

COURSE OUTCOME

UNDERGRADUATE CHEMISTRY HONOURS (FYUGP)

NAME OF THE PROGRAMME: B.Sc

YEAR OF INTRODUCTION: 2023

COURSE OUTCOME		
COURSE	COURSE NAME	COURSE OUTCOME
SEMESTER – 1 MAJOR-1 [Organic Chemistry-1] (FM 40)	Unit 1: Basics of Organic Chemistry	Students come to know fundamental features relating to organic chemistry. In this section, they understand basic matters that govern stability of molecules. In addition reaction intermediates, varieties of reagents and reaction mechanism are taught comprehensively.
	Unit 2: Chemistry of Hydrocarbons	Students learn style of functioning of basic skeleton of hydrocarbon family. They can differentiate paraffinic mode of alkane and reactive nature of alkene and alkyne. Here they also learn analogy between alkane and cyclo alkane.
	Unit 3: Aromatic hydrocarbon	This unit describes special features of a class of compounds having intriguing characteristics feature of aromaticity. Students learn distinct reactions associated with this hydrocarbon family.
SEMESTER – 1 MAJOR-1 PRACTICAL (FM 20)	Experiment based on Purification of Organic compounds, Mixed melting point, detection of boiling points and Chromatographic identification of amino acids, sugars are set	Students learn <ol style="list-style-type: none"> 1. Detection of melting point and boiling points of Organic compounds. 2. Impact of impurity on pure compounds. 3. Purification of compounds by recrystallization. Analysis of compounds when present in trace amount.
SEMESTER – 2 MAJOR-2 [INORGANIC]	UNIT 1: Atomic Structure	Student will get a good amount of knowledge about: Fine structure of atom, different quantum numbers, shapes of orbitals, wave function, wave equation, probability distribution of electron, filling

CHEMISTRY-I] (FM 40)		of electrons in different orbitals of an atom.
	UNIT 2: Periodicity Of Elements	Student will acquire the knowledge in this Unit: Idea about different block elements (s, p, d & f), Different atomic features and properties e.g. atomic/ionic/ covalent radii, electronegativity, electron affinity, screening effect, effective nuclear charge and their calculations.
	UNIT 3: Chemical Bonding	Student will get the knowledge about: Different types chemical bonds present in compounds, the suitable covalent structure, Molecular orbital diagrams, crystal packing, Lattice energy & its calculation, idea of polarization & its application, Polarity of chemical bond, dipole moment & its calculation, idea of hydrogen bonding and its application. Metallic bonding and band theory, semiconductor.
SEMESTER – 2 MAJOR-2 PRACTICAL	Qualitative analysis of water soluble mixtures	The students will learn about: •Qualitative analysis •Identification of metal ions and anions from mixture through systematic analysis
SEMESTER – 3 MAJOR-3 ORGANIC CHEMISTRY-II (FM 40)	Unit 1: Stereochemistry	In this unit students learn orientation of molecules in three dimensional space. In this unit concept of chirality is explicitly taught.
	Unit 2: Cycloalkanes and conformational analysis	Students learn origin of strain in cyclic system, conformational analysis help study of different conformers.
	Unit 3: Dynamic stereochemistry	Students learn stereochemical changes within reactions.
	Unit 4: Chemistry of Halogenated Hydrocarbons	Students learn different types of nucleophilic substitution reactions, impact of different parameters on these reactions. Chemistry of vinyl halides, allyl halides and aryl halides are intensely covered.
SEMESTER – 3 MAJOR-3 PRACTICAL	Experiment related to identification of functional groups and several organic synthesis are covered.	Students identify presence of functional groups by authentic chemical tests. Along with conventional methods of synthesis students are exposed to green methods of synthesis. Students carry out different hands on experiments like Acetylation and Benzoylation of phenols and amines, Bromination and Nitration of acetanilide. Some classic synthesis like Aldol condensation, Benzilic acid rearrangements are also practiced
SEMESTER – 3 MAJOR-4	Unit 1: Chemical bonding	Students can find ionic character in covalent bonds. They get idea about different chemical forces.

[INORGANIC CHEMISTRY - II] (FM 40)	Unit 2: General principles of Metallurgy	Students will get the knowledge about: <ul style="list-style-type: none"> •Standard electrode potentials and its application, •reduction of metal oxides by carbon and carbon monoxide-Ellingham diagram, •purification of metal- different processes
	Unit 3: Acids and Bases	<ul style="list-style-type: none"> • acid-base theory, relative strength, types of acid-base reactions • solvent role in acid-base reactions • soft and hard acid-base concept
	UNIT 4: Oxidation - Reduction	Student will acquire the knowledge about: Redox reactions, standard electrode potentials and its application
SEMESTER – 2 MAJOR-4 PRACTICAL	Qualitative Inorganic analysis of mixtures	The students will learn about: <ul style="list-style-type: none"> •Qualitative analysis •Identification of metal ions and anions from mixture through systematic analysis
SEMESTER – 3 MAJOR-5 [Physical Chemistry-I] (FM 40)	Unit 1: Gaseous state	Students will learn Kinetic molecular model of a gas, Maxwell distribution and its use in evaluating molecular velocities and behavior of real gases.
	Unit 2: Liquid state	Students will acquire knowledge in the structure and properties of liquid.
	Unit 3: Solid state	Students will learn the laws of crystallography, lattice structure of crystalline solids. They become acquainted with the basic theory of X-ray crystallography.
SEMESTER – 3 MAJOR-5 PRACTICAL (FM 20)	Experiment based on surface tension and viscosity	Students learn how to determine 1. Density of an unknown liquid 2. Viscosity coefficient of an unknown solution. 3. Surface tension of an unknown solution.
SEMESTER – 4 MAJOR-6 [Organic Chemistry-I] (FM 40)	Unit I: Alcohols, Phenols, Ethers and Epoxides	Students acquire knowledge of different types of alcohols regarding preparation, properties and chemical reactivities etc. Transition of properties from alcohol to phenol is also taught along with some specific name reactions. Students also gain knowledge of ethers and epoxides.
	Unit 2: Carbonyl Compounds.	Students comprehensively cover the reactivity of carbonyl compounds. Students come across a plenty of name reactions and varieties of reagents sensitive to carbonyl compounds.

	Unit 3: Carboxylic Acids and their derivatives	Students learn characteristics of monocarboxylic acids, dicarboxylic acids, hydroxy acids and unsaturated acids like maleic acid and fumaric acid.
SEMESTER – 3 MAJOR-6 PRACTICAL (FM 20)	Qualitative Organic analysis and Experiment related to identification of functional groups and several organic synthesis.	Students identify presence of functional groups by authentic chemical tests. Along with conventional methods of synthesis students are exposed to green methods of synthesis. Students carry out different hands on experiments like Acetylation and Benzoylation of phenols and amines, Bromination and Nitration of acetanilide. Some classic synthesis like Aldol condensation, Benzilic acid rearrangements are also practiced.
SEMESTER – 4 MAJOR-7 [Inorganic Chemistry-I] (FM 40)	UNIT 1: Chemistry of s and p block elements	Student will acquire the knowledge in this Unit: Idea about different block elements (s, p), Different atomic features and properties e.g. atomic/ionic/ covalent radii, electronegativity, electron affinity, screening effect, effective nuclear charge and their calculations.
	Unit 2: Noble Gases	<ul style="list-style-type: none"> • Inertness of noble gases • preparation, properties of noble gas compounds and their structure and bonding
	Unit 3: Inorganic Polymers	<ul style="list-style-type: none"> • Types of inorganic polymers and comparison with other type of polymers • some important inorganic polymers: their preparation, properties and structures
SEMESTER – 4 MAJOR-7 PRACTICAL (FM 20)	Qualitative Inorganic analysis of mixture	The students will learn about: <ul style="list-style-type: none"> • Qualitative semimicro analysis • Identification of metal ions and anions from mixture through systematic analysis
SEMESTER – 4 MAJOR-8 [Physical Chemistry-I]	Unit 1: Chemical Thermodynamics	Students will get the updated ideas of Thermodynamics

(FM 40)	Unit 2: Systems of Variable Composition	Students learn how thermodynamic parameters change with composition.
	Unit 3: Solutions and Colligative Properties	Students will be able to perform calculations and discuss the concepts of the 4 colligative properties: lowering of vapor pressure, elevation boiling point, depression freezing point, and osmotic pressure.
SEMESTER – 4 MAJOR-8 PRACTICAL (FM 20)	Experiment based on thermochemical properties are set	Students learn how to determine <ol style="list-style-type: none"> 1. heat capacity of the calorimeter 2. enthalpy of hydration 3. the enthalpy of ionization of ethanoic acid. 4. heat capacity of the calorimeter and integral enthalpy of solution of salts.
SEMESTER – 5 MAJOR-9 ORGANIC CHEMISTRY-II (FM 40)	Unit 1: Nitrogen Containing Functional groups	Students learn characteristics of amines and can also distinguish 1 ^o , 2 ^o and 3 ^o amines using Hinsberg reagents. Basicity of amines in gaseous phase and solvent are discussed. Apart from this many classic name reaction under this section are covered in details.
	Unit 2: Heterocyclic compounds	In this unit students learn many features of five and six membered heterocyclic compounds like their synthesis, reactions etc. Even in this section structure elucidation part is given special attention. This unit also make many classic name reaction in front.
	Unit 3: Amino acids	Students acquire knowledge on amino acids, peptides which includes their synthesis and several characteristic features. Determination C-end and N-end of peptides are highlighted
	Unit 4: Concept of Nucleic acid	Structure and role of DNA, RNA are known by students.

SEMESTER – 5 MAJOR-9 PRACTICAL (FM 20)	Experiments based on Detection of Extra elements, functional group and qualitative analysis of organic compounds.	By hands on experiments students identify special elements present in a compound both by conventional and green methods. Nitrogenous functional groups are also being detected. They come to know systematic approach of analysing organic compounds.
SEMESTER – 5 MAJOR-10 INORGANIC CHEMISTRY-II (FM 40)	Unit 1: Coordination Chemistry	The students will acquire the knowledge about: <ul style="list-style-type: none"> • IUPAC nomenclature, isomerism for coordination complexes • bonding nature in coordination complexes; • Crystal field splitting in different geometrical environments: stabilization energy, its calculation • Qualitative idea about ligand field theory and Molecular orbital theory.
	Unit 2: Transition Elements	<ul style="list-style-type: none"> • General group trends for different physical properties • Comparison between the different d-series
	Unit 3: Lantanoids and Actinoides	<ul style="list-style-type: none"> • Colour and spectral properties of series elements • magnetic properties of metal and its calculation
SEMESTER – 5 MAJOR-10 PRACTICAL (FM 20)	Experiments in Laboratory: * Titrimetric analysis * Acid-base titration * Redox titration	Students will acquire the knowledge about: <ul style="list-style-type: none"> • different types of apparatus used for quantitative analysis, their calibration and use • Strength of solutions and its preparation • Idea of different indicators used • Estimation of components in the mixture of acids or bases • Idea of redox reaction, equivalent weight and its calculation • Estimation of metal ions by redox titrimetric method
SEMESTER – 5 MAJOR-11 PHYSICAL CHEMISTRY-II (FM 40)	Unit 1: Ionic equilibria	Students will acquire concept of electrolyte, pH, buffer, solubility and solubility product. Also they will learn what is indicator and what is its range.
	Unit 2: Chemical Equilibrium	Students learn how to determine if a system is at equilibrium and if not which direction the reaction will shift to achieve equilibrium. Also they learn how to calculate the concentration of all species at equilibrium.

	Unit 3: Phase Equilibria:	Students enriched with the importance of Phase Diagrams Also they acquire knowledge about phase, component and degrees of freedom in different systems
SEMESTER – 5 MAJOR-11 PRACTICAL (FM 20)	pH –metric titration	Students will learn measurement of pH in varieties of solution and its implication in life.
SEMESTER – 5 MAJOR-12 PHYSICAL CHEMISTRY-II (FM 40)	Unit 1: Chemical kinetics	Students learn how to determine rate law of chemical change based on experimental data. Also they acquire the concept of an activation energy in the context of the transition state
	Unit 2: Catalysis	Students gain the knowledge of catalyst characteristics, various catalytic reaction mechanisms.
	Unit 3: Surface chemistry	Students enriched with the idea of interfacial phenomenon like adsorption
	Unit 4: Colloids	Students will be able to understand <ul style="list-style-type: none"> the colloidal system, Classification of colloidal systems preparation and purification techniques of colloidal solution kinetic and optical properties of colloids electrical properties of colloids - electric double layer and zeta potential
SEMESTER – 5 MAJOR-12 PRACTICAL (FM 20)	Experiment based on chemical kinetics and adsorption are set	Students learn how to <ul style="list-style-type: none"> study the kinetics of acid hydrolysis of methyl acetate with hydrochloric acid, Saponification of ethyl acetate verify the Freundlich and Langmuir isotherms for adsorption of acetic acid on activated charcoal.