



DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin- 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) - 222550 (Prin.) / 223-668 (Off.)

Ref. No.

Date20

DEPARTMENT OF CHEMISTRY

PROGRAM SPECIFIC OUTCOMES (PSO) IN CHEMISTRY

The CBCS Course curriculum in the discipline of Chemistry is well designed and very promising. The core course would help to enrich the subject knowledge of the students and increase their confidence level in the field of both academia and industry. Generic electives make integration among various interdisciplinary courses to fulfil the vision and mission of designing the course. The introduction of Skill Enhancement Courses (SEC) would help to gain more powerful knowledge not only in their core Chemistry subject but also in interrelated multidisciplinary subjects both theoretically and practically. The inclusion of Discipline Specific Courses (DSE) has brought an opportunity in front of students to gain knowledge on various naturally and industrially important useful materials and also helps them to familiar and expert in handling different chemistry based software and programming language after proper training. In brief the student graduated with this type of curriculum would be able to disseminate subject knowledge along with necessary skills to suffice their capabilities for academia, entrepreneurship and industry.

PSO-1: Different Inorganic Chemistry topics such as periodic properties and quantum chemistry and related laboratory based experiment will enable students to build firm concept in the subject.

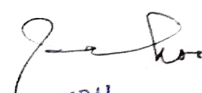
PSO-2: Different Physical Chemistry topic such as chemical kinetics, equilibrium, energy of various chemical systems and processes will enable students to build firm concept in the subject.

PSO-3: Physical Chemistry experiments related to measurement of conductance, pH, electromotive force, specific rotation will help to gain knowledge in various experimental techniques.

PSO-4: Students will be familiar with different experimental procedures such as analysis of salts and different titrations of unknown materials both qualitatively and quantitatively.

PSO-5: Students will get an insight in understanding the fundamental Organic Chemistry and its applications.

PSO-6: Students will learn the Chromatographic and Gravimetric separation technique of organic compounds.


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PSO-7: The concept of thermochemistry will be developed for different calorimetric measurement in laboratories.

PSO-8: Students will learn how to operate the UV-Visible spectrophotometer to measure absorbance and transmittance of light absorbing species.

PSO-9: Students will learn to synthesis new molecules by greener method of Organic and Inorganic Chemistry.

PSO-10: Students will gain the knowledge of applying Chemistry in polymer and Cement Industries.

PSO-11: Students will get a theoretical and practical knowledge on learning programming language such as FORTRAN and use of Microsoft Excel for data analysis and graph plotting.

PSO-12: Overall students will understand the multipurpose use of this program.

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COURSE OUTCOMES

HONOURS COURSE

SEM	CODE*	PAPER	BRIEF DESCRIPTION
1	CEMA-CC-1-1-TH	INORGANIC CHEMISTRY-1	Acid-base and redox reactions

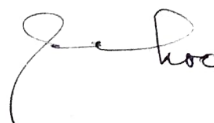
COURSE OUTCOME

- ❖ Learning scientific theory of atoms and its evolution, concept of wave function.
- ❖ Solving the conceptual questions using the knowledge gained by studying the quantum mechanical model of the atom, quantum numbers, electronic configuration, radial and angular distribution curves, shapes of s, p, d and f orbitals.
- ❖ The fundamentals of acid/base chemistry, including pH calculations, buffer behaviour, and acid/base titrations
- ❖ To identify the chemical species that function as acid and base and to identify conjugate acid-base pairs and understanding HSAB principle.
- ❖ Understanding the definition of oxidation, Reduction, Oxidant and reductant according to classical concept, electronic concept, oxidation number concept, balancing the redox reaction etc

SEM	CODE*	PAPER	BRIEF DESCRIPTION
1	CEMA-CC-1-1-TH	ORGANIC CHEMISTRY -1A	Basics of Organic Chemistry

COURSE OUTCOME

- ❖ Understand and explain the differential behavior of organic compounds based on fundamental concepts learnt.
- ❖ Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.
- ❖ Learn and identify many organic reaction mechanisms including free radical substitution, electrophilic addition and electrophilic aromatic substitution.


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SEM	CODE*	PAPER	BRIEF DESCRIPTION
1	CEMA-CC-1-1- P	PRACTICALS**	Acid-base and redox titration; separation of organic mixtures

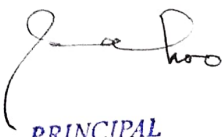
COURSE OUTCOME

- ❖ In the laboratory the student will first learn good laboratory practices and then get hands-on training on basic Analytical Chemistry techniques and methods.
- ❖ Description and use of common laboratory apparatus: Volumetric flasks, burettes, Pipettes, weighing bottles, different types of funnels, desiccators, drying ovens.
- ❖ Quantitative methods of analysis like volumetric methods of analysis (dichromatometry and permanganatometry)

SEM	CODE*	PAPER	BRIEF DESCRIPTION
1	CEMA-CC-1-2-TH	PHYSICAL CHEMISTRY-1	Kinetic theory, Chemical kinetics

COURSE OUTCOME

- ❖ Derive ideal gas law from kinetic theory of gases and explain why the real gases deviate from ideal behaviour.
- ❖ Explain Maxwell-Boltzmann distribution, critical constants and viscosity of gases.
- ❖ Learn about different equation of state of real gas.
- ❖ Learn about different types of intermolecular forces.
- ❖ Chemical kinetics: type of reactions, determination of rate, theories of reaction rate, steady state approximation.
- ❖ Catalyst – mechanism, acid base catalysis, enzyme catalysis.
- ❖ Understanding the basics of chemical kinetics: determination of order, molecularity, and determination of rate of opposing/parallel/chain reactions with suitable examples, application of steady state kinetics, Steady-state approximation.
- ❖ To be able to analyze various transport processes with understanding.
- ❖ Ability to understand the chemical and physical transport processes and their mechanism
- ❖ Ability to do mass and momentum transfer analysis


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SEM	CODE*	PAPER	BRIEF DESCRIPTION
1	CEMA-CC-1-2-TH	ORGANIC CHEMISTRY -1B	Stereochemistry, general treatment of reaction mechanism II

COURSE OUTCOME

- ❖ **Comprehend** and **Predict** the role of temperature, solvents, and catalysts in organic reactions.
- ❖ **Elucidate** reaction mechanisms using isotope effects
- ❖ **Identify** and **differentiate** prochirality and chirality at centers, axis, planes and helices and determine the absolute configuration
- ❖ **Evaluate** the stability of various conformers of acyclic and cyclic systems using steric, electronic and stereoelectronic effects and correlate them to reactivity.
- ❖ **Use** various models for determining stereoselectivity of various organic transformations

SEM	CODE*	PAPER	BRIEF DESCRIPTION
1	CEMA-CC-1-2-P	PRACTICALS	Experiments based on rate measurement and determination of boiling point of organic compounds

COURSE OUTCOME

- ❖ In the laboratory the student will first learn good laboratory practices and then get hands-on training on basic Physical Chemistry techniques and methods.
- ❖ Students will learn how to measure rate constant of a simple 1st order reaction.
- ❖ Students will learn how to measure viscosity of certain liquids and solutions such as glycerol and cane sugar.
- ❖ Students will learn to determine boiling points of certain liquids in organic chemistry.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
2	CEMA-CC-2-3-TH	ORGANIC CHEMISTRY -2	Stereochemistry, Reaction Mechanism
2	CEMA-CC-2-3-P	PRACTICALS	Organic preparations



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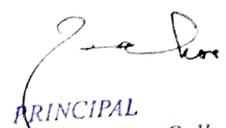
COURSE OUTCOME

- ❖ **Comprehend and Predict** the role of temperature, solvents, and catalysts in organic reactions.
- ❖ **Elucidate** reaction mechanisms using isotope effects
- ❖ **Identify and differentiate** prochirality and chirality at centers, axis, planes and helices and determine the absolute configuration
- ❖ **Evaluate** the stability of various conformers of acyclic and cyclic systems using steric, electronic and stereoelectronic effects and correlate them to reactivity.
- ❖ **Use** various models for determining stereoselectivity of various organic transformations

SEM	CODE*	PAPER	BRIEF DESCRIPTION
2	CEMA-CC-2-4-TH	INORGANIC CHEMISTRY-2	Chemical Bonding, Radioactivity, Iodo and Iodimetric titrations
2	CEMA-CC-2-4-P	PRACTICALS	

COURSE OUTCOME

- ❖ The bonding fundamentals for both ionic and covalent compounds, including electronegativity, bond angles, bond distances and bond energies using MO diagrams (homo- & hetero-nuclear diatomic molecules).
- ❖ How to predict the plausible structures and geometries of molecules using radius ratio rules, VSEPR theory in explaining structure and bonding.
- ❖ Students should be able to explain the band structure of solids and determine the electrical properties.
- ❖ Students should be able to explain selected crystal structures explain what kind of parameters that affect the crystal structure of a compound and perform calculations of the lattice enthalpy of ionic compounds.
- ❖ Concept of Hydrogen bonding and melting and boiling points.
- ❖ The fundamentals of nuclear decay.
- ❖ The properties of an atomic nucleus that make it unstable and undergo nuclear decay
- ❖ Understanding the concept of nuclear quantum number, magic numbers, fission, fusion and spallation.


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- ❖ How to use radio chemical methods for principles of determination of age of rocks and minerals, radio carbon dating, hazards of radiation and safety measures.
- ❖ Understanding the concept of separation and uses of isotopes.
- ❖ Understanding the methods of iodometry and iodimetry titrations and their difference.
- ❖ Analysis of the composition of brass, steel and cement.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
3	CEMA-CC-3-5-TH	PHYSICAL CHEMISTRY-2	Chemical Thermodynamics, Electrochemistry, Chemical and Ionic equilibrium, conductometric and potentiometric measurements
	CEMA-CC-3-5-P	PRACTICALS	

COURSE OUTCOME

- ❖ Laws of thermodynamics and concepts.
- ❖ Partial molar quantities and its attributes.
- ❖ Understanding the concept of system, variables, heat, work, and laws of thermodynamics.
- ❖ Understanding the concept of heat of reactions and use of equations in calculations of bond energy, enthalpy, etc.
- ❖ Understanding the concept of entropy; reversible, irreversible processes. Calculation of entropy using 3rd law of thermodynamics.
- ❖ Understanding the application of thermodynamics: Joule Thompson effects, partial molar quantities.
- ❖ Use the concepts learnt to predict feasibility of chemical reactions and to study the behaviour of reactions in equilibrium.
- ❖ Explain the factors that affect conductance, migration of ions and application of conductance measurement.
- ❖ Understand different types of galvanic cells, their Nernst equations, and measurement of EMF, calculations of thermodynamic properties and other parameters from the EMF measurements.
- ❖ Understand concept of pH and its effect on the various physical and chemical properties of the compounds.
- ❖ Know the modern theories defining ionic equilibria.
- ❖ Understand acid base equilibria involving weak acid and weak bases.
- ❖ Be familiar with Sorensen's pH scale and the importance of pH in pharmacy.


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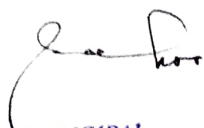
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❖ Accurately perform calculations related to pH of different solutions (e.g. buffers).

SEM	CODE	PAPER	BRIEF DESCRIPTION
3	CEMA-CC-3-6-TH	INORGANIC CHEMISTRY-3	Chemical periodicity, Chemistry of s and p Block Elements, Complexometric titration, Gravimetry
3	CEMA-CC-3-6-P	PRACTICALS	

COURSE OUTCOME

- ❖ To make student understand the modern periodic table and the periodic properties like atomic and ionic size, ionization energy, electron affinity, electronegativity.
- ❖ Making student understand Structure, bonding of s and p block materials and their oxides/compounds and their different chemical properties.
- ❖ Understanding the chemistry of boron compounds and their structures.
- ❖ Chemistry of oxoacids of nitrogen, phosphorus, sulphur and chlorine.
- ❖ Chemistry of noble gases and their compounds.
- ❖ Understanding chemistry of inorganic polymers, their structures and uses.
- ❖ Coordination compounds – its nomenclature, theories.
- ❖ The students should be able to describe various types of isomerism which can occur in coordination complexes.
- ❖ Various quantitative methods of analysis like Gravimetric Analysis, complexometric titration and volumetric methods of analysis
- ❖ Hard water and its hardness.
- ❖ Understand the underlying assumptions of the most common chromatographic separation techniques and approaches to method validation.
- ❖ Various quantitative methods of analysis like Gravimetric Analysis, complexometric titration and volumetric methods of analysis
- ❖ Hard water and its hardness. Understand the underlying assumptions of the most common chromatographic separation techniques and approaches to method validation.


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SEM	CODE*	PAPER	BRIEF DESCRIPTION
3	CEMA-CC-3-7-TH	ORGANIC CHEMISTRY -3	Alkenes, Alkynes, Carbonyls
3	CEMA-CC-3-7-P	PRACTICALS	Identification of pure organic compounds

COURSE OUTCOME

- ❖ To learn alkene and alkyne nomenclature
- ❖ To understand stereoisomerism
- ❖ To understand the key reaction that creates alkenes and alkynes.
- ❖ Student will learn reactivity and regioselectivity of alkene and alkyne and grow their knowledge about stereochemistry.
- ❖ To understand the reactivity of aromatic compounds.
- ❖ To understand different types and orientation of electrophilic aromatic substitution reaction and nucleophilic aromatic substitution reaction.
- ❖ Learn different nucleophilic attack reaction at the carbonyl carbon and the specific products formed in each case.
- ❖ Know the esterification reaction and hydrolysis of ester. Understand their reaction and importance in organic synthesis
- ❖ Learn about thermodynamic and kinetic product and their stability at different temperature.
- ❖ To understand the addition of organometallic reagent on carbonyl compounds.
- ❖ To understand the polarity reversal on carbonyl Compound
- ❖ Learn and identify many organic reaction mechanisms
- ❖ Learning safety procedure for dealing with organic chemicals
- ❖ Learn how to identify functional group in pure organic compound and their solubility
- ❖ Students will gain an understanding of the distinction between qualitative and quantitative chemical analysis and student will know about titration
- ❖ Students will learn how to use of graduated cylinders, graduated pipettes, and volumetric pipettes for volumetric measurement

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SEM	CODE*	PAPER	BRIEF DESCRIPTION
3	CEMA-SECA2 (SKILL ENHANCEMENT COURSE)	ANALYTICAL CLINICAL BIOCHEMISTRY	Carbohydrates, Enzymes, Lipids, Biochemistry of disease, Blood, Urine


COURSE OUTCOME

- ❖ Learn how the structure of biomolecules determines their reactivity and biological uses.
- ❖ Know basic principles of drug-receptor interaction and structure activity relationship (SAR).
- ❖ Know biochemistry of diseases.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
4	CEMA-CC-4-8-TH	ORGANIC CHEMISTRY - 4	Organic Synthesis, Spectroscopy
	CEMA-CC-4-8-P	PRACTICALS	Qualitative analysis of single, solid organic compounds

COURSE OUTCOME

- ❖ Students will understand the preparation of aliphatic and aromatic nitrogen compounds.
- ❖ Also the reaction with mechanism and important name reactions are learnt.
- ❖ Different types of rearrangement with mechanism are known.
- ❖ Stereochemical features of migratory group is known.
- ❖ Their applications in organic synthesis are studied.
- ❖ To learn the educant about the disconnection or synthon approach to organic synthesis by retro synthetic analysis
- ❖ Asymmetric synthesis is also learnt.
- ❖ Organic spectroscopy is used as a necessary tool to determine the structure of organic compounds.
- ❖ Students are skilled to solved the problems, think critically and analyse logically.


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SEM	CODE*	PAPER	BRIEF DESCRIPTION
4	CEMA-CC-4-9-TH	PHYSICAL CHEMISTRY- 3	Applications of Thermodynamics, Quantum Mechanics
4	CEMA-CC-4-9-P	PRACTICALS	Polarimetry, Phase diagram, pH measurement

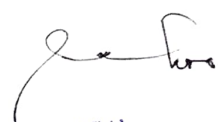
COURSE OUTCOME

- Phases, components, Gibbs phase rule, Phase diagrams and applications.
- Understanding phases, components, Gibb's phase rule and its applications, construction of phase diagram of different systems, the application of phase diagram.
- Know main aspects of the inadequacies of classical mechanics and understand historical development of quantum mechanics and ability to discuss and interpret experiments that reveal the dual nature of matter.
- Understand the theory of quantum measurements, wave packets and uncertainty principle.
- Understand the central concepts of quantum mechanics: wave functions, momentum and energy operator, the Schrodinger equation, time dependent and time independent cases, probability density and the normalization techniques.
- Solve Schrodinger equation in one and three dimension under different boundary conditions.
- Understanding basic parameters of crystalline solids, symmetry and crystal structures.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
4	CEMA-CC-4-10-TH	INORGANIC CHEMISTRY-4	Coordination Chemistry, d & f elements
4	CEMA-CC-4-10-P	PRACTICALS	Inorganic preparations

COURSE OUTCOME

- ❖ Understanding the concept of Crystal Field Theory and d-orbital splitting in tetrahedral, octahedral, square planar complexes.
- ❖ The students should be able to explain the spectro-chemical Series.


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- ❖ Understanding the transition metals stability in reactions, origin of colour and magnetic properties.
- ❖ Understanding the separation of Lanthanoids and Actinoids, its color, spectra and Magnetic behaviour.
- ❖ The students should be able to explain the terms stepwise stability constant and overall stability constant.
- ❖ The students should be able to give appropriate definitions of the terms inert and labile and state which d-electron configurations are associated with inertness.
- ❖ After completing the unit the student will be able to evaluate utility of UV-visible spectroscopy as a qualitative and quantitative method.
- ❖ To prepare the various complex salts.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
4	CEMA-SECB3 (SKILL ENHANCEMENT COURSE)	PHARMACEUTICALS CHEMISTRY	Drugs & Pharmaceuticals, Synthesis of the representative drugs, Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics

COURSE OUTCOME

- ❖ Describe different techniques of organic synthesis, mechanisms, their application to process chemistry and drug discovery.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
5	CEMA-CC-5-11-TH	PHYSICAL CHEMISTRY -4	Quantum Chemistry, Numerical analysis
5	CEMA-CC-5-11-P	PRACTICALS	FORTTRAN programming

COURSE OUTCOME



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- ❖ Account for the physical interpretation of partition functions and be able to calculate thermodynamic properties of model systems with using Boltzmann statistics.
- ❖ Account for the physical interpretation of distribution functions and discuss and show how these can be used in calculations of basic thermodynamic properties.
- ❖ Student will be able to describe dynamics of quantum harmonic oscillator and electron in H-atom.
- ❖ Student will be able to solve Schrodinger's wave equation for harmonic oscillator and electron in a hydrogen atom.
- ❖ Analyze the wavefunction of harmonic oscillator and electron in a hydrogen atom.
- ❖ Find the numerical differentiation by using the n-point method
- ❖ Find the numerical integration by using the trapezoidal rule
- ❖ Find the numerical integration by the Simpson's rules and find the numerical solution of a nonlinear system of equation by using the Newton-Raphson method

SEM	CODE*	PAPER	BRIEF DESCRIPTION
5	CEMA-CC-5-12-TH	ORGANIC CHEMISTRY -5	Cyclic Compounds, Bio-molecules
5	CEMA-CC-5-12-P	PRACTICALS	Chromatographic separations, spectroscopic analysis of organic compounds

COURSE OUTCOME

- ❖ At the end of the above course the student will be able to achieve the following skills -
- ❖ Students will be familiar with the chemistry of polynuclear hydrocarbon, heterocyclic compounds and their derivatives.
- ❖ They will learn the different methods of synthesis and various reactions of the compounds.
- ❖ In cyclic stereochemistry, conformational analysis including elimination and substitution reaction is learnt.
- ❖ Types of pericyclic reactions are studied.



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- ❖ The mechanism, stereochemistry and regioselectivity are also learnt.
- ❖ The students will learn the structure and function of carbohydrate.
- ❖ They will learn the preparation, properties and reactions of carbohydrates.
- ❖ The preparation, properties, and applications of amino acids, peptide and nucleic acids are studied in biomolecules.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
5	DSE-A2-TH	APPLICATIONS OF COMPUTERS IN CHEMISTRY	FORTAN AND EXCEL
5	DSE-A2-P	PRACTICALS	Microsoft Excel

COURSE OUTCOME

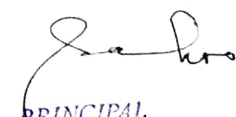
The aim of this paper is to make the students learn the working of computer and its applications in Chemistry via programming language, FORTRAN and use of software as a tool to understand chemistry, and solve chemistry based problems.

- ❖ Apply the basic operations of spreadsheet applications.
- ❖ Apply the FORTRAN computer programming language to write programs to solve the numerical and chemical problems.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
5	DSE-B1-TH	INORGANIC MATERIAL OF INDUSTRIAL IMPORTANCE	Silicate industries, Cements and fertilizer, Batteries
5	DSE-B1-P	PRACTICALS	Determination of acidity, calcium in fertilizers etc.

COURSE OUTCOME

- ❖ Learn the composition and applications of the different kinds of glass.
- ❖ Understand glazing of ceramics and the factors affecting their porosity.


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- ❖ Give the composition of cement and discuss the mechanism of setting of cement.
- ❖ Explain the suitability of fertilizers for different kinds of crops and soil.
- ❖ Explain the process of formulation of paints and the basic principle behind the protection offered by the surface coatings.
- ❖ Explain the principle, working and applications of different batteries.
- ❖ List and explain the properties of engineering materials for mechanical construction used in day today life.
- ❖ Explain the synthesis and properties of nano-dimensional materials, various semiconductor and superconductor oxides.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
6	CEMA-CC-6-13-TH	INORGANIC CHEMISTRY-5	Silicate industries, Cements and fertilizer, Batteries
6	CEMA-CC-6-13-P	PRACTICALS	Qualitative semi-micro analysis of mixtures

COURSE OUTCOME

- ❖ The aim of the course is the teaching and understanding of the basic principles of Bioinorganic chemistry – role of metal ions in biological system, its toxicity
- ❖ Know the function of metalloporphyrins of hemoglobin in oxygen binding by metal ions.
- ❖ Know the structure and function of metalloenzymes and metalloproteins.
- ❖ Evaluate applications of metal biomolecules as diagnostic agents.
- ❖ Know the applications of metal molecules in toxicology.
- ❖ The objective of the course is to appraise the students about the organometallic Chemistry.
- ❖ To learn about the 18 e rule and its violation.
- ❖ To identify the basic concept, terms, and important events in the development of organometallic chemistry.
- ❖ To develop an appreciation for the scope, diversity, and application of organometallic chemistry.



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- ❖ To learn about the common organometallic reactions and to be able to draw reasonable reaction mechanisms.
- ❖ By the end of the course student will be able to analyse unknown acid radical, basic radical and insoluble material. By the end of the course student will be able to analyse unknown acid radical, basic radical and insoluble material.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
6	CEMA-CC-6-14-TH	PHYSICAL CHEMISTRY -5	Molecular Spectroscopy, Photochemistry
6	CEMA-CC-6-14-P	PRACTICALS	Surface tension, spectrophotometry

COURSE OUTCOME

- ❖ Understand and use basic concepts of microwave, IR and UV-VIS spectroscopy for interpretation of spectra.
- ❖ Explain Lambert-Beer's law, quantum efficiency and photochemical processes.
- ❖ Learn about various theories of reaction rates and how these account for experimental observations.
- ❖ Explain the properties of liquids especially surface tension and viscosity
- ❖ Langmuir, Freundlich – adsorption isotherms, significance, multilayer adsorption –theory and significance.
- ❖ Colloids and their properties.
- ❖ Polarisation and the effect of temperature on polar and non-polar molecules.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
6	DSE-A3-TH	GREEN CHEMISTRY AND CHEMISTRY OF NATURAL PRODUCTS	What is Green Chemistry, Twelve principle of it, Example of green synthesis


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6	DSE-A3-P	PRACTICALS	Green synthesis
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COURSE OUTCOME

Students learn the basic principles of green and sustainable chemistry. They must be able to do and understand stoichiometric calculations and relate them to green process metrics. They learn alternative solvent media and energy sources for chemical processes. They learn about renewable feedstocks for the chemical industry, present and under development. They review the principles of catalysis, photochemistry and other interesting processes from the viewpoint of green chemistry. They perform laboratory experiments in which they apply some of the concepts previously learnt (stoichiometry, green metrics ...) and they put into practice some of the principles of green chemistry.

SEM	CODE*	PAPER	BRIEF DESCRIPTION
5	DSE-B3-TH	POLYMER CHEMISTRY	Introduction and history of polymeric materials, Determination of molecular weight, Thermodynamics and kinetics
5	DSE-B3-P	PRACTICALS	

COURSE OUTCOME

- ❖ Know about history of polymeric materials and their classification
- ❖ Learn about different mechanisms of polymerization and polymerization techniques
- ❖ Evaluate kinetic chain length of polymers based on their mechanism
- ❖ Differentiate between polymers and copolymers
- ❖ Learn about different methods of finding out average molecular weight of polymers
- ❖ Differentiate between glass transition temperature (T_g) and crystalline melting point (T_m)
- ❖ Determine T_g and T_m
- ❖ Know about solid and solution properties of polymers
- ❖ Learn properties and applications of various useful polymers in our daily life.


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COURSE OUTCOMES

GENERAL COURSE

SEM & COURSE CODE	Brief description of the Topic	COURSE OUTCOME
SEM 1 GE1/CC1 (THEORY)	Kinetic Theory of Gases and Real gases, Liquids, Chemical Kinetics, Atomic Structure, Chemical Periodicity Acids and bases, Fundamentals of Organic Chemistry, Stereochemistry, Nucleophilic Substitution and Elimination Reactions.	Students will get some knowledge on basic inorganic, organic and physical chemistry.
SEM 1 GE1/CC1 (PRACTICAL)	Volumetric Estimation	Students will acquire hand-on experience in doing titration based quantitative estimation of different types of chemical systems.
SEM 2 GE2/CC2 (THEORY)	Chemical Thermodynamics, Chemical Equilibrium, Solutions, Phase Equilibria, Solids, Aliphatic Hydrocarbons, Error Analysis and Computer Applications, Redox reactions	In this topic students will have knowledge and understanding in chemical thermodynamics, equilibrium, redox reactions and aliphatic hydrocarbons.
SEM 2 GE2/CC2 (PRACTICAL)	Basic Physical Chemistry Experiments	In this topic students will learn simple physical chemistry practical experiments based on viscosity, surface tension etc.
SEM 3 GE3/CC3 (THEORY)	Chemical Bonding and Molecular Structure Ionic Bonding Comparative study of p-block elements Transition Elements (3d series) Coordination Chemistry Electrochemistry, Aromatic hydrocarbons and Organometallic Compounds	The course outcome of this topic is to provide exclusive knowledge and understanding of bonding and molecular structure of simple inorganic molecules. They will also learn about electrochemistry, some organic functional molecule and co-ordination chemistry.



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SEM 3 GE3/CC3 (PRACTICAL)	Qualitative semi-micro analysis of mixtures containing two radicals. Emphasis should be given to the understanding of the chemistry of different reactions	Students will be developed with knowledge of carrying out of qualitative semi-micro analysis of acid and basic radicals.
SEM 4 GE4/CC4 (THEORY)	Alcohols, Phenols and Ethers Carbonyl Compounds Carboxylic Acids and Their Derivatives Amines and Diazonium Salts Amino Acids and Carbohydrates Crystal Field Theory Quantum Chemistry and Spectroscopy	The students will understand properties and reactions of different organic molecule having different functional group attached. Students will also get knowledge of crystal field theory, quantum chemistry and spectroscopy.
SEM 4 GE4/CC4 (PRACTICAL)	Qualitative Analysis of Single Solid Organic Compound(s) Identification of a pure organic compound	Students will learn to do qualitative analysis of single solid organic and will be able to identify a pure organic compound according to their functional group detection.
SEM 5 DSEA-2 (Theory & Practical)	Inorganic materials of industrial importance, Silicate industries, Cements and fertilizer, Batteries Determination of acidity, calcium in fertilizers etc.	Students will get an exclusive knowledge on inorganic materials of industrial importance like glass, ceramics, cements etc.
SEM 6 DSE B-2 (Theory & Practical)	Analytical methods in Chemistry, Basic principles of quantitative analysis, Thermal methods of analysis, Electroanalytical methods, Separation techniques	Students will get knowledge of different analytical technique for separation such as chromatography and solvent extractions, will be able to analyse soil, ion exchange and spectrophotometry.
SEM 5 SEC-A2	Analytical Clinical Biochemistry	In this section students will learn about structures and function of biological molecule like carbohydrates, proteins, enzymes, lipids etc.
SEM 6 SEC-B3	Pharmaceutical Chemistry	Students will gain advance theoretical knowledge on drug synthesis and pharmaceutical chemistry



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Mapping between CO and PSO for Honours Course

CO of	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CC-1	✓			✓								✓
CC-2		✓	✓					✓				✓
CC-3					✓							✓
CC-4	✓			✓								✓
CC-5	✓	✓	✓				✓	✓				✓
CC-6	✓			✓					✓	✓		✓
CC-7				✓	✓	✓			✓	✓		✓
CC-8					✓	✓			✓	✓		✓
CC-9	✓	✓	✓				✓	✓				✓
CC-10	✓			✓				✓	✓	✓		✓
CC-11	✓	✓	✓				✓	✓				✓
CC-12					✓	✓			✓	✓		✓
CC-13	✓			✓				✓	✓	✓		✓
CC-14	✓	✓	✓				✓	✓				✓
SEC-A2			✓								✓	✓
DSE-A2										✓		✓
DSE-B1									✓	✓		✓
SEC-B3												✓
DSE-A3				✓						✓		✓
DSE-B3												✓

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Mapping between CO and PSO for General Course

CO of	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
GE-1/ CC-1	√			√								√
GE-2/ CC-2		√	√					√				√
GE-3/ CC-3					√							√
GE-4/ CC-4				√		√				√		√
SEC-A2				√					√			√
SEC-B2					√				√			√
DSE-A2										√		√
DSE-B2			√									√

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