UG Programme: Course Outcome
Name of the Course: B.Sc. Chemistry

In the Format of,
Class
Semester
Course Code, Course Title
Course Outcome

CO No.	Course Outcome
F. Y. B.Sc.	
Semester-I	
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
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.
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.
Semester-II	
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.
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.
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.
S. Y. B.Sc.	
Semester-III	
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.
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.
CH-303 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.
Semester-IV	
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.
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.
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.
T. Y. B.Sc.	
Semester-V	
DSEC-I: CH-501: Physical Chemistry -I	
CO1	Know historical of development of quantum mechanics in chemistry.
CO2	Understand and explain the differences between classical and quantum mechanics.
CO3	Understand the idea of wave function
CO4	Understanding the operators: Position, momentum and energy
CO5	Understanding of De Broglie hypothesis and the uncertainty principle
CO6	Applications to conjugated systems, zero-point energy and quantum tunnelling, Numerical Problems
CO7	Dipole moment and its experimental determination by temperature variation method.
CO8	Rotational spectra of rigid diatomic molecules, selection rules, nature of spectral lines.
CO9	Pure rotational Raman spectra of diatomic molecules, Energy Expression, Selection rule, Rotational energy level diagram, Rotational Raman spectrum and Problems
CO10	Student should Understand Various photochemical phenomena like fluorescence and phosphorescence, Chemiluminescence,
DSEC-I: CH-502: Analytical Chemistry- I	
CO1	After completion of the course student should be able to Perform quantitative calculations depending upon equations student has studied in the theory. Furthermore, student should able to solve problems on the basis of theory
CO2	Select particular method of analysis if analyte sample is given to him.
CO3	Demonstrate theoretical principles with help of practical.
CO4	Apply whatever theoretical principles he has studied in theory during practical session in laboratory.
DSEC-I: CH-503: Physical Chemistry Practical - I	

CO1	Student should learn the concept of chemical kinetics, viscosity, adsorption, critical solution temperature, refractive index, Lambert-Beer's law, redox potentials, pH of solution, conductivity of solution and radioactivity.
CO2	Set up glassware, apparatus& instruments to conduct experiments in Physical Chemistry.
CO3	Understand the rate of reaction and factors affecting it.
CO4	Determine the effect of concentration and temperature on viscosity of liquids.
DSEC-II: CH-504: Inorganic Chemistry - I	
CO1	Student should learn the concept of electroneutrality principle and different types of pi bonding.
CO2	Able to explain Nephelauxetic effect towards covalent bonding
CO3	Gain the knowledge of inorganic reaction mechanisms available in the literature to solve chemical problems.
CO4	Able to explain Charge Transfer Spectra.
CO5	Able to compare the different approaches to bonding in Coordination compounds.
CO6	To know trends in periodic properties of these elements w.r.t. size of atom and ions, reactivity, catalytic activity, oxidation state, complex formation ability, color, magnetic properties, non-stoichiometry, density, melting point, boiling point.
CO7	The meaning of term f-block elements, Inner transition elements, lanthanides, actinides.
CO8	IUPAC nomenclature for super heavy elements with atomic no. 100 onwards.
CO9	Electronic configuration of lanthanides and actinides.
DSEC-II: CH-505: Industrial Chemistry - I	
CO1	Importance of chemical industry, meaning of the terms involved.
CO2	Comparison between batch and continuous process.
CO3	Concept of basic chemicals, their uses and manufacturing process.
CO4	They should also know the physic chemicals principals involved in manufacturing process.
CO5	Manufacturing of industrial starch and its applications, characteristics of some food starches.
CO6	Manufacture of cement by modern methods.
DSEC-II: CH-506: Inorganic Chemistry Practical - I	
CO1	Students receive knowledge of qualitative & quantitative analysis of inorganic compounds.
CO2	It would help in development of practical skills of the students.
CO3	Students get knowledge about good laboratory procedures.
DSEC-III: CH-507: Organic Chemistry - I	
CO1	Understand the reactions and mechanisms
CO2	Describe the synthesis of chemical reactions of polynuclear and hetreonuclear aromatic Hydrocarbons.
CO3	Synthetic applications ethyl acetoacetate and malonic ester
CO4	To predict product with panning or supply the reagent/s for these reactions
CO5	How to write the mechanism of some named rearrangement reactions and their applications
CO6	Understand stereochemistry by using models and learn reactivity of geometrical isomers
DSEC-III: CH-508: Chemistry of Biomolecules	
CO1	The student will understanding of Cell types, Difference between a bacterial cell, Plant cell and animal cell. Biological composition and organization of cell membrane, structure and function of various cell organelles of plant and animal cell. Concepts of biomolecules, Bonds that link monomeric units to form macromolecules
CO2	The student will understand the types of carbohydrates and their biochemical significance in living organisms, structure of carbohydrates and reactions of carbohydrates with Glucose as example. Properties of carbohydrates.

CO3	The student needs to know the types of lipids with examples, structure of lipids, properties of lipids
CO4	The student know the classes of enzymes with subclasses and examples. Enzyme specificity, Equations of enzyme kinetics Km and its significance, features of various types of enzyme inhibitions, industrial applications of enzymes.
DSEC-III: CH-509: Organic Chemistry Practical-I	
CO1	Students are able to carried out experiments on small scale and minimize the environmental pollution.
CO2	Practical Skills developed in students like Monitoring of the Reaction, purification, titration, determination of physical constant, performing chromatographic methods e.g. thin layer Chromatography (TLC), Column Chromatography.
CO3	Students can separate the organic compound from mixture and identified some characteristics.
SEC-I: CH-510: Skills Enhancing Course-I	
CH-510 (A) : Introduction to Medicinal Chemistry	
CO1	The basics of medicinal chemistry, biophysical properties, overview of basic concepts of traditional systems of medicine.
CO2	Over view of the overall process of drug discovery, and the role played by medicinal chemistry in this process.
CO3	Biological activity parameters and importance of stereochemistry of drugs and receptors.
CO4	Knowledge of mechanism of action of drugs belonging to the classes of infectious and non-infectious diseases.
CO5	Enhancement of practical skills in synthesis, purification and analysis.
CH-510 (B) : Polymer Chemistry	
CO1	Basics of polymer, Nomenclature, Degree of polymerization, Classification of polymerization reactions.
CO2	Uses & properties of polymers.
CO3	Role of polymer industry in the economy.
SEC-II: CH-511: Skills Enhancing Course-II	
CH-511 (A) : Environmental Chemistry	
CO1	Students should know Importance and conservation of environment
CO2	Importance of biogeochemical cycles
CO3	Students should know Water resources, Hydrological Cycle, Organic and inorganic pollutants, Water quality parameters.
CH-511 (B) : Cheminformatics	
CO1	Students should understand the significance of cheminformatics in the modern practices of chemical science
CO2	Students should learn the necessity of cheminformatics in chemical science
CO3	Students should understand the significance of different representation methods for their specific applications.
CO4	Students should understand the significance of structural data in the process of referencing
CO5	Students should able to understand data interpretation using these methods for basic or representative molecules.
Semester-VI	
DSEC-IV: CH-601 : Physical Chemistry-II	
CO1	Explanation of Daniell cell, Conventions to represent electrochemical cells
CO2	Thermodynamic conditions of reversible cell, Explanations of reversible and irreversible electrochemical cell with suitable example
CO3	Nernst Equation for theoretical determination of EMF
CO4	Distinguish between crystalline and amorphous solids / anisotropic and isotropic solids
CO5	Bravais lattices, space groups, seven crystal systems and fourteen Bravais lattices

CO6	Energy released in nuclear reaction: Einstein's equation, Mass Defect, Nuclear Binding Energy
CO7	Application of radioisotopes as a tracer: Chemical investigation- Esterification, Friedel - Craft reaction and structure determination w.r.t PCl_5, Age determination use of tritium and C14 dating
DSEC-IV: CH-602 : Physical Chemistry-III	
CO1	students are known Meaning of the terms-Solution, electrolytes, nonelectrolytes and colligative properties
CO2	Application of colligative properties to determine molecular weight of nonelectrolyte, abnormal molecular weight
CO3	Relation between Vant Hoff's factor and degree of dissociation of electrolyte by colligative property
CO4	Applying rate laws for solid state reactions
CO5	Results of kinetics studies
CO6	Correspondence between energy levels in the atom and energy bands in solid
CO7	Cohesive Energy of ionic crystals based on coulomb's law and Born Haber Cycle
DSEC-IV: CH-603 : Physical Chemistry Practical-II	
CO1	Students will skilled in handling the various instruments like Refractometer, Colorimeter, Potentiometer, pH-meter, Conductivity meter and G.M. Counter which are used in various industries these days.
CO2	Set up glassware, apparatus& instruments to conduct experiments in Physical Chemistry.
CO3	Understand the role of adsorption phenomenon in various chemical reactions.
DSEC-V: CH-604 : Inorganic Chemistry -II	
CO1	To understand M-C bond and to define organometallic compounds
CO2	To understand the multiple bonding due to CO ligand.
CO3	To understand the structure and bonding using valence electron count (18 ele. rule)
CO4	Understand the phenomenon of catalysis, its basic principles and terminologies.
CO5	Understand the principle of heterogeneous catalyst and development in it.
CO6	Understand the role of metals in non-enzymatic processes.
CO7	know thy types of Inorganic polymers
CO8	synthesis, structural aspects of Inorganic polymers
DSEC-V: CH-605: Inorganic Chemistry -III	
CO1	Student will learn the concept of acid base and their theories.
CO2	Know the crystal structures of solids.
CO3	Draw the simple cubic, BCC and FCC structures.
CO4	Know the effect of radius ratio in determining the crystal structure.
CO5	Be able to define Pauling's univalent radius and crystal radius
CO6	Be able to differentiate between the defects.
CO7	Different Zeolite Framework Types and their classification
CO8	To know toxic chemical in the environment.
DSEC-V: CH-606: Inorganic Chemistry Practical-II	
CO1	Students receive knowledge of qualitative & quantitative analysis of inorganic compounds.
CO2	It would help in development of practical skills of the students.
CO3	Students get knowledge about good laboratory procedures.
CO4	Expected that student have hands on instruments like FES, Spectrophotometer, colorimeter etc.
CO5	Student develops their practical skills which is helpful in research to the students.
DSEC-VI: CH-607: Organic Chemistry-II	
CO1	Students will learn the interaction of radiations with matter. They will understand different regions of electromagnetic radiations. They will know different wave parameters

CO2	Students will learn the principle of mass spectroscopy, its instrumentation and nature of mass spectrum.
CO3	Students will understand the principle of UV spectroscopy and the nature of UV spectrum. They will learn types of electronic excitations.
CO4	Students will be able to calculate maximum wavelength for any conjugated system. And from the value of λ-max they will be able to find out the extent of conjugation in the compound.
CO5	Students will be able to interpret the NMR data and they will be able to use it for determination of structure of organic compounds.
CO6	Students will be able to determine the structure of simple organic compounds on the basis of spectral data such as λ max values, IR frequencies, chemical shift (δ values).
CO7	The use of models to draw different types of disubstituted cyclohexanes in chair form
CO8	The stability, energy calculations and optical activity of these conformers
DSEC-VI: CH-608: Organic Chemistry-III	
CO1	Student should learn Retrosynthetic Analysis and Applications
CO2	Organic Reaction Mechanism and Synthetic Applications
CO3	Student will be understand Reagents in Organic Synthesis
CO4	Know about Natural Products
DSEC-VI: CH-609: Organic Chemistry Practical-II	
CO1	Practical knowledge of handling chemicals.
CO2	Achieve the practical skills required to estimations of glucose and glycine
CO3	Understand the equipment for extraction.
CO4	Gain practical hands-on experience of modern Extraction.
CO5	Develop basic design of extractor
SEC-III: CH-610: Skill Enhancing Course-III	
CH-610 (A) : Chemistry of Soil and Agrochemicals	
CO1	Understood various components of soil and soil properties and their impact on plant growth.
CO2	Understood the classification of the soil.
CO3	Understood the Reclamation and management of soil physical and chemical constraints.
CO4	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
CH-610 (B) Introduction to Forensic Chemistry	
CO1	The significance of forensic science to human society.
CO2	The methods of identifying of narcotics, drugs and psychotropic substance
CO3	The menace of designer drugs.
SEC-IV: CH-610: Skill Enhancing Course-IV	
CH-611(A): Analytical Chemistry-II	
CO1	After completion of the course student should able to Define basic terms in solvent extraction, basics of chromatography, HPLC, GC, and AAS and AES.
CO2	Identify important parameters in analytical processes or estimations.
CO3	Perform quantitative calculations depending upon equations students has studied in the theory. Furthermore, student should able to solve problems on the basis of theory.
CH-611 (B): Chemistry of Cosmetics and Perfumes	
CO1	Understanding of regulations of Central Drugs Standard Control Organization, India Cosmetic Regulation, Steps for process of cosmetic registration in India
CO2	Chemical composition, preparation and uses of some cosmetics
CO3	Student should understand Chemistry of Perfumes and fragrances