SIKKIM MANIPAL INSTITUTE OF TECHNOLOGY
DEPARTMENT OF CHEMISTRY
COURSE OUTCOME

M.Sc. Chemistry

I[st] Semester

Sl.No.	Semester	Subject Code	Subject Name	Course Outcome
1.	I[st]	CH20101A	Principles of Inorganic Chemistry	**CO1:** In-Depth knowledge of periodic properties of elements, structure and bonding in molecules. Ability to assign structure and deduce properties of a given molecules. **CO2:** Ability to explain acid base concept, magnetic properties of molecules, and their application in deducing properties of a molecule. **CO3:** In-Depth knowledge of synthesis, properties bonding of p- block elements and their compounds and applications. **CO4:** In-Depth knowledge of synthesis, properties bonding of Boranes, Carboranes, Metallocarboranes, Borazines, Phosphazenes, Sulfur-Nitrogen compounds, silicates, silicones. Iso- and Hetero-poly anions. Understand the concept of allotropy and its significance. **CO5:** In-Depth knowledge of Metal-Metal bonds, industrial importance of the compounds of main group elements. Brief review of inorganic chains, rings and cages, organometallic compounds of non-transition elements.
2.		CH20102A	Principles of Organic Chemistry	**CO1:** Ability to use MOT for predicting reaction mechanism **CO2:** Able to solve problems related with stereochemistry **CO3:** Able to use acidic and basic conditions for carrying out suitable reactions **CO4:** Understanding of role of reaction intermediate in organic synthesis and nucleophilic substitution reaction.
3.		CH20103A	Chemical Thermodynamics	**CO1:** To impart fundamental concepts of solution thermodynamics involving ideal and non-ideal systems.

				CO2: To use solution thermodynamic concepts and phase equilibria in two-component and multi-component systems.
4.		**CH20104A**	**Analytical Chemistry**	**CO1:** Understand the principles of Chemometrics. **CO2:** Understand the underlying principles, techniques, data analysis of Seperation techniques and quantitative analysis. **CO3:** Ability to apply chemical analysis techniques for determining composition of samples. **CO4:** Interpret and optimize results.
5.		**CH20401A**	**Analytical Chemistry Lab**	**CO1:** Independently perform separation of components. **CO2:** Perform accurately volumetric and gravimetric analysis. **CO3:** Ability to analyse results.
6.		**CH20402A**	**Physical Chemistry Laboratory**	**CO1:** Ability to apply basic techniques of solution preparation and determine the aggregation process through Viscometric and conductometric methods. **CO2:** Understand the experimental procedure to determine the kinetic parameters of selected reactions. **CO3:** Ability to apply the knowledge of conductometric and potentiometric titration for determination of solubility of sparingly soluble salts. **CO4:** Ability to determine the composition and complex formation through spectroscopic analysis.

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II[nd] Semester

Sl.No.	Semester	Subject Code	Subject Name	Course Outcome
1.	II[nd]	CH20105A	Modern Spectroscopic Techniques	**CO1:** Understanding fundamentals of spectroscopy and ability to solve numerical problems (Determination of spectroscopic quantities, molar absorption coefficient). **CO2:** Understanding fundamentals of rotational spectroscopy, interpret spectra and solve numerical problems. (Determination of rotational constants Bond Length). **CO3:** Understanding fundamentals of vibrational spectroscopy, interpret spectra and solve numerical problems. (Force constant/Bond Energy). **CO4:** Understanding fundamentals of Electronic spectroscopy of atoms and molecules, interpret spectra and solve numerical problems. **CO5:** Understanding fundamentals of NMR and EPR spectroscopy, interpret spectra and solve numerical problems.
2.		CH20106A	Organic Reactions And Mechanisms	**CO1:** Build up a strong foundation on various aspects of a reaction mechanism to establish it. **CO2:** A clear conceptual understanding on various phenomena of organic compounds (especially unsaturated system)/intermediates through MOT. **CO3:** A detail understanding about rearrangement reactions based on substrate nature & reaction condition and their reaction path. **CO4:** A comprehensive knowledge on elimination reaction bases on substrate nature, used reagents and reaction conditions in organic synthesis. **CO5:** Develop a power to reason, creative thought on elimination reaction based on substrate nature and reaction condition.
3.		CH20107A	Computer Fundamentals and Programming	**CO1:** Understand the functioning of functioning of hardware and software. **CO2:** Knowledge of basics of C-programming. **CO3**: Ability to write C-programs using conditional statements and loops.

				CO4: Ability to write C-programs for solving common analytical problems in chemistry.
4.		**CH20108A**	**Quantum Chemistry- I**	**CO1:** To acquire basic knowledge in fundamentals of quantum chemistry. **CO2:** To understand the concept of wave function through the Schrodinger equation and understand the use of operators in quantum mechanics. **CO3:** To understand the applications of Schrodinger equation in simple systems like atoms and molecules. **CO4:** To acquire knowledge on quantum mechanical treatment of the Harmonic Oscillator, Energy eigenvalues and symmetry of the wave function. **CO5:** To understand the use of Schrodinger wave equation in polar co-ordinates, particle in a ring, angular momentum and particle on a sphere model.
5.		**CH20403A**	**Computer Programming Lab**	**CO1:** Ability to write simple programs using logical operators, loops and arrays. **CO2:** Simplify complex problems using functions. **CO3:** Ability to write C-programs for data analysis for chemical problems.
6.		**CH20404A**	**Organic Chemistry Lab**	**CO1:** Learn and apply techniques used in Organic Chemistry laboratory for synthesis, purification and identification. **CO2:** Employ the basic techniques used in Organic Chemistry laboratory for analysis such as chromatography, spectroscopy and estimation.

III[rd] Semester

Sl.No.	Semester	Subject Code	Subject Name	Course Outcome
1.	III[rd]	CH20109A	Advanced Coordination Chemistry & Inorganic Reaction Mechanism	**CO1:** Understanding of VBT, CFT and their applications. **CO2:** Ability to predict electronic transitions and interpret electronic spectra of transition metal complexes and influence of distortion, calculation of CFSE. **CO3:** Understanding fundamentals of molecular orbital theory and interpretation of electronic spectra. **CO4:** Understanding fundamentals of reaction mechanism & electron transfer reaction mechanism. **CO5:** Understand the importance of use of organometallic catalysts in different reactions & bonding in carbonyl complexes
2.		CH20110A	Concepts in Organic Synthesis	**CO1:** Ability to identify and deduce mechanisms of various types of pericyclic and photochemical reactions. **CO2:** In-depth understanding of solid state chemistry of peptides and its applications. **CO3:** In-depth understanding of catalysis in chemistry and its applications. **CO4:** Ability to identify and apply the oxidation-reduction reactions in synthesis. **CO5:** In-depth knowledge of heterocyclic chemistry and its applications.
3.		CH20111A	Chemical Dynamics and Electrochemistry	**CO1:** To impart basic knowledge of Chemical Kinetics of Collision theory and the activated complex theory. To understand the mechanisms of unimolecular reactions. **CO2:** To understand the chemistry of Complex reactions, consecutive reactions, chain reactions, oscillatory, Thermal & photochemical chain reactions. To understand the kinetics of fast reactions. **CO3:** To acquire knowledge on the principles of Debye-Huckel model of ion-ion interactions and its verification. **CO4:** To understand the theory of electrolytic conductance and the principle of Dispersion of conductance through the Debye- Falkenhagen effect and Wien effect.

				CO5: To impart knowledge on the chemistry of Ion-Solvent interaction, its concept, the experimental determination and its application to equilibria.
4.		**CH20112A**	**Biochemistry**	**CO1:** Basic knowledge of biomolecules, biochemical solvents, important functional groups, importance of non-covalent bonds in biochemistry and biochemical thermodynamics **CO2:** Fundamental knowledge of protein, carbohydrate and lipid structures and functions **CO3:** Basic knowledge of polynucleotide structures, gene, genetic code, protein synthesis within cell and control of genetic expressions **CO4:** Fundamental knowledge about the relationship between properties and structure of the enzymes, their mechanism of action and kinetics of enzymatic reactions. **CO5:** An understanding of biochemistry in photosynthesis, carbon assimilation, functioning of the biochemical components of photosystems, photoexcitation and de-excitation of LHC.
5.		**CH20301A**	**Photoinorganic Chemistry**	**CO1:** In- depth understanding of photochemical Laws, Ability to explain various photophysical process taking place in excited state and factors influencing them. **CO2:** Ability to identify and explain photophysical kinetics of excited state gaseous and liquid state and electron transfer process **CO3:** In-depth understanding of photo-reduction and related reactions. **CO4:** Ability to identify various types of photochemical reactions and its application. **CO5:** In-depth understanding of photochemical reactions in biological processes and its explanation using model systems.
6.		**CH20302A**	**Synthetic Organic Chemistry**	**CO1:** A comprehensive knowledge of organometallic and their uses in organic synthesis.

				CO2: A comprehensive knowledge of organometalloid and their uses in organic synthesis. **CO3:** Ability to demonstrate knowledge of asymmetric synthesis. **CO4:** Ability to design retro-synthetic strategies independently for compounds of moderate complexity. **CO5:** Ability to project and deprotect functional group during organic synthesis.
7		**CH20303A**	**Advanced Physical Chemistry**	**CO1:** Able to find the connection between statistics and thermodynamics. and differentiate between classical statistics and quantum statistics **CO2:** Able to account for the physical interpretation of partition functions and be able to calculate thermodynamic properties of model systems with using Boltzmann, Fermi-Dirac and Bose-Einstein statistics. **CO3**: Able to understand process of aggregation of amphiphilic molecules and their industrial application.
8		**CH20405A**	**Inorganic Chemistry Lab**	**CO1:** Ability to synthesize different first row transition metal complexes, their purification and crystallization. **CO2:** Ability to determine percentage of yield of the products and to characterize physical properties. **CO3:** Ability to carry out UV-vis spectroscopic studies of the prepared complexes. **CO4:** Ability to analyse UV-vis spectral data (Molar extinction coefficient, identification of d-d transistion and charge transfer).

IVth Semester

Sl.No.	Semester	Subject Code	Subject Name	Course Outcome
1.	IVth	CH20113A	Bio-inorganic Chemistry	**CO1:** Understanding of basic reactions in the biological systems and storage & transport of metabolic energy. **CO2:** Ability to understand ion transport across the biological membrane. **CO3:** In-depth knowledge of biological redox reactions, their importance and dioxygen in biological systems. **CO4:** In-depth Knowledge of metalloproteins in biological system and their active site structures. **CO5:** Knowledge of metalloenzymes and their applications in biological systems.
2.		CH20114A	Solid State Chemistry & Interface Science	**CO1:** Able to understand basic concept of crystal structure, its defect and its application to explain electrical properties of the solid material. **CO2:** Able to describe the fundamental aspects of colloid and surface chemistry and demonstrate how colloid and surface chemistry is applied in industry and the environment.
3.		CH20115A	Group Theory – A Chemist Approach	**CO1:** Ability to identify the symmetry elements and symmetry operation in molecules. **CO2:** Ability to identify point group, group multiplication table, subgroups and various groups. **CO3:** Ability to make transformation matrix for various symmetry elements. **CO4:** Ability to make irreducible character representation of a point group. **CO5:** Able to construct character table and apply them to find various properties of molecules.
4.		CH20116A	Quantum Chemistry II	**CO1:** Understanding of approximation methods in quantum chemistry **CO2:** Application of these methods for multi-electronic systems **CO3:** Application of these methods for explaining chemical bonding.
5.		CH20304A	Chemistry of Nanomaterials	**CO1:** Understanding of basics of nanomaterials. **CO2:** Ability to generate new methods for synthesis of nanomaterials.

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				CO3: Knowledge of various experimental techniques and characterizations of nanomaterials. **CO4:** Applications of nanomaterials in various fields of chemistry.
6.		**CH20305A**	**Supramolecular Chemistry**	**CO1:** Understanding Host-Guest Chemistry, receptors & Macrocyclic effects CO2: Understanding of various intermolecular forces and it application in construction of supramolecules. **CO3:** Understanding chemistry of formation of various supramolecular systems and their application. **CO4:** Knowledge of self-assembly process in construction of supramolecules. **CO5:** Understanding the role of coordination chemistry in construction of functional supramolecular materials.
		CH20306A	**Medicinal Chemistry**	**CO1:** In-depth understanding of mode of action of drugs. **CO2:** Synthesis and ability to establish structure-activity relationships of various classes of drug. **CO3:** Understanding the role and function of Antihistaminics. **CO4:** Expertise in synthesis and classifications of various classes of local Anaesthetics. **CO5:** In-depth understanding of various classes of Antimalarial drugs.

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MAJHITAR, RANGPO

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Prof. (Dr.) N.K. Bhattacharyya
Head, Department of Chemistry
Sikkim Manipal Institute of Technology
Majitar, East Sikkim-737136