

UNDERGRADUATE PROGRAMME: COURSE OUTCOME

Name of the Programme: B.Sc. Chemistry

Name of the Class	Course Code	Course Title	Course Outcomes	
SEMESTER I				
F.Y.B.Sc.	CH-101	Physical Chemistry	CO1	Students will be able to apply thermodynamic principles to physical and chemical process
			CO2	To calculate of enthalpy , Bond energy, Bond dissociation energy , resonance energy
			CO3	To understand the relation between Free energy and equilibrium and factors affecting on equilibrium constant.
			CO4	To understand the concept to ionization process occurred in acids, bases and pH scale
			CO5	Gas equilibrium, equilibrium constant and molecular interpretation of equilibrium constant
F.Y.B.Sc.	CH-102	Organic Chemistry	CO1	The students will understand the fundamentals, principles, and recent developments in the subject area.
			CO2	It will inspire and boost interest of the students towards chemistry as the main subject..
			CO3	The Learner will familiarize with current and recent developments in Chemistry.
			CO4	It will create foundation for research and development in Chemistry.
F.Y.B.Sc.	CH-103	Chemistry Practical Course I	CO1	The students will understand the importance of chemical safety and Lab safety while performing experiments in laboratory
			CO2	The students will understand to determine thermochemical parameters and related concepts
			CO3	The students will understand techniques of pH measurements and preparation of buffer solutions
			CO4	The students will learn elemental analysis of organic compounds and chromatographic techniques

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SEMESTER II				
F.Y.B.Sc.	CH-201	Inorganic Chemistry	CO1	Students will be able to understand origin of quantum mechanics and its need to understand structure of hydrogen atom
			CO2	To understand the Schrodinger equation for hydrogen atom.
			CO3	Explain rules for filling electrons in various orbitals- Aufbau's principle, Pauli exclusion principle, Hund's rule of maximum multiplicity
			CO4	To describe Block, group, modern periodic law and periodicity.
			CO5	Explain periodicity in the following properties in details: a. Effective nuclear charge, shielding or screening effect; some numerical problems.
			CO6	Define various types of chemical bonds- Ionic, covalent, coordinate and metallic bond
			CO7	Explain characteristics of ionic bond, types of ions, energy consideration in ionic bonding, lattice and solvation energy
F.Y.B.Sc.	CH-202	Analytical Chemistry	CO1	The students will understand the calculations of mole, molar concentrations and various units of concentrations which will be helpful for preparation of solution.
			CO2	The students will understand SI units, distinction between mass and weight
			CO3	Basics of type determination, characteristic tests and classifications, reactions of different functional groups. Separation of binary mixtures and analysis
			CO4	Elemental analysis -Detection of nitrogen, sulfur, halogen and phosphorous by Lassaigne test.
			CO5	Basics of chromatography and types of chromatography
			CO6	Understand pH meter and electrodes for pH measurement
F.Y.B.Sc.	CH-203	Chemistry Practical Course II	CO1	The students will understand inorganic estimations using volumetric analysis
			CO2	The students will understand Purification of organic compounds
			CO3	The students will understand Synthesis of Inorganic compounds

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SEMESTER III				
S.Y.B.Sc.	CH-301	Physical and Analytical Chemistry	CO1	Students will be able to explain concept of kinetics, terms used, rate laws, molecularity, order.
			CO2	To derive integrated rate laws, characteristics, expression for half-life and examples of zero order, first order, and second order reactions.
			CO3	Derivation of Arrhenius equation and evaluation of energy of activation
			CO4	To describe Block, group, modern periodic law and periodicity.
			CO5	Explain adsorption, classification of given processes into physical and chemical adsorption.
			CO6	Discuss factors influencing adsorption, its characteristics, differentiates types as physisorption and Chemisorption
			CO7	Define, explain and compare meaning of accuracy and precision and apply the methods of expressing the errors in analysis from results.
S.Y.B.Sc.	CH-302	Inorganic and Organic Chemistry	CO1	The students will understand terms related to molecular orbital theory and explain formation of different types of MO's from AO's.
			CO2	The students will draw and explain MO energy level diagrams for homo and hetero diatomic molecules.
			CO3	Define different terms related to the coordination chemistry
			CO4	Explain Werner's theory of coordination compounds.
			CO5	Identify and draw the structures aromatic hydrocarbons from their names or from structure name can be assigned.
			CO6	Identify and draw the structures alkyl / aryl halides from their names or from structure name can be assigned.
S.Y.B.Sc.	CH- 203	Practical Chemistry III	CO1	The students will understand the kinetics of reactions
			CO2	The students will understand qualitative estimation of organic compounds
			CO3	The students will understand synthesis of Inorganic compounds

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SEMESTER IV				
S.Y.B.Sc.	CH-401	Physical and Analytical Chemistry	CO1	Students will be able to define the terms in phase equilibria such as- system, phase in system, components in system, degree of freedom
			CO2	To derive of phase rule and explain of one component system-water & sulphur
			CO3	Define various terms, laws, differentiate ideal and no-ideal solutions.
			CO4	Interpretation of i) vapour pressure–composition diagram ii) temperature- composition diagram.
			CO5	Define different terms in conductometry such as electrolytic conductance, resistance, conductance
			CO6	Apply conductometric methods of analysis to real problem in analytical laboratory.
			CO7	Explain and derive Beer’s law of absorptivity.
			CO8	Explain different terms in column chromatography such as stationary phase, mobile phase, elution, adsorption, ion exchange resin, adsorbate
S.Y.B.Sc.	CH-402	Inorganic and Organic Chemistry	CO1	The students will understand isomerism in coordination complexes.
			CO2	Apply principles of VBT to explain bonding in coordination compound of different geometries.
			CO3	Identify & explain discuss inner and outer orbital complexes.
			CO4	Apply crystal field theory to different type of complexes (Td, Oh, sq. pl complexes)
			CO5	Explain and discuss synthesis of aldehydes and ketones.
			CO6	Write and discuss the mechanism reactions carboxylic amines.
			CO7	Draw the structures of different conformations of cyclohexane
S.Y.B.Sc.	CH- 403	Practical Chemistry IV	CO1	The students will understand cell constant and application of conductometric techniques.
			CO2	The students will be able to separate mixtures using column chromatography.
			CO3	The students will be able to verify the Freundlich and Langmuir adsorption isotherm
			CO4	Verify Beer-Lambert’s law
			CO5	Students will learn organic estimations.

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SEMESTER V				
T.Y.B.Sc.	CH-501	Physical Chemistry-I	CO1	Students will be able to know historical of development of quantum mechanics in chemistry & understand the idea of wave function
			CO2	Understand the meaning of electrical polarization of molecule, induced and orientation polarization
			CO3	Electromagnetic spectrum, Nature of wave and its characteristics
			CO4	Raman spectra: Concept of polarizability, Pure rotational Raman spectra of diatomic molecules
			CO5	Difference between thermal and photochemical processes. Quantum yield and reasons for high and low quantum yield.
			CO6	Discuss factors influencing factors affecting the quantum yield
T.Y.B.Sc.	CH-502	Analytical Chemistry-I	CO1	The students will be able to define basic terms in gravimetry, spectrophotometry, qualitative analysis and parameters in instrumental analysis.
			CO2	The students will identify important parameters in analytical processes or estimations.
			CO3	Explain different principles involved in the gravimetry, spectrophotometry, parameters in instrumental analysis, qualitative analysis.
			CO4	Describe procedure for different types analyses included in the syllabus.
			CO5	Design analytical procedure for given sample and apply whatever theoretical principles he has studied in theory
T.Y.B.Sc.	CH- 503	Physical Chemistry Practical I	CO1	The students will understand the concept and applications of specific refractivity, molar refractivity and techniques involved.
			CO2	The students will be able to work with spectrophotometer with a proper understanding of Beer-lambert;s law.
			CO3	The students will understand the concept of cell constant, Kohlrausch law and its applications.
			CO3	The students will be able to perform viscosity experiments using Ostwald's viscometer.
T.Y.B.Sc.	CH-504	Inorganic Chemistry - I	CO1	Students will be able to understand about inert and labile complexes and stability of complexes in aqueous solutions
			CO2	Classification of reactions of coordination compounds

			CO3	To know the general electronic configuration & electronic configuration of elements.
			CO4	To know trends in periodic properties of these elements with respect to various properties
			CO5	Write electronic configuration of lanthanides and actinides.
			CO6	Lanthanide contraction and effects of lanthanide contraction on post-lanthanides.
T.Y.B.Sc.	CH- 505	Industrial Chemistry	CO1	The students are expected to learn importance of chemical industry
			CO2	The students are expected to learn concept of basic chemicals, their uses and manufacturing process
			CO3	The students are expected to learn importance of sugar industry, manufacture of direct consumption sugar
			CO4	The students are expected to learn different types of soap products, chemistry of soap.
			CO5	Students should know about dyes, intermediates, structural features of a dye and classification of dyes.
T.Y.B.Sc.	CH- 506	Inorganic Chemistry Practical I	CO1	The students will understand gravimetric estimation of various metals.
			CO2	The students will be able to analyze sodium bicarbonate from mixture by thermal decomposition method
			CO3	The students will learn preparation of inorganic complexes and spot tests for metal ions and ligands
			CO4	Inorganic Qualitative analysis of simple water soluble mixture, mixtures containing borates and phosphates
			CO5	Qualitative and confirmatory tests of inorganic toxicants of any four ions.
T.Y.B.Sc.	CH-507	Organic Chemistry - I	CO1	Students will be able to define and classify polynuclear and hetroonuclear aromatic hydrocarbons.
			CO2	Write the structure, synthesis of polynuclear and hetroonuclear aromatic hydrocarbons.
			CO3	Explain the reactivity of polynuclear and hetroonuclear aromatic hydrocarbons.
			CO4	To predict product with panning or supply the reagent/s for these reactions.
			CO5	To write the mechanism of some named rearrangement reactions and their applications
			CO6	Understand E1, E2 and E1cB mechanism

			CO7	Effect of factors on the rate elimination reactions.
T.Y.B.Sc.	CH- 508	Chemistry of Biomolecules	CO1	The student will understanding of Cell types, Difference between a bacterial cell, Plant cell and animal cell.
			CO2	Biological composition and organization of cell membrane, structure and function of various cell organelles of plant and animal cell.
			CO3	The student will understand the types of carbohydrates and their biochemical significance in living organisms, structure of carbohydrates and reactions of carbohydrates
			CO4	The student needs to know the types of lipids with examples, structure of lipids, properties of lipids
			CO5	The student will understand the structure and types of amino acids. Reactions of amino acids. Properties of amino acids.
			CO6	The student know the classes of enzymes with subclasses and examples. Enzyme specificity, Equations of enzyme kinetics K_m and its significance.
			CO7	Basic concepts of Endocrinology. Types of Endocrine glands and their hormones.
			T.Y.B.Sc.	CH- 509
CO2	The students will understand the concept of green chemistry, its importance and some synthesis using green chemistry technique.			
CO3	The students will be able to perform synthesis of organic compounds and their organic derivatives			
CO4	The students will be able to systematic working skill in laboratory will be imparted in student.			
T.Y.B.Sc.	CH-510	Polymer Chemistry	CO1	The students are expected to learn the history of polymers and difference between simple compounds and polymer.
			CO2	The students are expected to know difference between natural, synthetic, organic and inorganic polymers.
			CO3	The students are expected to understand the mechanisms of polymerization.
			CO4	The students are expected to understand the polymerization techniques.
			CO5	The students are expected to understand uses & properties of polymers.
			CO6	The students are expected to understand role of polymer industry in the economy.
			CO7	The students are expected to understand the

				advantages of polymers
T.Y.B.Sc.	CH- 511	Environmental Chemistry	CO1	Students should know the importance and conservation of environment and importance of biogeochemical cycles
			CO2	Students should know water resources, hydrological cycle, organic and inorganic pollutants, water quality parameters
			CO3	Students should know water quality parameters and standards.
			CO4	Students should know analytical techniques in water analysis
			CO5	Students should know water pollutants, eutrophication, waste water treatment

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SEMESTER VI				
T.Y.B.Sc.	CH-601	Physical Chemistry-II	CO1	The student will be able to know and understand electrochemical cells: Explanation of Daniell cell
			CO2	Understand the EMF of electrochemical cell and its measurement.
			CO3	The primary reference electrode: The standard hydrogen electrode with reference to diagram, Construction, representation
			CO4	Secondary reference electrodes, calomel electrode, glass electrode, silver-silver chloride electrode
			CO5	Nernst Equation for theoretical determination of EMF
			CO6	Applications of emf measurements: Determination of pH of a solution by using hydrogen electrode, quinhydrone electrode and glass electrodes Potentiometric titrations
			CO7	Detection and Measurement of Radioactivity
T.Y.B.Sc.	CH-602	Physical Chemistry-III	CO1	The students will be able to perform potentiometric titration.
			CO2	The students will know application of colligative properties to determine molecular weight of nonelectrolyte, abnormal molecular weight.
			CO3	Factors affecting on solid state reactions.
			CO4	Applying rate laws for solid state reactions
T.Y.B.Sc.	CH- 603	Physical Chemistry Practical II	CO1	The students will understand the concept and applications of specific refractivity, molar refractivity and techniques involved.
			CO2	The students will be able to determine of Pka of given weak acid by pH metry titration with strong base
			CO3	The students will able to determine the molecular weight of solute by depression in freezing point method.
			CO3	The students will be able to perform analyse crystal structure from X-ray diffraction spectra
T.Y.B.Sc.	CH-604	Inorganic Chemistry - II	CO1	Students will be able to understand the multiple bonding due to CO ligand.
			CO2	To understand the uses of organometallic compounds in the homogenous catalysis.
			CO3	Understand the phenomenon of catalysis, its basic principles and terminologies.
			CO4	Understand the classification and essential properties of heterogeneous catalysts.

			CO5	Know the abundance of elements in living system and earth crust and give the classification of metals as enzymatic and non-enzymatic.
T.Y.B.Sc.	CH- 605	Inorganic Chemistry - III	CO1	The Student will learn the concept of acid base and their theories.
			CO2	The students are to draw the simple cubic, BCC and FCC structures.
			CO3	The students are expected to learn different Zeolite Framework Types and their classification
			CO4	A student should know various methods of nanoparticle synthesis
			CO5	A student should know toxic chemical in the environment and know the impact of toxic chemicals on enzyme.
T.Y.B.Sc.	CH- 606	Inorganic Chemistry Practical II	CO1	The students will know volumetric estimation and analysis of Phosphate from Fertilizer..
			CO2	The students will be able to analyze metals by Flame Photometry
			CO3	The students will learn the column chromatography technique
			CO4	The student will have the experience of synthesis of nanoparticles
T.Y.B.Sc.	CH-607	Organic Chemistry - II	CO1	Students will learn the interaction of radiations with matter and understand different regions of electromagnetic radiations.
			CO2	Students will understand the principle of UV spectroscopy and the nature of UV spectrum.
			CO3	Students will be able to calculate maximum wavelength for any conjugated system.
			CO4	From the IR spectrum, they will be able to find out IR frequencies of different functional groups.
			CO5	Students will understand the principle of NMR spectroscopy and will understand various terms used in NMR spectroscopy.
			CO6	Students will learn the principle of mass spectroscopy, its instrumentation and nature of mass spectrum.
T.Y.B.Sc.	CH- 608	Organic Chemistry - III	CO1	The student will understanding the concept of Retrosynthetic Analysis and its Applications
			CO2	Organic Reaction Mechanism and Synthetic Applications and the common name reactions
			CO3	The student will understand the role of Reagents in Organic Synthesis
			CO4	The student needs to know the natural products like Terpenoids and alkaloids

T.Y.B.Sc.	CH- 609	Organic Chemistry Practical II	CO1	The students will be able to explain “fingerprint region” of an infrared spectrum can used in the identification of an unknown compound.
			CO2	The students will be able to identify the functional group or groups present in a compound.
			CO3	The students will be able to understand use NMR spectra to determine the structures of compounds.
			CO4	The students will be able to practical knowledge of handling chemicals..
T.Y.B.Sc.	CH-610	Chemistry of Soil and Agrochemicals	CO1	The students know the different components and properties of soil.
			CO2	The students are expected to explore the problems and potentials of soil and decide the most appropriate treatment for land use.
			CO3	The students are expected to make decisions on nutrient dose, choice of fertilizers and method of application etc. practiced in crop production.
			CO4	Proper understanding of chemistry of pesticides will be inculcated among the students.
			CO5	Imparts knowledge on different pesticides, their nature and, mode of action and their fate in soil so as to monitor their effect on the environment.
T.Y.B.Sc.	CH- 611	Analytical Chemistry II	CO1	Students should define basic terms in solvent extraction, basics of chromatography, HPLC, GC, and AAS and AES
			CO2	Students should able to identify important parameters in analytical processes or estimations.
			CO3	Explain different principles involved in the analyses using solvent extraction, basics of instrumental chromatography, HPLC, GC, and atomic spectroscopic techniques.
			CO4	Describe procedure for different types analyses included in the syllabus.
			CO5	Design analytical procedure for given sample.