformation, Conformational nomenclature, Reaction thermodynamic, Concept of organic acids and bases, Tautomerism, Reaction kinetics, Free-radical substitution reaction and Elimination reactions by studying this course.

The theory paper (C4T) of this course (CC-4) provides the student with-

CO 1. Know about the concepts of stereochemistry.

CO 2. Understand the different conformational nomenclature.

CO 3. Know the concept of prostereoisomerism.

CO 4. Learn nucleophilic substitution reactions mechanism by stereochemistry approach.

CO 5. Assess the concept of Elimination reactions.

CO 6. Understand the basics of chemical kinetics in organic chemistry.

Semester	II
Title of Course	Organic Chemistry-II (CC-4)
Paper Code	C4P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-II will acquire the hands-on practical knowledge about the Organic Preparations by nitration, condensation reaction, hydrolysis, benzoylation, oxidation, Diazo coupling reactions, multi-component-coupling, etc and purify them by crystallisation, also measure Melting point of purified product.

The lab paper (C4P) of this course (CC-4) provides the student with-

CO 1. Check the yield of Organic preparations.

CO 2. Compare the melting point value of an experiment with the literature.

Semester	III
Title of Course	Physical Chemistry-II (CC-5)
Paper Code	C5T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-III will acquire the knowledge about the Fick's law, viscocity, Conductance and transport number, Partial properties and Chemical potential, Chemical Equilibrium, Nernst's distribution law, Chemical potential and other properties of ideal substances- pure and mixtures, Condensed Phase rule, Beginning of Quantum Mechanics, Wave function, Concept of Operators, Particle in a box and Simple Harmonic Oscillator by studying this course.

The theory paper (C5T) of this course (CC-5) provides the students with-

CO 1. Learn knowledge about liquid states.

CO 2. Learn thermodynamic laws to explain chemical equilibrium.

CO 3. Know concept of operator on quantum mechanical system.

CO 4. Use the concept of wave functions.

CO 5. Explain the concept of Harmonic Oscillator.

Semester	III
Title of Course	Physical Chemistry-II (CC-5)
Paper Code	C5P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-III will acquire the acquire the hands-on practical knowledge on study of viscosity of unknown liquid, determination of partition coefficient of different mixture, conductometric titration of an acid against base, study of saponification reaction conductometrically and verification of Ostwald's dilution law and determination of K_a of weak acid.

The lab paper (C5P) of this course (CC-5) provides the students with-

CO 1. Execute the concept of viscosity.

CO 2. Judge the Ostwald's dilution law in case of weak acid.

Semester	III
Title of Course	Inorganic Chemistry-II (CC-6)
Paper Code	C6T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-III will acquire the knowledge about the Ionic bond, Covalent bond, Molecular orbital concept of bonding, Metallic Bond, Weak Chemical Forces in chemical bonding and Radioactivity by studying this course.

The theory paper (C6T) of this course (CC-6) provides the students with-

After completion of these course, students should be able to;

CO 1. Explain the fundamental concepts of ionic bond and covalent bond.

CO 2. Understand the basic principles involved in nuclear chemistry.

CO 3. Aware the advanced level of nuclear chemistry.

CO 4. Assess the knowledge on molecular orbital theory.

CO 5. Solve practical problem on chemical bonding.

Semester	III
Title of Course	Inorganic Chemistry-II (CC-6)
Paper Code	C6P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-III will acquire the practical knowledge about the Iodo-/ Iodimetric Titrations (e,g. Estimation of Cu(II), of Vitamin C, of (i) arsenite and (ii) antimony in tartar-emetic iodimetrically and of available chlorine in bleaching powder), Estimation of metal content in some selective samples (e.g. Estimation of Cu in brass, of Cr and Mn in Steel. And of Fe in cement) by hands on practical experiments.

The lab paper (C6P) of this course (CC-6) provides the student with-

CO 1. Design Iodo-/ Iodimetric Titrations of a given sample.

CO 2. Experimenting the estimation of metal content in some selective samples.

Semester	III
Title of Course	Organic Chemistry-III (CC-7)
Paper Code	C7T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-III will acquire the knowledge about Chemistry of alkanes and alkynes (mechanism, reactivity, regioselectivity and stereoselectivity), Electrophilic aromatic substitution, Nucleophilic aromatic substitution, Addition to Carbonyl Exploitation of acidity of a-H of Carbonyl, Elementary ideas of Green Chemistry, Substitution at sp^2 carbon, Grignard reagent, Organolithiums and Gilman cuprates by studying this course.

The theory paper (C7T) of this course (CC-7) provides the student with-

CO 1. Enhances the knowledge on name reaction with examples.

CO 2. Learn the mechanism of rearrangement reaction by using synthetic reagent.

CO 3. Recognize various oxidation and reduction reactions.

CO 4. Create interest and thinking in the mechanisms of organic reactions.

Semester	III
Title of Course	Organic Chemistry-III (CC-7)
Paper Code	C7P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-III will acquire the practical knowledge about the Detection of special elements (N, S, Cl, Br) by Lassaigne's test, Solubility and classification of functional groups by systematic chemical tests, Melting point of the organic compound, Preparation, purification and melting point determination of a crystalline derivative of the given compound by hands on practical experiments.

The lab paper (C7P) of this course (CC-7) provides the student with-

CO 1. Construct the qualitative analysis of single solid organic compounds.

CO 2. Classify of the compound through literature survey.

Semester	III
Title of Course	Pharmaceutical Chemistry (SEC-1)
Paper Code	SEC1T (Theory)
Credits	01
Hours	01 hours/week

The students of Chemistry (H) of Semester-III will acquire the knowledge about the Drug discovery, design and development; basic Retrosynthetic approach. Synthesis of the representative drugs (analgesics agents, antipyretic agents, anti-inflammatory agents, antibiotics, etc), Aerobic and anaerobic fermentation ((i) Ethyl alcohol (ii) Antibiotics; Penicillin, (iii) Lysine, Glutamic acid, etc) following classes by studying this course.

The theory paper (SEC1T) of this course (SEC-1) provides the student with-

CO 1. Learn about drug analysis and synthesis.

CO 2. Know the various green techniques for drug synthesis.

CO 3. Understand the pharmaceutical chemistry.

CO 4. Knowledge about antibiotic drugs.

Semester	III
Title of Course	Pharmaceutical Chemistry (SEC-1)
Paper Code	SEC1P (Lab)
Credits	01
Hours	02 hours/week

The students of Chemistry (H) of Semester-III will acquire the knowledge about the hands -on preparation of Aspirin, magnesium bisilicate (Antacid) and its analysis.

The theory paper (SEC1P) of this course (SEC-1) provides the student with-

CO 1. Design the preparation of drug and its analysis.

CO 2. Demonstrate the drug preparation procedure.

Semester	IV
Title of Course	Physical Chemistry III (CC-8)
Paper Code	C8T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-IV will acquire the knowledge about the Colligative properties, Phase rule, Binary solutions, Ionic equilibria, Electromotive Force, Dipole moment and polarizability, Angular momentum, Qualitative treatment of hydrogen atom and hydrogen-like ions, Quantum approach of LCAO and HF-SCF by studying this course.

The theory paper (C8T) of this course (CC-8) provides the students with-

CO 1. Learn thermodynamic view on solutions containing ionic species.

CO 2. Know the activity and activity coefficient of various ionic species present in the solution.

CO 3. Identify various electrode processes.

CO 4. Understand the Nernst equation using thermodynamic laws.

CO 5. Know Schrodinger's wave equation in real quantum mechanical system.

CO 6. Apply the wave mechanics to one-electron system like hydrogen atom.

Semester	IV
Title of Course	Physical Chemistry III (CC-8)
Paper Code	C8P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-IV will acquire the knowledge of Determination of solubility of sparingly soluble salt in water, Potentiometric titration of Mohr's salt solution, Determination of K_{sp} for AgCl by potentiometric titration, Effect of ionic strength on the rate of Persulphate – Iodide reaction, Effect of ionic strength on the rate of Persulphate – Iodide reaction and pH-metric titration of acid (mono- and di-basic) against strong base.

The lab paper (C8P) of this course (CC-8) provides the student with-

CO 1. Construct a Potentiometric titration experiment.

CO 2. Interpret the result on ionic strength.

Semester	IV
Title of Course	Inorganic Chemistry - III (CC-9)
Paper Code	C9T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-IV will acquire the knowledge about the pH-metric titration of acid (mono- and di-basic) against strong base, pH-metric titration of acid (mono- and di-basic) against strong base, Chemistry of Noble Gases, Inorganic Polymers, Coordinate bonding by studying this course.

The theory paper (C9T) of this course (CC-9) provides the student with-

CO 1. Learn the basic concept and theory in coordination chemistry.

CO 2. Know about complex formation, stability and nature of metal ligand bonding on coordination chemistry.

CO 3. Understand the chemistry of a vrious of compounds of the s-block and p-block periodic elements.

CO 4. Know the applications of these compounds in different industrial needs.

Semester	IV
Title of Course	Inorganic Chemistry - III (CC-9)
Paper Code	C9P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-IV will acquire the practical knowledge about the Complexometric titration Zn(II), Zn(II) in a Zn(II) and Cu(II) mixture, Ca(II) and Mg(II) in a mixture, Hardness of water, Inorganic preparations Potassium diaquadioxalatochromate(III), Tetraamminecarbonatocobalt (III) ion, Potassium tris(oxalato)ferrate(III), Tris-(ethylenediamine) nickel(II) chloride $[Mn(acac)_3]$ and $Fe(acac)_3]$ by hands on practical experiments.

The lab paper (C9P) of this course (CC-9) provides the student with-

CO 1. Assemble the experimental result on Complexometric titration.

CO 2. Judge the metal content present in mixture of solution.

Semester	IV
Title of Course	Organic Chemistry -IV (CC-10)
Paper Code	C10T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-IV will acquire the knowledge about the Aliphatic & Aromatic Amines, Nitro compounds (aliphatic and aromatic), Nitro compounds (aliphatic and aromatic), Mechanism Rearrangement to electron-deficient carbon, nitrogen and oxygen, Rearrangement reactions by green approach, Asymmetric synthesis, UV Spectroscopy, IR Spectroscopy, NMR Spectroscopy and Applications of IR, UV and NMR spectroscopy for identification of simple organic molecules by studying this course.

The theory paper (C10T) of this course (CC-10) provides the student with-

CO 1. Apply mechanism concept in retro synthesis reactions.

CO 2. Understand about disconnection approach in retro synthesis.

CO 3. Understand the fundamental principles of different spectroscopies.

CO 4. Learn the mechanism of rearrangement reaction.

Semester	IV
Title of Course	Organic Chemistry -IV (CC-10)
Paper Code	C10P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-IV will acquire the practical knowledge about the Quantitative Estimations of glycine by Sörensen's formol method, Glucose by titration using, Fehling's solution sucrose by titration using, Fehling's solution of vitamin-C (reduced), of aromatic amine (aniline) by bromination (Bromate-Bromide) method, of phenol by bromination (Bromate-Bromide) method, of formaldehyde (Formalin), of acetic acid in commercial vinegar, of urea (hypobromite method), of saponification value and of oil/fat/ester by hands on practical experiments.

The lab paper (C10P) of this course (CC-10) provides the student with-

CO 1. Investigate the saponification value of an experiment.

CO 2. Judge the quality of commercial product.

Semester	IV
Title of Course	Basic analytical Chemistry (SEC-2)
Paper Code	SEC2T (Theory)
Credits	01
Hours	01 hour/week

The students of Chemistry (H) of Semester-IV will acquire the knowledge about the Analytical Chemistry and its interdisciplinary nature, Concept of sampling, Importance of accuracy, Analysis of soil, Analysis of water, Analysis of food products, Chromatography, Ion-exchange and Analysis of cosmetics by studying this course.

The theory paper (SEC2T) of this course (SEC-2) provides the student with-

CO 1. Make scientific reports from chemical experiments and draw conclusions.

CO 2. Formulate the important factors on analytical experiments and results.

CO 3. Understand the theoretical principles of various separation techniques in chromatography.

Semester	IV
Title of Course	Basic analytical Chemistry (SEC-2)
Paper Code	SEC2P (Lab)
Credits	01
Hours	02 hours/week

The students of Chemistry (H) of Semester-IV will acquire the practical knowledge about the Determination of pH, acidity and alkalinity of a water sample, Paper chromatographic separation of mixture of metal ion, to compare paint samples by TLC method, Determination of constituents of talcum powder, Instrumental demonstrations by hands

The lab paper (SEC2P) of this course (SEC-2) provides the student with-

CO 1. Test the metal present in a tablet by Spectrophotometric instrument.

CO 2. Investigate the acidity and alkalinity of a water sample by pH measurement.

Semester	V
Title of Course	Inorganic Chemistry - IV (CC-11)
Paper Code	C11T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-V will acquire the knowledge about the Elementary Crystal Field Theory, Metalligand bonding, L-S coupling, Orgel diagrams, chemistry of Transition Elements, chemistry of Lanthanoids and Actinoids by studying this course.

The theory paper (C11T) of this course (CC-11) provides the students with-

CO 1. Understand the nature of metals of d-block elements.

CO 2. Describe the bonding models, structures and applications of coordination complexes.

CO 3. Learn the depth knowledge on crystal field theory.

CO 4. Learn the chemistry of Lanthanoids and Actinoids metals.

Semester	V
Title of Course	Lab (CC-11)
Paper Code	C11P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-V will acquire the knowledge of Principles involved in chromatographic separations, Paper chromatographic separation of metal ions Ni (II) and Co (II), Fe (III) and Al (III) Gravimetric Estimation of Ni(II) using Dimethylglyoxime (DMG), of copper as CuSCN, of Al(III) by precipitating with oxine and weighing as $Al(oxine)_3$, of chloride, spectrophotometric method.for determination of λ_{max} for complexes .

The lab paper (C11P) of this course (CC-11) provides the student with-

CO 1. Demonstrate the chromatographic separations of metal ions.

CO 2. Understand the λmax of metal complexes.

Semester	V
Title of Course	Organic Chemistry - V (CC-12)
Paper Code	C12T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-V will acquire the knowledge about the Polynuclear hydrocarbons and their derivatives, Heterocyclic compounds: 5- and 6-membered rings with one heteroatom, Stereochemistry of Alicyclic compounds, Mechanism, stereochemistry, regioselectivity in case of Electrocyclic reactions, Cycloaddition reactions, Sigmatropic reactions, Sigmatropic reactions, Amino acids, Peptides, Nucleic acids by studying this course.

The theory paper (C12T) of this course (CC-12) provides the student with-

CO 1. Understand the principles of pericyclic reactions.

CO 2. Know the nomenclature of hetero-cyclic.

CO 3. Know the synthesis and reactions of different heterocycles.

CO 4. Know the optical activity & chirality of cyclohexane.

Semester	V
Title of Course	Organic Chemistry - V (CC-12)
Paper Code	C12P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-V will acquire the practical knowledge about the Chromatographic Separations (TLC separation, Column chromatographic separation, Column chromatographic separation of a mixture), Spectroscopic Analysis of Organic Compounds ^1H NMR spectra, IR spectrum by hands on practical experiments.

The lab paper (C12P) of this course (CC-12) provides the student with-

CO 1. Predict the δ-values and splitting pattern of a organic compounds.

CO 2. Assign frequencies of the absorptions of a organic compounds.

Semester	V
Title of Course	Advanced Physical Chemistry (DSE-1)
Paper Code	DSE1T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-V will acquire the knowledge about the Bravais Lattice and Laws of Crystallography, Determination of crystal structure, Crystal planes, Statistical Thermodynamics Configuration, Boltzmann distribution, Partition function, Partition function Partition function and Polymers by studying this course.

The theory paper (DSE1T) of this course (DSE-1) provides the student with-

CO 1. Learn Bragg's law and crystal planes in crystal system.

CO 2. Calculate interplanar distance.

CO 3. Get an idea about classical statistical thermodynamics and Quantum statistics on an elementary level.

CO 4. Get an idea about of polymers.

Semester	V
Title of Course	Advanced Physical Chemistry (DSE-1)
Paper Code	DSE1T (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-V will acquire the knowledge about the Computer programs based on numerical methods for Roots of equations, Numerical differentiation, Numerical integration, Matrix operations and Simple exercises using molecular visualization software by studying this course.

The theory paper (DSE1P) of this course (DSE-1) provides the student with-

CO 1. Design the computer programs based on numerical methods.

CO 2. Operate the computer programs on Matrix operations.

Semester	V
Title of Course	Analytical Methods in Chemistry (DSE-2)
Paper Code	DSE2T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-V will acquire the knowledge about the Simple exercises using molecular visualization software, fundamental laws of spectroscopy and selection rules, UV-Visible Spectrometry, Basic principles of quantitative analysis, Infrared Spectrometry, Flame Atomic Absorption and Emission Spectrometry, Thermal methods of analysis, Electroanalytical methods, Solvent extraction, Mechanism of extraction, Chromatography, Stereoisomeric separation and analysis, Role of computers in instrumental methods of analysis by studying this course.

The theory paper (DSE2T) of this course (DSE-2) provides the student with-

CO 1. Identify different types of chromatography techniques.

CO 2. Gain the fundamental knowledge on spectroscopic instrumentation.

CO 3. Understand different types of electroanalytical methods.

CO 4. Understand thermal methods of analysis.

Semester	V
Title of Course	Analytical Methods in Chemistry (DSE-2)
Paper Code	DSE2T (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-V will acquire the knowledge about the Separation of mixtures by paper chromatography, TLC technique, Chromatographic separation, Solvent Extractions, Determination of COD, BOD by studying this course.

The theory paper (DSE2P) of this course (DSE-2) provides the student with-

CO 1. Identify chromatographic separation techniques of mixtures of compounds.

CO 2. Estimate the metal present in given compound.

Semester	VI
Title of Course	Inorganic Chemistry-V (CC-13)
Paper Code	C13T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-VI will acquire the knowledge about the Elements of life, Metal ion transport across biological membrane, Dioxygen management proteins, Electron transfer proteins, Photosynthesis, Definition and classification of organometallic compounds, 18-electron and 16-electron rules, Zeise's salt, Catalysis by Organometallic Compounds, Introduction to inorganic reaction mechanisms and Reaction Kinetics by studying this course.

The theory paper (C13T) of this course (CC-13) provides the student with-

CO 1. Understand the biological aspects of metal.

CO 2. Know about the function of the catalysts and its surface action.

CO 3. Identify the bonding of inorganic & organometallic compounds.

CO 4. Know about metal ion transport and storage.

Semester	VI
Title of Course	Inorganic Chemistry-V (CC-13)
Paper Code	C13P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-VI will acquire the practical knowledge about the Qualitative semimicro analysis of mixtures, Cation Radicals Anion Radicals, Insoluble Materials and different reactions to assign the most probable composition by hands on practical experiments.

The lab paper (C13P) of this course (CC-13) provides the student with-

CO 1. Interpret the radicals present in a given compound.

CO 2. Assign the most probable composition in Qualitative

Semester	VI
Title of Course	Physical Chemistry-V (CC-14)
Paper Code	C14T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-VI will acquire the knowledge about the Rotation spectroscopy Vibrational spectroscopy, Raman spectroscopy, Nuclear Magnetic Resonance (NMR) spectroscopy, Electron Spin Resonance (ESR) spectroscopy, Lambert-Beer's law, Photochemical Processes, Rate of Photochemical processes, Surface tension and energy, Adsorption, Colloids by studying this course.

The theory paper (C14T) of this course (CC-14) provides the student with-

CO 1. Gain the fundamental knowledge in the spectroscopy.

CO 2. Learn photo physical processes in excited state.

CO 3. Learn about Beer Lamberts law and photo chemical Grouters- Dropper law.

CO 4. Learn about surface chemistry.

Semester	VI
Title of Course	Physical Chemistry-V (CC-14)
Paper Code	C14P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-VI will gain the knowledge on Determination of surface tension of a liquid using Stalagmometer, Determination of surface tension of a liquid using Stalagmometer, of pH of unknown buffer, spectrophotometrically, Verification of Beer and Lambert's Law and Spectrophotometric determination of CMC.

The lab paper (C14P) of this course (CC-14) provides the student with-

CO 1. Verification of Beer and Lambert's Law.

CO 2. Develop kinetics reaction by spectrophotometrically.

Semester	VI
Title of Course	Green Chemistry (DSE-3)
Paper Code	DSE3T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (H) of Semester-VI will acquire the knowledge about the Introduction to Green Chemistry, Principles of Green Chemistry and Designing a Chemical synthesis, Examples of Green Synthesis/ Reactions and some real world cases, Future Trends in Green Chemistry by studying this course.

The theory paper (DSE3T) of this course (DSE-3) provides the student with-

CO 1. Focus on the principles of green chemistry.

CO 2. Learn alternative solvent media for chemical process.

CO 3. Tell the future trends in green chemistry.

CO 4. Learn the synthesis of any type of organic compounds with green chemistry.

Semester	VI
Title of Course	Green Chemistry (DSE-3)
Paper Code	DSE3P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-VI will acquire the practical knowledge about the Preparation and characterization of nanoparticles of gold using tea leaves Preparation of biodiesel from vegetable/ waste cooking oil , Principle of atom economy, Use of enzymes as catalysts, Alternative Green solvents, Alternative sources of energy by hands on practical experiments.

The lab paper (DSE3P) of this course (DSE-3) provides the student with-

CO 1. Understand the Principle of atom economy.

CO 2. Sketch an experiment by Safer starting materials.

Estd.-1966

Semester	VI
Title of Course	Polymer Chemistry (DSE-4)
Paper Code	DSE4T (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry s (H) of Semester-VI will acquire the practical knowledge about the Introduction and history of polymeric materials, Functionality and its importance, Kinetics of Polymerization, Crystallization and crystallinity, Nature and structure of polymers, Determination of molecular weight of polymers, Glass transition temperature (T_g) and determination of T_g, Polymer Solution, Properties of Polymer by hands on practical experiments.

The theory paper (DSE4T) of this course (DSE-4) provides the student with

CO 1. Know of all aspects of polymer chemistry.

CO 2. Understand how polymers are characterized.

CO 3. Assess kinetics and mechanism of polymer.

CO 4. Know the structure and properties of polymers.

Semester	VI
Title of Course	Polymer Chemistry (DSE-4)
Paper Code	DSE4P (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (H) of Semester-V will acquire the knowledge about the Polymer synthesis (styrene (St) / Methyl Methacrylate (MMA) / Methyl Acrylate (MA) / Acrylic acid (AA), etc), Polymer characterization (molecular weight by viscometry, mechanical properties), Polymer analysis(Instrumental Technique, IR, DSC) by studying this course.

The lab paper (DSE4P) of this course (DSE-4) provides the student with-

CO 1. Construct a free radical solution polymerization reaction.

CO 2. Test the polymer quality by Instrumental Techniques.

NARAJOLE RAJ COLLEGE

(NAAC Accredited 'B' Grade Govt. Aided College)
NARAJOLE: PASCHIM MEDINIPUR: WEST BENGAL: Pin-721211
E-mail: *arajoleracollege@rediffmail.com*
Website: *https://www.narajolerajcollege.ac.in*

Course Outcome

Chemistry (GE)

Semester	I
Title of Course	Atomic Structure, Chemical Periodicity, Acids And Bases, Redox Reactions,General Organic Chemistry & Aliphatic Hydrocarbons. (GE-1)
Paper Code	GE1T (Theory)
Credits	04
Hours	04 hours/week

The students of other science subjects (H) of Semester-I will acquire the knowledge about the Atomic Structure,Chemical Periodicity, Acids and bases, Redox reaction, Redox reactions, Redox reactions, Nucleophilic Substitution and Elimination Reactions, Aliphatic Hydrocarbons by studying this course.

The theory paper (GE1T) of this course (GE-1) provides the student with-

CO 1. Understand the atomic theory and its development.

CO 2. Understand electronic configuration to explain periodic properties.

CO 3. Understand different acid-bases theory of organic compounds.

CO 4. Understand the different types of interactions present in molecules.

CO 5. Know about the concepts of stereochemistry.

CO 6. Understand the reaction mechanism of aliphatic hydrocarbon.

Semester	I
Title of Course	Atomic Structure, Chemical Periodicity, Acids And Bases, Redox Reactions,General Organic Chemistry & Aliphatic Hydrocarbons(GE-1)
Paper Code	GE1P (Lab)
Credits	02
Hours	04 hours/week

The students of other science subjects (H) of Semester-I will acquire the practical knowledge about the Estimation ofsodium carbonate and sodium hydrogen carbonate present in a mixture, sodium carbonate and sodium hydrogen carbonate present in a mixture, water of crystallization in Mohr's salt by titrating with KMnO4, Qualitative Analysis of Single Solid Organic Compound(s)by hands on practical experiments.

The lab paper (GE1P) of this course (GE-1) provides the student with-

CO 1. Design Acid and Base Titrations of mixture of compounds.

CO 2. Produce the results of mixture of compounds by Oxidation-Reduction Titration.

Semester	II
Title of Course	States Of Matter & Chemical Kinetics, ChemicalBonding& Molecular Structure, P-Block Elements(GE-2)
Paper Code	GE2T (Theory)
Credits	04
Hours	04 hours/week

The students of other science subjects (H) of Semester-IIwill acquire the knowledge about Kinetic Theory of Gases and Real gases, Liquids, Solids, Chemical Kinetics, Chemical Bonding and Molecular Structure, Comparative study of p-block elementsby studying this course.

The theory paper (GE2T) of this course (GE-2) provides the students with-

CO 1. Understand the Kinetic model of gas and its properties.

CO 2. Learn knowledge about liquid states.

CO 3. Learn Bragg's law and crystal planes in crystal system.

CO 4. Know the concepts of chemical kinetics in different chemical processes.

CO 5. Assess the knowledge on molecular orbital theory.

Semester	II
Title of Course	States Of Matter & Chemical Kinetics, ChemicalBonding& Molecular Structure, P-Block Elements(GE-2)
Paper Code	GE2P (Lab)
Credits	02
Hours	04 hours/week

The students of other science subjects (H) of Semester-IIwill acquire the practical knowledge about the Surface tension measurement, Viscosity measurement, Study the kinetics of the Iodide-persulphate reaction, andQualitative semimicro analysis of mixtures containing radicalsby hands on practical experiments.

The lab paper (GE2P) of this course (GE-2) provides the student with-

CO 1. Design Surface tension experiment of a given sample.

CO 2. Experimenting the qualitative semimicro analysis in some selective samples.

Semester	III
Title of Course	Chemical Energetics, Equilibria, Organic Chemistry-II (GE-3)
Paper Code	GE3T (Theory)
Credits	04
Hours	04 hours/week

The students of other science subjects (H) of Semester-III will acquire the knowledge about Chemical Energetics, Chemical Equilibrium, Ionic Equilibria, Aromatic Hydrocarbons, Carbonyl Compounds, Alcohols, Phenols and Ethers, Aryl Halidesby studying this course.

<u>The theory paper (GE3T) of this course (GE-3) provides the student with-</u>

CO 1. Learn thermodynamic laws to explain chemical equilibrium.

CO 2. Know the activity and activity coefficient of various ionic species present in the solution.

CO 3. Learn the chemistry of aromatic hydrocarbon

CO 4. Create interest and thinking in the mechanisms of organic reactions.

Semester	III
Title of Course	Chemical Energetics, Equilibria, Organic Chemistry-II(GE-3)
Paper Code	GE3P (Lab)
Credits	02
Hours	04 hours/week

The students of other science subjects (H) of Semester-IIIwill acquire the practical knowledge about the Thermochemistry, Ionic Equilibria, Identification of a pure organic compoundby hands on practical experiments.

<u>The lab paper (GE3P) of this course (GE-3) provides the student with-</u>

CO 1. Classify of the compound through melting point survey.

CO 2. Experimenting the qualitative analysis in single solid organic compounds.

Semester	IV
Title of Course	Solutions, Phase Eequilibria, Conductance,Electrochemistry & Analytical and Enviornmetal Chemistry-I(GE-4)
Paper Code	GE4T (Theory)
Credits	04
Hours	04 hours/week

The students of other science subjects (H) of Semester-IV will acquire the knowledge about theSolutions, Phase Equilibria, Conductanc, Electromotive force, Chemical Analysis, Environmental Chemistry, by studying this course.

The theory paper (GE4T) of this course (GE-4) provides the student with-

CO 1. Explain the applications of emf measurements.

CO 2. Learn thermodynamic view on solutions containing ionic species.

CO 3. Identify various electrode processes.

CO 4. Know the atmosphere, hydrosphere and lithosphere.

Semester	IV
Title of Course	Solutions, Phase Eequilibria, Conductance,Electrochemistry & Analytical and Enviornmetal Chemistry-I (GE-4)
Paper Code	GE4P (Lab)
Credits	02
Hours	04 hours/week

The students of other science subjects (H) of Semester-IV will acquire the practical knowledge about the Distribution Law,Phase equilibria, Conductance, Potentiometry, hardness of water by EDTA titration and the solubility of a sparingly soluble saltby hands

The lab paper (GE4P) of this course (GE-4) provides the student with-

CO 1. Construct a Potentiometric titration experiment.

CO 2. Interpret the result after completion of an experiment.

NARAJOLE RAJ COLLEGE

(NAAC Accredited 'B' Grade Govt. Aided College)
NARAJOLE: PASCHIM MEDINIPUR: WEST BENGAL: Pin-721211
E-mail: *arajoleracollege@rediffmail.com*
Website: *https://www.narajolerajcollege.ac.in*

Course Outcome

Chemistry (DSC)

Semester	I
Title of Course	Atomic structure, Bonding, General organicchemistry & Aliphatic Hydrocarbons (DSC-1A)
Paper Code	DSC1AT (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (Gen) of Semester-I will acquire the knowledge about the Atomic Structure, Chemical Bonding and Molecular Structure, Fundamentals of Organic Chemistry, Stereochemistry, Aliphatic Hydrocarbons, Alkenes and Alkynes by studying this course.

The theorypaper (DSC1AT) of this course (DSC-1A) provides the student with-

CO 1. Understand the atomic theory and its development.

CO 2. Understand electronic configuration to explain periodic properties.

CO 3. Understand different acid-bases theory of organic compounds.

CO 4. Understand the different types of interactions present in molecules.

CO 5. Know about the concepts of stereochemistry.

CO 6. Understand the reaction mechanism of aliphatic hydrocarbon.

Semester	I
Title of Course	Atomic structure, Bonding, General organicchemistry & Aliphatic Hydrocarbons (DSC-1A)
Paper Code	DSC1AP (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (Gen) of Semester-I will acquire the practical knowledge about the Volumetric Analysis,Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture, Detection of extra elements (N, S, Cl, Br, I) in organic compounds and Separation of mixtures by Chromatographyby hands on practical experiments.

The labpaper (DSC1AP) of this course (DSC-1A) provides the student with-

CO 1. Design Acid and Base Titrations of mixture of compounds.

CO 2. Produce the results of mixture of compounds by Oxidation-Reduction Titration.

Semester	II
Title of Course	Chemical Energetics, Equilibria & Functional Organic Chemistry(DSC-1B)
Paper Code	DSC1BT (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry (Gen) of Semester-II will acquire the knowledge about the Chemical Energetic,Chemical Equilibrium, Ionic Equilibria, Aromatic hydrocarbons,Alkyl and Aryl Halides,Alcohols, Phenols and Ethers, Ethers (aliphatic and aromatic) and Aldehydes and ketones (aliphatic and aromatic)by studying this course.

The theorypaper (DSC1BT) of this course (DSC-1B) provides the student with-

CO 1. Understand the Kinetic model of gas and its properties.

CO 2. Learn knowledge about liquid states.

CO 3. Learn Bragg's law and crystal planes in crystal system.

CO 4. Know the concepts of chemical kinetics in different chemical processes.

CO 5. Assess the knowledge on molecular orbital theory.

Semester	II
Title of Course	Chemical Energetics, Equilibria & Functional Organic Chemistry (DSC-1B)
Paper Code	DSC1BP (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (Gen) of Semester-II will acquire the practical knowledge about the Determination of heat capacity of calorimeter for different volumes, of enthalpy of neutralization of hydrochloric acid with sodium hydroxide,Study of the solubility of benzoic acid in water and determination of ΔH, Measurement of pH,Preparation of buffer solutions, preparation and Purification of organic compoundsby hands on practical

The labpaper (DSC1BP) of this course (DSC-1B) provides the student with-

CO 1. Design Surface tension experiment of a given sample.

CO 2. Experimenting the qualitative semimicro analysis in some selective samples.

Semester	III
Title of Course	Solutions, Phase equilibrium, Conductance, Electrochemistry& Functional Organic Chemistry(DSC-1C)
Paper Code	DSC1CT (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry(Gen) of Semester-IIIwill acquire the knowledge about the Solutions, Phase Equilibrium, Conductance, Electrochemistry, Carboxylic acids and their derivatives, Amines and Diazonium Salts,Diazonium salts, Amino Acids, Peptides and Proteins and Carbohydratesby studying this course.

The theory paper (DSC1CT) of this course (DSC-1C) provides the students with-

CO 1. Learn thermodynamic laws to explain chemical equilibrium.

CO 2. Know the activity and activity coefficient of various ionic species present in the solution.

CO 3. Learn the chemistry of aromatic hydrocarbon

CO 4. Create interest and thinking in the mechanisms of organic reactions.

Semester	III
Title of Course	Solutions, Phase equilibrium, Conductance, Electrochemistry& Functional Organic Chemistry(DSC-1C)
Paper Code	DSC1CP (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry(Gen) of Semester-III will acquire the practical knowledge about the Study of the equilibrium bydistribution methodby hands,Phase equilibria, Potentiometry, Conductance, Qualitative organic analysis of organic compounds possessingmonofunctional groupsby hands on practical experiments.

The lab paper (DSC1CP) of this course (DSC-1C) provides the students with-

CO 1. Classify of the compound through melting point survey.

CO 2. Experimenting the qualitative analysis in single solid organic compounds.

Semester	III
Title of Course	Basic analytical Chemistry (SEC-1)
Paper Code	SEC1T (Theory)
Credits	01
Hours	02 hours/week

The students of Chemistry (Gen) of Semester-IIIwill acquire the knowledge about theAnalytical Chemistry and its interdisciplinary nature, Conceptof sampling, Importance of accuracy, Analysis of soil, Analysis of water,Analysis of food products, Chromatography, Ion-exchange and Analysis of cosmetics by studying this course.

The theorypaper (SEC1T) of this course (SEC-1) provides the student with-

CO 1. Make scientific reports from chemical experiments and draw conclusions.

CO 2. Formulate the important factors on analytical experiments and results.

CO 3. Understand the theoretical principles of various separation techniques in chromatography.

Semester	IV
Title of Course	Basic analytical Chemistry (SEC-2)
Paper Code	SEC2P (Lab)
Credits	01
Hours	02 hours/week

The students of Chemistry (Gen) of Semester-IV will acquire the practical knowledge about the Determination of pH, acidity and alkalinity of a water sample, Paper chromatographic separation of mixture of metal ion, to compare paint samples by TLC method, Determination of constituents of talcum powder, Instrumental demonstrationsby

The lab paper (SEC2P) of this course (SEC-2) provides the student with-

CO 1. Test the metal present in a tablet by Spectrophotometric instrument.

CO 2. Investigate the acidity and alkalinity of a water sample by pH measurement.

Semester	IV
Title of Course	Coordination Chemistry, States of matter Chemical Kinetics(DSC-1D)
Paper Code	DSC1DT (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry(Gen) of Semester-IV will acquire the knowledge about the Transition Elements, Coordination Chemistry, Crystal Field Theory, Kinetic Theory of Gases, Liquids, Solids and Chemical Kineticsby studying this course.

The theorypaper (DSC1DT) of this course (DSC-1D) provides the student with-

CO 1. Explain the applications of emf measurements.

CO 2. Learn thermodynamic view on solutions containing ionic species.

CO 3. Identify various electrode processes.

CO 4. Know the atmosphere, hydrosphere and lithosphere.

Semester	IV
Title of Course	Coordination Chemistry, States of matter Chemical Kinetics (DSC-1D)
Paper Code	DSC1DP (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (Gen) of Semester-IV will acquire the practical knowledge about the Semi-micro qualitative analysis using H_2S of mixtures of the ionic species,Surface tension measurement, Viscosity measurement, Chemical Kinetics experiments by hands on practical experiments.

The labpaper (DSC1DP) of this course (DSC-1D) provides the student with-

CO 1. Construct a Potentiometric titration experiment.

CO 2. Interpret the result after completion of an experiment.

Semester	IV
Title of Course	Analytical Clinical Biochemistry(SEC-2)
Paper Code	SEC2T (Theory)
Credits	02
Hours	02 hours/week

The students of Chemistry (Gen) of Semester-IV will acquire the knowledge about the Carbohydrates, Proteins, Enzymes, Lipids, Hormone, Structure of DNA and RNA, Enzymes, Blood and Urineby studying this course.

The theorypaper (SEC2T) of this course (SEC-2) provides the student with-

CO 1. Explain the structure, properties and function of carbohydrates, lipids and proteins.

CO 2. Learn abouts the DNA and RNA structure.

Semester	IV
Title of Course	Analytical Clinical Biochemistry(SEC-2)
Paper Code	SEC2P (Lab)
Credits	01
Hours	02 hours/week

The students of Chemistry (Gen) of Semester-IV will acquire the knowledge about the Identification and estimation of Carbohydrates, Lipids, Proteins, nucleic acids and Isolation of proteinby studying this course.

The theorypaper (SEC2P) of this course (SEC-2) provides the student with-

CO 1. Predict the saponification number of compounds.

CO 2. Estimate the iodine number of Oil.

Semester	V
Title of Course	Polymer Chemistry (DSE-1A)
Paper Code	DSE1AT (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry(Gen) of Semester-V will acquire the knowledge about the theIntroduction and history of polymeric materials, Functionality and its importance, Kinetics of Polymerization, Crystallization and crystallinity, Nature and structure of polymers, Determination of molecular weight of polymers, Glass transition temperature (T_g) and determination of T_g, Polymer Solution,Properties of Polymer by studying this course

The theorypaper (DSE1AT) of this course (DSE-1A) provides the student with-

CO 1. Know of all aspects of polymer chemistry.

CO 2. Understand how polymers are characterized.

CO 3. Assess kinetics and mechanism of polymer.

CO 4. Know the structure and properties of polymers.

Semester	V
Title of Course	Polymer Chemistry (DSE-1A)
Paper Code	DSE1AP (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (Gen) of Semester-V will acquire the practical knowledge about the the Polymer synthesis (styrene (St) / Methyl Methacrylate (MMA) / Methyl Acrylate (MA) / Acrylic acid (AA), etc), Polymer characterization (molecular weight by viscometry, mechanical properties), Polymer analysis(Instrumental Technique, IR, DSC) by hands on practical experiments.

The labpaper (DSE1AP) of this course (DSE-1A) provides the student with-

CO 1. Construct a free radical solution polymerization reaction.

CO 2. Test the polymer quality by Instrumental Techniques.

Semester	V
Title of Course	Pharmaceutical Chemistry(SEC-3)
Paper Code	SEC3T (Theory)
Credits	01
Hours	01 hour/week

The students of Chemistry(Gen) of Semester-V will acquire the knowledge about theDrug discovery, design and development; basic Retrosynthetic approach. Synthesis of therepresentative drugs (analgesics agents, antipyretic agents, anti-inflammatory agents, antibiotics, etc),Aerobic and anaerobic fermentation ((i) Ethyl alcohol(ii)Antibiotics; Penicillin, (iii) Lysine,Glutamic acid, etc) following classes by studying this course.

The theorypaper (SEC3T) of this course (SEC-3) provides the student with-

CO 1. Learn about drug analysis and synthesis.

CO 2. Know the various green techniques for drug synthesis.

CO 3. Understand the pharmaceutical chemistry.

CO 4. Knowledge about antibiotic drugs.

Semester	V
Title of Course	Pharmaceutical Chemistry (SEC-3)
Paper Code	SEC3P (Lab)
Credits	01
Hours	02 hours/week

The students of Chemistry (Gen) of Semester-V will acquire the practical knowledge about hands -on preparation of Aspirin, magnesium bisilicate (Antacid) and its analysisby studying this course.

The labpaper (SEC3P) of this course (SEC-3) provides the student with-

CO 1. Design the preparation of drug and its analysis.

CO 2. Demonstrate the drug preparation procedure.

Semester	VI
Title of Course	Green Chemistry (DSE-1B)
Paper Code	DSE1BT (Theory)
Credits	04
Hours	04 hours/week

The students of Chemistry(Gen) of Semester-VI will acquire the knowledge about theIntroduction to Green Chemistry, Principles of Green Chemistry and Designing a Chemical synthesis, Examples of Green Synthesis/ Reactions and some real world cases, Future Trends in Green Chemistry by studying this course.

The theorypaper (DSE1BT) of this course (DSE-1B) provides the student with-

CO 1. Focus on the principles of green chemistry.

CO 2. Learn alternative solvent media for chemical process.

CO 3. Tell the future trends in green chemistry.

CO 4. Learn the synthesis of any type of organic compounds with green chemistry.

Semester	VI
Title of Course	Green Chemistry(DSE-1B)
Paper Code	DSE1BP (Lab)
Credits	02
Hours	04 hours/week

The students of Chemistry (Gen) of Semester-VI will acquire the practical knowledge about the Preparation and characterization of nanoparticles of gold using tea leaves Preparation of biodiesel from vegetable/ waste cooking oil ,Principle of atom economy, Use of enzymes as catalysts, Alternative Green solvents, Alternative sources of energy by hands on practical experiments.

The labpaper (DSE1BP) of this course (DSE-1B) provides the student with-

CO 1. Understand the Principle of atom economy.

CO 2. Sketch an experiment by Safer starting materials.

Semester	VI
Title of Course	Fuel Chemistry(SEC-4)
Paper Code	SEC4T (Theory)
Credits	02
Hours	02 hour/week

The students of Chemistry(Gen) of Semester-VI will acquire the knowledge about the Coal, Petroleum and PetrochemicalIndustry,Petrochemicals and Lubricantsby studying this course.

<u>The theory paper (SEC4T) of this course (SEC-4) provides the students with-</u>

CO 1. Interpret and distinguish between the different types of conventional and non-conventional fuels.

CO 2. Describe various parameters that are utilized to characterize fuels and its combustion process.