Srikrishna College
Department of Chemistry
Course & Learning Outcome of 3-Year Degree/4-Year Honours in Chemistry
National Education Policy-2020 (With effect from 2023-2024)
Syllabus of Kalyani University

Semester I

Course Code	Course title	Name of the course	Credit of course	Course Learning Outcomes (CLOs)
CHEM-MAT-1	Inorganic -1A & Physical-1A	Major (Theory)	4	• Understand atomic structure, and orbital theory • Explain periodic properties and trends of elements • Apply kinetic theory of gases and real gas behavior • Analyze thermodynamic laws (1st and 2nd) and thermochemical calculations
CHEM-MAP-1	Inorganic-1A & Physical-1A	Major (Practical)	2	• Prepare standard solutions and perform titrations • Estimate mixtures using volumetric methods • Determine pH and thermochemical parameters experimentally • Develop laboratory skills and data interpretation
CHEM-MIT-1A	Inorganic-1& Organic-1	Minor-1(Theory)	3	• Understand atomic structure and periodicity • Apply acid-base and redox concepts • Explain organic fundamentals and stereochemistry • Analyze substitution and elimination reactions
CHEM-MIP-1A	Inorganic-1& Organic-1	Minor 1(Practical)	1	• Perform volumetric redox titrations • Identify organic compounds qualitatively though detecting functional groups and elements • Interpret experimental observations
CHEM-MDC-1	Chemistry in Daily Life	Multidis-ciplinary course	3	• Understand importance of chemistry in food, drugs, and materials • Analyze roles of chemicals in daily applications • Evaluate environmental and health impacts • Develop awareness of sustainable chemical use
CHEM-SEC-1	Pharmaceutical Chemistry	Skill Enhancement course	3	• Understand drug design and synthesis • Explain fermentation and industrial production • Prepare pharmaceutical compounds • Evaluate drug applications and safety

Semester II

Course Code	Course title	Name of the course	Credit of course	Course Learning Outcomes (CLOs)
CHEM-MAT-2	Organic-1	Major (Theory)	4	• Understand bonding theories (VBT, MO) and electronic effects • Analyze reaction mechanisms and reactive intermediates • Explain stereochemistry and chirality concepts • Apply theoretical concepts to predict organic reactions and stability
CHEM-MAP-2	Organic -1	Major (Practical)	2	• Separation and purification organic compounds • Determine boiling points • Identify organic compounds by chemical tests • Develop laboratory skills and analytical reasoning
CHEM-MIT-2A	Inorganic -1 & Organic-1	Minor-2 (Theory)	3	• Understand atomic structure and periodicity • Apply acid-base and redox concepts • Explain fundamentals of organic chemistry • Analyze hydrocarbon reactions
CHEM-MIP-2A	Inorganic-1 & Organic-1	Minor-2 (Practical)	1	• Perform redox titrations • Identify organic compounds • Detect functional groups • Interpret analytical data
CHEM-MDC-2	Basic Industrial Chemistry	Multidisciplin-ary course	3	• Understand fuels, fertilizers, cement, and polymers with explaining various industrial chemical processes • Analyze applications of materials in industry • Evaluate environmental impact of industrial chemistry
CHEM-SEC-2	IT Skills for Chemist	Skill Enhancement course	3	• Develop computerised skills to improve academic writing • Apply mathematical tools in chemistry • Use programming concepts for problem-solving and Analyze experimental data • Present scientific data effectively

Semester III

Course Code	Course title	Name of the course	Credit of course	Course Learning Outcomes (CLOs)
CHEM-MAT-3	Inorganic-1 B& Physical-1B	Major (Theory)	4	• Explain redox reactions, electrochemical series, and solubility principles • Apply acid-base theories and buffer concepts in chemical systems • Analyze thermodynamic functions (entropy, free energy) and spontaneity • Evaluate reaction kinetics, rate laws, and catalytic mechanisms
CHEM-MAP-3	Inorganic-1 B& Physical-1B	Major (Practical)	2	• Perform redox titrations and quantitative estimations • Analyze kinetic data from experimental reactions • Apply experimental techniques in physical chemistry • Evaluate experimental results and errors
CHEM-MIT-1B	Physical 1&Inorganic-2	Minor-1 (Theory)	3	• Explain gas behavior, liquids, and solid-state chemistry • Apply kinetic theory and thermodynamic principles • Understand chemical bonding and molecular structure • Analyze coordination chemistry and crystal field theory
CHEM-MIP-1B	Physical-1 & Inorganic-2	Minor-1 (Practical)	1	• Measure physical properties (viscosity, surface tension) • Study reaction kinetics experimentally • Perform qualitative inorganic analysis
CHEM-MDC-3	Basic Concept of Clinical Biochemistry	Multidisciplin -ary course	3	• Understand biomolecules and metabolic pathways • Explain structure and function of proteins and lipids • Analyze biochemical processes and diseases • Interpret diagnostic data from blood and urine analysis
CHEM-SEC-3	Basic Analytical Chemistry	Skill Enhancement course	3	• Understand principles of analytical chemistry • Apply titrimetric and chromatographic techniques • Analyze water, soil, food, and cosmetic samples • Evaluate analytical data and quality

				parameters

Semester IV

Course Code	Course title	Name of the course	Credit of course	Course Learning Outcomes (CLOs)
CHEM-MAT-4	Organic-2	Major (Theory)	4	• Explain reactions of aromatic compounds and electrophilic substitution • Apply concepts of carbonyl chemistry and reaction mechanisms •
CHEM-MAP-4	Organic -2	Major(Practical)	2	• Perform organic synthesis and purification techniques & Determine physicochemical parameters • **A**nalyze conductometric and potentiometric data with experimental accuracy and report the findings
CHEM-MAT-5	Physical-2	Major (Theory)	4	• Analyze phase equilibria and colligative properties • Understand the electrochemistry and conductance principles • Understand wave–particle duality and the origin of quantum mechanics • Apply Schrödinger equation to simple systems (particle-in-a-box problems and interpret results) • Understand operators, eigenvalues, and expectation values
CHEM-MAP-5	Physical -2	Major(Practical)	2	• Perform experiments to determine physiochemical properties like viscosity, partition coefficient) • Conduct and analyze conductometric titrations • Study kinetics (saponification) using conductance
CHEM-MIT-2B	Physical-1& Inorganic -2	Minor-2 (Theory)	3	• Explain aromatic chemistry and substitution reactions • Apply thermodynamics and electrochemistry concepts • Explain carbonyl chemistry and derivatives • Analyze solution behavior and phase equilibria
CHEM-MIP-2B	Physical-1& Inorganic-2	Minor-2(Practical)	1	• Perform qualitative and organic analysis • Conduct physicochemical measurements

				• Analyze experimental data & Interpret results and draw scientific conclusions

Semester V

Course Code	Course title	Name of the course	Credit of course	Course Learning Outcomes (CLOs)
CHEM-MAT-6	Inorganic-2	Major (Theory)	4	• Apply bonding concepts to predict structure, stability, and properties of inorganic compounds • Analyze crystal structures, defects, and band theory in solids • Apply principles of metallurgy for extraction and purification of metals • Analyze properties, structure, and reactivity of s- and p-block compounds • Evaluate industrial and environmental relevance of inorganic compounds
CHEM-MAP-6	Inorganic -2	Major (Practical)	2	• Apply complexometric methods (EDTA) for estimation of Ca^{2+} and Mg^{2+} in mixtures • Perform gravimetric estimations (chloride, Ni-DMG complex) accurately • Selectively estimate individual components in a binary mixture • Evaluate accuracy, precision, and sources of error in quantitative analysis
CHEM-MAT-7	Physical-3	Major (Theory)	6	• Understand ionic equilibrium, activity, and Debye–Hückel theory • Analyze electrochemical cells, potentiometric titrations, and transference phenomena • Apply concepts of dipole moment, polarizability, and dielectric behavior • Analyze phase equilibria, phase diagrams, and thermodynamic transformations • Analyze crystal structures, Bravais lattices, and X-ray diffraction principles
CHEM-MIT-3	Physical-2 & Organic-2	Minor-1/ Minor-2 (Theory)	3	• Explain thermodynamic and electrochemical principles • Apply organic reaction mechanisms and functional group chemistry • Apply physical chemistry concepts to problem-solving • Analyze reaction behavior and chemical systems
CHEM-MIP-3	Physical-2	Minor-1/	1	• Perform physical chemistry

	&Organic-2	Minor-2 (Practical)		experiments for thermodynamic parameters, determination of PH etc. ● Analyze and detect pure organic compounds

Semester VI

Course Code	Course title	Name of the course	Credit of course	Course Learning Outcomes (CLOs)
CHEM-MAT-8	Inorganic-3	Major (Theory)	6	● Analyze electronic spectra, CFSE, isomerism, and structure–property relationships in coordination compounds ● Apply principles of magnetochemistry to determine magnetic properties of transition metal complexes ● Analyze properties and trends of d- and f-block elements including lanthanide contraction ● Analyze complexometric reaction mechanisms including substitution reactions and trans-effect ● Apply nuclear chemistry concepts including radioactivity, decay processes, and nuclear stability ● Evaluate applications of coordination compounds, radioisotopes, and nuclear processes in science and industry
CHEM-MAT-9	Organic-3	Major (Theory)	6	● Understand mechanisms and reactivity of alkenes, alkynes, and aromatic systems ● Apply reaction principles to carbonyl compounds and organic transformations ● Analyze reaction mechanisms, rearrangements, and synthetic pathways for nitrogen-containing compounds ● Apply concepts of organometallics & Analyze spectroscopic data (UV, IR) for structure determination ● Apply stereochemistry and conformational analysis in cyclic systems ● Analyze structure and reactivity of biomolecules

CHEM-MAP 10	Inorganic-3 + Physical-3 + Organic-3	Major(Practical)	Inorganic -2 + Physical 2 + Organic 2	• Perform semi-micro qualitative analysis of inorganic mixtures • Apply principles of inorganic reactions in analysis • Analyze experimental observations and chemical behavior • Interpret results and identify unknown radicals • Evaluate accuracy and prepare systematic reports