

## DEPARTMENT OF ORGANIC CHEMISTRY

### **COURSE OUTCOMES**

#### **SEMESTER - I**

#### **GENERAL CHEMISTRY - I**

<b>CO#</b>	<b>Course Outcome</b>
<b>CO1</b>	To learn about basic fundamentals of Quantum Chemistry and Molecular Spectroscopy.
<b>CO2</b>	To learn about wave mechanics of simple systems with contact potential energy, particle in one dimensional box.
<b>CO3</b>	To learn about concepts of microwave and IR_spectroscopy.
<b>CO4</b>	To learn about Raman spectroscopy and electronic spectra of diatomic molecules.

#### **INORGANIC CHEMISTRY - I**

<b>CO#</b>	<b>Course Outcome</b>
<b>CO1</b>	Acquire the knowledge on VSEPR, Valence bond and molecular orbital theories in explaining the structure of simple molecules.
<b>CO2</b>	Acquire the knowledge on preparation, structure and mechanisms of boranes, carboranes, metallo carboranes and cage compounds.
<b>CO3</b>	To learn about crystal field theory, crystal field splitting pattern in different geometries and calculation of crystal field stabilization energy.
<b>CO4</b>	Acquire the knowledge on how to draw Orgel and Tanabe_Sugano diagrams for metal complexes.

#### **INORGANIC CHEMISTRY PRACTICALS**

<b>CO#</b>	<b>Course Outcome</b>
<b>CO1</b>	To Synthesis the inorganic complexes like (i) Tetraamminecopper(II) sulphate (ii) Potassium tris-oxalato ferrate(III) trihydrate (iii) Tris-thiourea copper(I) sulphate.
<b>CO2</b>	Hands on experience on Semi micro qualitative analysis of six radical mixtures Anions: $\text{CO}_3^{2-}$ , $\text{S}^{2-}$ , $\text{SO}_3^{2-}$ , $\text{Cl}^-$ , $\text{Br}^-$ , $\text{I}^-$ , $\text{NO}_3^-$ , $\text{SO}_4^{2-}$ , $\text{CH}_3\text{COO}^-$ , $\text{C}_2\text{O}_4^{2-}$ , $\text{C}_4\text{H}_4\text{O}_6^{2-}$ , $\text{PO}_4^{3-}$ , $\text{CrO}_4^{2-}$ , $\text{AsO}_4^{3-}$ , $\text{F}^-$ , $\text{BO}_3^{3-}$ Cations : Ammonium ( $\text{NH}_4^+$ ) 1st group: Hg, Ag, Pb, Tl, W 2nd group: Hg, Pb, Bi, Cu, Cd, As, Sb, Sn, Mo 3rd group: Fe, Al, Cr, Ce, Th, Ti, Zr, V, U, Be 4th group: Zn, Mn, Co, Ni 5th group: Ca, Ba, Sr 6th group: Mg, K, Li

## ORGANIC CHEMISTRY

CO#	Course Outcome
CO1	Acquire the knowledge on Nature of bonding in organic molecules and Aromaticity.
CO2	To understand the Stereo Chemistry & Molecular representation of organic molecules.
CO3	Acquire the knowledge of Heterocyclic compounds.
CO4	To learn about Chemistry of some typical natural products (Alkaloids and Terpenoids).

## ORGANIC CHEMISTRY PRACTICALS

CO#	Course Outcome
CO1	Hands on experience on Preparation, recrystallization, and determination of melting point & yield of the following compounds: (i) Aspirin, (ii) Nerolin, (iii) Chalcone, (iv) p-Nitro acetanilide, (v) 2,4,6- Tribromoaniline, (vi) m-Dinitrobenzene, (vii) Phthalimide, (viii) Diels-Alder adduct.

## PHYSICAL CHEMISTRY - I

CO#	Course Outcome
CO1	Acquire knowledge on Thermodynamics.
CO2	Acquire knowledge on Micelles and Macro molecules.
CO3	Acquire knowledge on Chemical Kinetics.
CO4	Acquire knowledge on Photochemistry.

## PHYSICAL CHEMISTRY PRACTICALS

CO#	Course Outcome
CO1	Acquire practical knowledge on Determination of critical solution temperature of phenol-water system.
CO2	Acquire practical knowledge on Effect of added electrolyte on the CST of phenol-

	water system.
<b>C03</b>	Acquire practical knowledge on Conductometric titration of Strong acid versus Strongbase.
<b>C04</b>	Acquire practical knowledge on Dissociation constant of weak acid (CH <sub>3</sub> COOH) by conductometric method.
<b>C05</b>	Acquire practical knowledge on Conductometric titration of Weak acid vs Strong base.
<b>C06</b>	Acquire practical knowledge on Determination of cell constant.
<b>C07</b>	Acquire practical knowledge on Adsorption of acetic acid on animal charcoal or silicagel.
<b>C08</b>	Acquire practical knowledge on Acid-catalyzed hydrolysis of methyl acetate.
<b>C09</b>	Acquire practical knowledge on Determination of partial molar volume of solute – H <sub>2</sub> O system by apparent molar volume method.

## SEMESTER – II

### GENERAL CHEMISTRY – II

CO#	Course Outcome
<b>C01</b>	To learn about basic fundamental concepts of Quantum chemistry.
<b>C02</b>	Acquire the knowledge on symmetry element, symmetry operation and pointgroups.
<b>C03</b>	To learn about accuracy and precision in doing experiments, understands the different errors and methods for minimizing errors.
<b>C04</b>	To learn about introduction to computer programming_FORTRAN.
<b>C05</b>	
<b>C06</b>	

### INORGANIC CHEMISTRY – II

CO#	Course Outcome
<b>C01</b>	To learn about classification of clusters and different structural pattern of metal clusters.
<b>C02</b>	Acquired knowledge on 16&18 electron rule ,bonding modes of CO,NO.
<b>C03</b>	Acquire the knowledge on how to determine stability constant of particular complex through spectrophotometric and pH_metric method.
<b>C04</b>	To learn about different types of electron transfer reaction and factors affecting them.

## INORGANIC CHEMISTRY PRACTICALS

CO#	Course Outcome
C01	To understand Volumetric Determination of Ferric iron by photochemical reduction.
C02	To understand Volumetric Determination of Nickel by EDTA.
C03	To understand Volumetric Determination of Calcium and Magnesium in a mixture by EDTA.
C04	To understand Volumetric Determination of Ferrocyanide by Ceric sulphate.
C05	To understand Volumetric Determination of Copper(II) in presence of iron(III).
C06	To understand Gravimetric Determination of Zinc as Zinc pyrophosphate.
C07	To understand Gravimetric Determination of Nickel from a mixture of Copper and Nickel.

## ORGANIC CHEMISTRY - II

CO#	Course Outcome
C01	Acquire knowledge on Aliphatic Nucleophilic Substitution, Nucleophilic Aromatic substitution and Elimination Reactions.
C02	To understand Addition to Carbon – Carbon Multiple Bonds Reactions, Addition to Carbon– Hetero Multiple Bonds Reactions.
C03	To understand Types of molecular rearrangements, migratory aptitude.
C04	Acquire Basic principles and importance of UV, IR, NMR and Mass, Protection of carbonyl, Hydroxyl, carboxylic and Amine groups.

## ORGANIC CHEMISTRY PRACTICALS

CO#	Course Outcome
C01	To understand Systematic qualitative analysis of an organic mixture containing two compounds Identification of method of separation and the functional group(s) present in each of them and preparation of one solid derivative for the confirmation of each of the functional group(s).

## PHYSICAL CHEMISTRY – II

CO#	Course Outcome
C01	To understand Physical methods of molecular structural elucidation.
C02	Acquire knowledge on Thermodynamics part –II and Statistical Thermodynamics.
C03	Acquire knowledge on Electrochemistry part-I.
C04	Acquire knowledge on Electrochemistry part –II.

## PHYSICAL CHEMISTRY PRACTICALS

CO#	Course Outcome
C01	Acquire knowledge on Distribution of iodine between $\text{CHCl}_3$ and water.
C02	Acquire knowledge on Distribution of $\text{I}_2$ between $\text{CHCl}_3$ and aq.KI solution- calculation of equilibrium constant.
C03	Acquire knowledge on Determination of Coordination number of cuprammonium cation.
C04	Acquire knowledge on Titration of $\text{Fe}^{+2}$ Vs $\text{K}_2\text{Cr}_2\text{O}_7^-$ potentiometry
C05	Acquire knowledge on Titration of mixture Strong acid and weak acid versus Strong base by conductometry.
C06	Acquire knowledge on Titration of Strong acid Vs Strong Base – pH – metry.
C07	Acquire knowledge on Titration of mixture of ( $\text{NaHCO}_3 + \text{Na}_2\text{CO}_3$ ) Vs $\text{HCl}$ –pH- metry.
C08	Acquire knowledge on Titration of Strong acid Vs Strong Base using Quinhydrone electrode.
C09	Acquire knowledge on Verification of Beer-Lambert's law by Iron-thiocyanate system –colorimetry.
C010	Acquire knowledge on Determination of single electrode potential of $\text{Cu}^{2+}/\text{Cu}$ and estimate the given unknown concentration.

## SEMESTER – III

### ORGANIC REACTION MECHANISMS – I & PERICYCLIC REACTIONS

CO#	Course Outcome
CO1	To deep learning of Aliphatic Nucleophilic substitution and Aliphatic Electrophilic Substitution reactions.
CO2	To understand Principles of asymmetric synthesis.
CO3	Acquire knowledge on Molecular orbital symmetry, frontier orbitals of some compounds, classification of pericyclic reactions and Electrocyclic reactions.
CO4	To understand FMO, PMO approach for the explanation of sigma tropic rearrangements under thermal and photochemical conditions, sigmatropic rearrangements, sigmatropic rearrangements.

### ORGANIC SPECTROSCOPY – I

CO#	Course Outcome
CO1	To understand UV-Visible spectroscopy and it's applications.
CO2	To understand Infrared spectroscopy and it's applications.
CO3	To understand Nuclear Magnetic Resonance Spectroscopy ( $^1\text{H}$ NMR & $^{13}\text{C}$ NMR) and it's applications.
CO4	To understand Mass spectrometry and it's applications.

### MODERN ORGANIC SYNTHESIS – I

CO#	Course Outcome
CO1	Acquire knowledge on Formation of C-C single bonds.
CO2	Acquire knowledge on Formation of Carbon-Carbon double bonds.
CO3	Acquire knowledge on Reactions of unactivated C-H bonds and organoboranes.
CO4	Acquire knowledge on Protecting groups and simple applications of microwave and ultrasound assisted reactions.

## MODERN ORGANIC SYNTHESIS - I

CO#	Course Outcome
C01	Acquire knowledge on Introduction, isolation, general methods of structure elucidation and physiological action, degradation, classification based on nitrogen heterocyclic ring, structure, stereochemistry, synthesis and biosynthesis of Alkaloids.
C02	Acquire knowledge on Occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, biosynthesis and synthesis of Terpenoids.
C03	Acquire knowledge on Occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, biosynthesis and synthesis of Steroids.
C04	Acquire knowledge on Occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, biosynthesis and synthesis of Flavonoids and Isoflavonoids.

## SEMESTER - IV

### ORGANIC REACTION MECHANISMS - II AND ORGANIC PHOTO CHEMISTRY

CO#	Course Outcome
C01	Acquire knowledge on Free Radical Reactions, Quantitative relationships between Molecular structure and Chemical reactivity and Rearrangements.
C02	To understand knowledge on Methodologies in asymmetric synthesis.
C03	Acquire knowledge on Photochemical energy, Frank Condon Principle, Types of Electronic Excitation and Molecular orbital view of excitation, Jablonski Diagram, singlet and triplet states, dissipation of photochemical energy, photosensitization, quenching, quantum efficiency and quantum yield, Determination of Quantum yield and Photo Chemistry of Carbonyl Compounds.
C04	Acquire knowledge on different types of photo chemical rearrangement reactions.

## ORGANIC SPECTROSCOPY - II

CO#	Course Outcome
C01	Acquire knowledge on Optical Rotatory Dispersion and The octant rule-application in structural studies- $\alpha$ - halo keto rule.
C02	To understand Improving the PMR spectrum, Simplification of complex spectra, 2D NMR spectroscopy.
C03	To understand how to deduce the structure of unknown compound by using following spectral data (UV, IR, NMR ( $^1\text{H}$ & $^{13}\text{C}$ ) and mass spectrometry).
C04	To understand Separation Techniques and Instrumental Techniques (GC, HPLC, XRD).

## MODERN ORGANIC SYNTHESIS - II

CO#	Course Outcome
C01	Acquire knowledge on Organo Silanes and its Synthetic applications.
C02	To understand properties and Synthetic applications of the oxidizing reagents in the oxidation of functional groups like alkenes, alkynes, alcohols, aldehydes and ketones.
C03	To understand different types of Catalytic reductions, properties and Synthetic applications of the Reducing reagents in the reduction of functional groups.
C04	Acquire knowledge on Retro Synthetic Analysis.

## BIO - ORGANIC SYNTHESIS - II

CO#	Course Outcome
C01	Acquire knowledge on Biopolymers and Enzymes.
C02	Acquire knowledge on Antimalarials & Antibiotics.
C03	Acquire knowledge on Vitamins and Prostaglandins.
C04	Acquire knowledge on Nucleic Acids.