Srikrishna College

(Affiliated to University of Kalyani)

Bagula, Nadia, West Bengal.

Course Outcome

The learning outcome-based curriculum framework for B.Sc. degree in Chemistry is fundamental approach of learning a broad framework of chemical science and its application to our world.

The graduate students in chemistry are being upskilled with different equipment and instrumental knowledge which would empower them in their higher education, research field and industrial interface. The curriculum induces critical thinking, basic psychology, scientific reasoning, moral ethical reasoning and lays emphasis on the objectivity and employability for the students.

- The course helps to acquire chemistry knowledge which help further for higher studies and research in this field as well as develop students' ability and skill to acquire expertise over solving both theoretical and applied chemistry problems.
- Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistry.
- Able to carry-over the course with a broad and thorough knowledge in chemistry with chemical concepts, principles, and theories.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyse the results of such experiments and able to explain the synthesis and analysis.
- students will be able to understand the characterization of materials and understand the basic principle of equipment used in the chemistry laboratory.
- Students will be proficient in problem solving, critical thinking and analytical reasoning as applied to real life scientific problems.
- Course will enable them to explore new areas of research in both chemistry and allied fields of science and technology.
- Student are capable of expressing the subject through technical writing as well as through oral presentation

- ❖ Students will be a critical thinker and problem solver, Team player, Skilled project manager.
- ❖ Students will be empowered to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
- ❖ Enhance the ability to use computers for chemical simulation and computation.

- ➢ **Honours Course wise Credit Distribution and Outcome**

Course	Total no of Papers	Total Credit						
		Theory	Practical	Core competence	Critical Thinking	Analytical Reasoning	Research Skill	Team Work
Core Courses	14	56	28	√	√	√	√	√
Discipline Specific Elective	4	16	8	√	√	√	√	√
Generic Elective	4	16	8	√	X	√	X	√
Skill Enhancement	2	4	-	√	√	X	X	X

CBCS 1st SEM (Honours)

Course code	Course title	Course Outcome	Credit
CHEMHT-1 (Inorganic +Physical)	i)Extra nuclear structure of atom and Periodic properties, ii) Kinetic Theory and Gaseous state, iii)Chemical Thermodynamics - I	i) To familiarised students about the basic concept of atomic structure and it's relation with the elements of modern periodic table. ii) To understand about concept of the Kinetic theory of gases and differentiate between real and ideal gases through different concepts. iii) To learn the concepts of 1st law of thermodynamics and related state and path functions of different chemical processes.	4
CHEMHP-1	Inorganic Chemistry – IA & Physical Chemistry - IA	i)To illustrate the acid-base reactions of the different binary mixtures and idea about different standard solution, ii)To give knowledge about exothermic and endo thermic reactions, iii)To provide Concept of pH using colour matching method.	2
CHEMHT-2	Theory: Basics of Organic Chemistry, Bonding and Physical Properties, General Treatment of Reaction Mechanism and Stereochemistry	i)To acute students with the fundamental of organic chemistry such as bonding, physical properties and rection mechanism. ii)To understand geometries, chirality, symmetry of organic molecules and it's relation to optical activity, relatives and absolute configuration of the organic molecules.	4

CHEMHP-2	Organic Chemistry – I	i)To learn the experiment separation of binary mixture based upon solubility determination of boiling points of different organic compounds ii)To learn specific chemical tests to identify different organic compounds.	2

CBCS 2nd SEM honours

Course code	Course title	Course Outcome	Credit
CHEMHT-3 (Inorganic +Physical)	i)Redox reactions and Precipitation reactions, Acid-Base Concepts and Solvents ii)Chemical Thermodynamics – II, Chemical kinetics	i) To acquire the knowledge on oxidation-reduction reactions and the conditions of precipitation. ii) To learn about the detail's idea regarding different concepts on acid base and HSAB theory as well as the idea regarding indicators and their applications in chemical reactions. iii) To illustrate the basic concepts of 2^{nd} Law of thermodynamics and related state functions with the criterial concepts for spontaneity and equilibrium of the reactions. iii)To understand critically rate law of different types of reactions and dependence of rate constant on temperature, concentration etc. iv) To introduce the concept of the homogeneous catalysis and their application on the biological reactions.	4
CHEMHP-3	Inorganic Chemistry – IB &Physical Chemistry – IB	i)Demonstrate redox reactions and teach estimation of different metals. ii) To familiarized with different orders of Chemical kinetics.	2

CHEMHT-4	Theory: Stereochemistry, General Treatment of Reaction Mechanism, Substitution and Elimination Reactions	i)To provide students understanding on advance stereochemistry and confirmational analysis of different organic molecules. ii) To learn the basic concepts of reaction energetics and understand the mechanism of substitution and elimination reactions.	4
CHEMHP-4	Organic Chemistry – II	Preparation, purification, melting point determination and yield calculation for various organic compounds to enhance the skill of different methodology of organic synthesis.	2

CBCS 3rd SEM honours

Course code	Course title	Course Outcome	Credit
CHEMHT-5 (Physical)	Transport processes, Applications of Thermodynamics – I, Foundation of Quantum Mechanics,	i)To inform students about the fluidic nature of matter and transport processes, conductance of difference solution. ii) To apprise students about various application of thermodynamics such as chemical equilibrium, chemical potential, idealist of the solution etc. iii) To introduce the basic concept of operators, wave function and degeneracy of energy level of quantum systems through the postulates of quantum mechanics.	4
CHEMHP-5	Physical Chemistry – II	To provide students knowledge about transport properties of solutions and electrolytes and chemical equilibria.	2

CHEMHT-6	Theory: Chemical Bonding – I, Chemical Bonding – II, Metal extraction and purification from ores and minerals	i) To give the details knowledge on bonding mainly the ionic and covalent bonding. ii) To learn the basic knowledge of meteorology.	4
CHEMHP-6	Inorganic Chemistry – II	To provide the understanding on permanganometry and dichromatometry for estimation of metals from binary mixture.	2
CHEMHT-7	Theory: Chemistry of alkenes and alkynes, Aromatic Substitution, Carbonyl and Related Compounds, Organometallics	i)To give the concept about alkenes, alkynes, Carbonyl and organometallics. ii) To familiarize with aromatic substitution mechanism.	4
CHEMHP-7	Organic Chemistry – III	Identification and qualitative analysis of solid organic compounds.	2
CHEMHS – 1B	Basic Analytical Chemistry	To enhance students skill about basic analytics of different chemical compounds. Certain instrumental demonstration also provided.	2

CBCS 4th SEM honours

Course code	Course title	Course Outcome	Credit
CHEMHT-8 (Physical)	Application of thermodynamics -ii, electrical properties of molecules, quantum chemistry	i)To enrich students with the knowledge of H-atom and H-like atom and solving Schrodinger equations. Also to give the basic concept about LCAO-MO and HF-SCF theory ii)To update students with phase-equilibrium chemistry and electrical properties of any molecules.	4
CHEMHP-8	Physical Chemistry – III	i)To enable students about ionic equilibrium, potentiometric titration of different redox reactions, phase equilibrium etc. ii)Titrimetric knowledge about EMF measurements and pH values.	2
CHEMHT-9	Radioactivity and nuclear chemistry, Chemistry of s and p-block elements, Coordination Chemistry - I	i)To introduce the concept of radioactivity and co-ordination chemistry. ii) Chemical periodicity and concept about the subsequent elements: s and p-block	4
CHEMHP-9	Inorganic Chemistry – III	To teach students carryout different complexometric titration and to familiarized students with inorganic preparation.	2
CHEMHT-10	Nitrogen compounds, Rearrangements, The Logic of	i)To enable students with the knowledge of N-compounds and it's rearrangement and organic spectroscopic method. ii)To understand the beginning of different C-	4

	Organic Synthesis, Organic Spectroscopy,	C bond formation and breaking required for designing synthetic route and it's viability.	
CHEMHP-10	Organic Chemistry – IV	To demonstrate about quantitative analysis of different organic molecules through various estimation methods	2
CHEMHS-2A	Pharmaceutical Chemistry	To enhance students skill abouts different drugs and pharmaceuticals and the basic knowledge of fermentation process has been incorporated.	2

CBCS 5th SEM honours lesson Plan

Course code	Course title	Course Outcome	Credit
CHEMHT-11	Coordination Chemistry – II, Magnetochemistry, Chemistry of d- and f-block elements, Reaction Kinetics and Mechanism	i)To introduce students with the spectrochemical series and a details idea about the crystal field theory with a preliminary idea about ligand field theory. To study the concept of John Teller effect and it's application in Z-in and Z-out complexes. Explain about the origin of colour and magnetic properties of the complexes. ii) To give introductory idea about various inorganic reaction mechanism through concept of labile-inert complex, trans-cis effect. iii) Elementary concept about the d and f block elements and their properties.	4
CHEMHP-11	Inorganic Chemistry – IV	i)To give idea about gravimetric estimations and applications of permanganometry,	2

		iodometry etc. ii)Inorganic preparation of complexes and it's spectrophotometric analysis.	
CHEMHT-12	Theory: Molecular Spectroscopy, Photochemistry, Surface phenomenon,	i)To infuse the knowledge of Rotational, Vibrational, Raman, NMR, ERS spectroscopy. ii)To develop understanding about the Law's abortion of light energy by different molecules and sequent photochemical reactions and chemical processes and it's mechanism. iii)To give a brief idea about physical and chemical adsorption and origin of stability of colloids.	4
CHEMHP-12	Physical Chemistry – IV	To give them experiences about different spectrophotometric and surface phenomenon experiment.	2
CHEMHTDSE-1B		i)To learn the importance of inorganic materials in industrial zone. ii)Introductory idea about renewable energy, different catalysis and chemical explosive. iii)	4
CHEMHPDSE-1B		To give the students required expertise on different estimation processes of industrial materials.	2
CHEMHTDSE-2A	Qualitative and quantitative, Optical methods of analysis. Thermal and	i)Basic concepts of analytical chemistry and it's applications.	4

	Electroanalytical methods of analysis. Separation techniques		
CHEMHPDSE-2A	Analytical Methods in Chemistry	i)To give hands on experiences on different separation technique such as chromatography, solvent extraction, and ion exchange methods. ii)Spectrophotometric determinations of indicators and soil.	2

CBCS 6th SEM honours

Course code	Course title	Course Outcome	Credit
CHEMHT-13	Molecular Symmetry and Point group, (12 L) Bio-inorganic Chemistry, Organometallic Chemistry and Catalysis	i)To give an elementary idea about application of symmetry on some simple inorganic molecules through the concept of point group. ii) Introduce the concept of bio-inorganic molecules available in nature and different biological processes. iii)To acquaint details idea about organometallic chemistry and it's application in catalysis.	4
CHEMHP-13	Inorganic Chemistry – V	To build up a concept of semi-micro qualitative analysis of different acid and basic radicals and their chemical reactions in different conditions.	2

CHEMHT-14	Carbocycles and Heterocycles, Cyclic Stereochemistry, Pericyclic reactions, Carbohydrates, Carbohydrates, Biomolecules	i)To develop concept in diverse chemistry of heterocycles, carbocycles, Cyclic Stereochemistry and natural products. ii) To give a foundation leaning in pericyclic reactions through FMO approach.	4
CHEMHP-14	Organic Chemistry – V	i)To give a thorough experiments on chromatographic separations of different ammino acids, dyes, sugars etc. ii)Key idea of spectroscopic analysis of organic compounds of 1H-NMR and IR spectroscopy of certain compounds.	2
CHEMHT DSE-3	Crystal Structure, Statistical Thermodynamics, Special selected topics,	i)To enrich students with the knowledge of details of crystal structure and it's determination method of solid compounds. ii)To introduce concept of statistical thermodynamics and it's applications. iii) To give knowledge about macromolecules and it's formation kinetics.	4
CHEMHP DSE-3	Advanced Physical Chemistry	To benefits students with the knowledge of computer applications in aspects of solving various numerical problems of chemistry.	2

CHEMHT DSE-4 and CHEMHP DSE-4	Project Work	To manifest the total CBCS curriculum knowledge by each student to plan and execute a specific work with necessary literature survey with some laboratory work. The outcome should be presented by each student in a systematic manner. To trained and inspired each students to take the research work in their future carrier.	4 2

➢ **Programme Course wise Credit Distribution and Outcome**

Course	Total no of Papers	Total Credit						
		Theory	Practical	Core competence	Critical Thinking	Analytical Reasoning	Research Skill	Team Work
Core Courses	12	48	24	√	√	√	√	√
Discipline Specific Elective	6	24	12	√	√	√	√	√
Skill Enhancement	4	8	-	√	√	X	X	X

CBCS 1st SEM Programme and GE

Course code	Course title	Course Outcome	Credit
CHEMGT-1	Atomic Structure, Chemical Periodicity, Acids and Bases,Redox Reactions, General	i)To give clear concepts about Atomic Structure, Chemical Periodicity, Acids and Bases, Redox Reactions, and elementary idea about stereochemistry,	4

	Organic Chemistry & Aliphatic Hydrocarbons	substitution and elimination reactions and aliphatic hydrocarbons.	
CHEMGP-1	Inorganic Chemistry - I & Organic Chemistry – I	i)To introduce estimation processes through Permanganometry, dichromatometry, iodometry and acid-base mixture. ii) To learn identification of single solid through Qualitative analysis.	2

CBCS 2nd SEM Program & GE

Course code	Course title	Course Outcome	Credit
CHEMGT-2	States of Matter & Chemical Kinetics, Chemical Bonding & Molecular Structure, P-Block	i)To give a comprehensive idea about Kinetic theory of gases, liquids, solids and Chemical kinetics. ii) To give thorough idea about chemical bonding and molecular structure and properties of p-block elements.	4
CHEMGP-2	Physical Chemistry – I &Inorganic Chemistry – II	i)Experiments on kinetics, viscosity, surface tension through different apparatuses. ii)Qualitative semi-micro analysis of 3radicals.s	2

CBCS 3rd SEM Program

Course code	Course title	Course Outcome	Credit
CHEMGT	Chemical	i)To give clear idea about thermodynamics,	4

-3	Energetics, Equilibria, Organic Chemistry-II	chemical equilibria and ionic equilibria. ii) To introduce elementary functional group approach for different reactions of aromatic hydrocarbons, organometallic compounds, aryl halides, alcohol, phenol, ethers and carbonyl compounds.	
CHEMGP-3	Physical Chemistry - II &Organic Chemistry - II	i)To study different experiments of thermochemistry, ionic equilibria and solubility. ii) Identification of few pure organic compounds.	2

CBCS 4th SEM Program

Course code	Course title	Course Outcome	Credit
CHEMGT-4	Solutions, Phase Equilibria, Conductance, Electrochemistry, Transition Metal & Coordination Chemistry	i)To understand the transport property, phase equilibria, electrochemistry and concepts of solutions. ii) To introduce transition elements (3d) and it's relations with the co-ordination chemistry and crystal field theory.	4
CHEMGP-4	Physical Chemistry - III &Inorganic Chemistry – III	i)Hands-on experiment on equilibrium, conductometric and potentiometric titration. ii)To give idea on Complexometric estimation and complex synthesis	2

CBCS 5th SEM Program lesson Plan

Course code	Course title	Course Outcome	Credit
CHEMGT DSE-5	Analytical, Environmental and Industrial Chemistry	To give introductory idea about Analytical, Environmental and Industrial Chemistry	4
CHEMGP DSE-5	Analytical and Environmental Chemistry	Experiment on acid-base redox reaction to identify the pH range and estimation of hardness of water and strength of H_2O_2 sample.	2

CBCS 6th SEM Program lesson Plan

Course code	Course title	Course Outcome	Credit
CHEMGT DSE-2	Advanced Organic Chemistry and Industrial Chemistry	i)To take again the functional group approach for different organic reactions of carboxylic acids and their derivatives, diazonium salts, amino acids and carbohydrates ii)To explain the basic concepts of different chemical products from industries.	4
CHEMGP DSE-2	Advanced Organic Chemistry &Industrial Chemistry	To learn certain nitration and condensation reactions and derive yield of the crude product. To learn experiment for estimation of different commercial products	2