



## M.E.S MAMPAD COLLEGE (AUTONOMOUS)

MAMPAD COLLEGE P.O, MALAPPURAM, KERALA, INDIA, 676542

Affiliated to University of Calicut

Accredited by NAAC with A grade

Syllabus Year	2021-2022
Department	Chemistry
Programme	MSc Chemistry

### Programme outcome.

Sl.No	Programme Outcome
PO1	Gains complete knowledge about all fundamental aspects of chemistry covering all process and prospectives
PO2	Familiarize with all branches and the emerging areas of chemistry and their applications in various spheres of sciences expose the diversified aspects of chemistry where the students experience a broader outlook of the subject.
PO3	Student will be able to handle standard and modern scientific instruments and acquire analytical skills to synthesize the chemical compounds by maneuvering the addition of reagents under optimum reaction conditions
PO4	Able to solve complex chemical problem such as analysis of data, synthetic logic, spectroscopy, structure and modeling, which are essential skills to succeed in field of research or in industry.

### Programme specific outcome

Sl.No	Programme Specific Outcome.
1	Understand the theoretical and physical aspects of atomic structure, chemical bonding, reaction pathways and dynamics, various energy transformations, molecular assembly in nano level, significance of electrochemistry, molecular segregation using their symmetry
2	Familiarize various reagents for organic synthesis, organic reaction mechanisms, separation techniques, stereochemistry etc

3	Identify the principles, structure and reactivity of organic and inorganic compounds (complexes) and able to characterize materials and interpret their spectra
4	Obtain knowledge in qualitative and quantitative techniques and contribute new scientific insights or innovative applications of chemical research to the next generation
5	Understand and apply the tools and concepts of computational quantum chemistry methods to the problems of chemistry and other branch of science

### Course Outcome

Semester	Course Code	Course Name	Course out come
I	CHE1C01	<b>QUANTUM MECHANICS AND COMPUTATIONAL CHEMISTRY</b>	The students are expected to
			1. Understand the historical background, evolution, importance and impact of quantum mechanics in science
			2. Understand the basic concepts and postulates of quantum mechanics
			3. Apply concept of quantum mechanics to exact solvable systems of translational, rotational and vibrational motions
			4. Apply concept of quantum mechanics to atomic structure and chemical bonding and realize that the wave functions of hydrogen atom are nothing but atomic orbitals and understand that chemical bonding is the mixing of wave functions of the two combining atoms.
			5. Familiarize approximation methods of quantum mechanics and apply those methods to many electron atoms
			6. Understand and apply the tools and concepts of computational quantum chemistry methods to the problems of chemistry
	7. Inculcate an atomic/molecular level philosophy in the mind.		
	CHE1C02	Elementary inorganic chemistry	The students will be able to
			1. Understand the basic principles of acid – base chemistry and non – aqueous solvents
2. Understand the chemistry of the main group, transition and inner transition elements.			
		3. Understand nuclear fission, fusion and radiation chemistry .	

			4. Know the significance of nanoscale & its dimensions
			5. Acquire knowledge of various characterization techniques and the short term and longer term applications of nanomaterials.
	CHE1C03	Structure and reactivity of organic Compounds	1. Able to identify aromaticity, non aromaticity and anti aromaticity of compounds and to predict their stability.
			2. To propose reaction mechanisms and determine neighbouring group participation effects on rates of reactions
			3. Students will be able to evaluate the stability of various conformations of cyclic and acyclic systems using steric, electronic and stereo electronic effects and correlate them to reactivity
			4. Acquire knowledge about the importance of asymmetric synthesis and will be able to propose synthesis of molecules of reasonable complexity with the control of stereo chemistry
	CHE1C04	Thermodynamics, kinetics, and catalysis	1 • Understand the terminologies associated with thermodynamics and fundamental relations in irreversible thermodynamics
			2. Understand the theories and methods of determination of the kinetics of the fast reaction.
			3. Knowledge of molecular reaction dynamics.
			4. Knowledge of homogeneous and heterogeneous catalysis and the related mechanisms.
II	CHE2C05	Group theory and Chemical Bonding	The students are expected to
			1. Understand the basic concepts of group theory and apply group theory concepts and character table to various chemical applications
			2. Analyze various symmetry operations of molecule and predict the symmetry and point group of molecules.
			3. Familiarize character table and apply character table as a tool for the prediction of IR and Raman active vibrational modes and prediction of electronic spectra
			4. Apply character table for the finding orbitals for hybridization and generation of SALCS

			5. Understand quantum mechanical concepts of hybridization and bonding of polyatomic molecules.
	CHE2C06	Coordination chemistry	1.Enable student to understand the stability of coordination compounds and their bonding characters 2.Understand the spectral properties of coordination compounds 3.Understand the reactions and their mechanism in coordination compounds 4.Enable student to understand the redox and photochemical reactions in coordination compounds.
	CHE2C07	Organic reaction mechanisms	1.Understand the mechanism of different organic reactions. 2.Students will be able to predict the product and mechanism of different reactions. 3.The intermediates formed during various organic reactions can be identified. 4.The students will be able to explain different name reactions of carbonyl compounds. 5. Will enable the students to predict the out put of click chemistry. 6.The students will acquire proper knowledge about photochemical reactions with mechanism 7.The students will understand the chemistry of natural products including biosynthesis
	CHE2C08	Electrochemistry, solid state chemistry and Statistical Thermodynamics	Students will be able to 1.Understand the chemistry of electrochemical cells, fuel cells and dynamic electrochemistry. 2. Understand symmetry elements, symmetry operations and crystal systems. 3. know the stoichiometric and non stoichiometric defects in crystals. 4. Understand Maxwell Boltzman, Bose-Einstein and Fermi-Dirac statistics and their applications. 5. Know the classical and quantum theories of heat capacities of solids
II ( Practical )	CHE1L01&CHE2L04	Inorganic chemistry	1.To enable the students to develop skill in the qualitative determination of common and less common cations from their mixture

		practical I & Inorganic chemistry practical II*	2.To understand the theory of colorimetry and the way of determining the quantity of metal ions through this technique. 3. To enable the students to develop skill in the cerimetric determination of metal ions 4.To apply proper techniques for volumetric estimation of metal ions
	CHE1L02&CHE2L05	Organic chemistry Practical I & Organic chemistry Practical II*	1.Able to identify the functional groups present in the given organic compound 2.To learn the pilot separation of bi mixtures 3.To understand the techniques involving drying and recrystallisation of synthesised organic compounds by various methods and to determine their b.p&m.p 4.Able to synthesise solid derivatives of all organic compounds with different functional groups
	CHE1L03&CHE2L06	Physical chemistry practical I & Physical chemistry practical II*	The students are expected to 1.Acquire analytical skills for measuring physical parameters 2.Understand the basic principle and applications of conductometric ,potentiometric,refractometric and viscosity measurements 3.Acquire skills for handling instruments like conductivity meter ,potentiometer,refractometer etc 4. Construct phase diagram for two component systems 5.Calculate thermodynamic parameters from thermochemistry experimental data
III	CHE3C09	Molecular spectroscopy	The students are expected to 1. Understand the theoretical background of various spectroscopic techniques. 2. Understand the fundamentals of UV, IR, NMR and mass spectroscopy for the characterization of organic molecules. 3. Use combined spectral data of various techniques for the structural elucidation of organic compounds 4. Apply spectroscopic methods as analatytical tool for characterization of materials in chemistry, biology, and medicine and material science
	CHE3C10	Organometallic And	1.Acquire knowledge about the nature of ligands, its electron donating

		Bioinorganic chemistry	<p>ability and bonding modes of ligands with metal ions.</p> <p>2.Able to understand the stability and structural patterns of metal clusters,carbonyls and nitrosyls.</p> <p>3.Able to identify the role of metal ions in the biological and physiological systems and applications.</p> <p>4.Get knowledge about the homogeneous and heterogeneous organometallic catalysts in various industrial processes.</p>
	CHE3C11	Reagents and Transformations in Organic Chemistry	<p>1.students are expected to understand the reagents used for oxidation and reductions</p> <p>2.Students will be able to design the mechanisms of organic reactions.</p> <p>3.students will acquire knowledge of supramolecular chemistry and type of interactions between molecules.</p> <p>4.students will be able to identify selective reagents used for oxidation reactions</p>
	CHE3E01	Synthetic organic chemistry (Elective)	<p>1.Students acquire proper knowledge on various reagents used for organic synthesis.</p> <p>2.Students can predict the products formed when different reagents are used in a reaction.</p> <p>3.Students can evaluate the use of different reagents for various reactions.</p> <p>4.Students acquire proper knowledge on carbonyl compounds.</p> <p>5.Students understand the use and applications of different coupling reactions.</p> <p>6/Students will be able to plan, design and explain the mechanism of synthesis of different organic compounds.</p> <p>7.Students will be able to identify the synthons, synthetic equivalents, synthetic reagents and substrates required for a reaction leading to a particular product.</p> <p>8.Students will acquire knowledge on synthesis, reactions and applications of heterocyclic compounds</p>
IV	CHE4C12	Instrumental Methods of Analysis	<p>Students will be able to;</p> <p>1.understand the principles of conventional procedures</p> <p>2.Evaluate errors in measurements and to minimise errors while</p>

			<p>conduction of measurements.</p> <p>3. Identify compounds from a mixture using chromatographic techniques.</p> <p>4. Understand principle and procedures of optical and electroanalytical methods</p>
	CHE4E06	Natural Products & Polymers(Elective)	<p>1. Acquire knowledge of the classification of the natural products by their molecular structures and biosynthesis.</p> <p>2. Acquire knowledge of the functions of important natural products and the methodology used in natural product chemistry</p> <p>4. Get a comprehensive knowledge about different polymerization techniques and characterizations.</p> <p>5. Can interpret the stereochemistry of polymers and the knowledge of optoelectronic properties of polymers and their application in to electronic research</p>
	CHE4E08	Organometallic Chemistry (Elective )	<p>1. Able to identify the structure and bonding aspects of simple organometallic compounds.</p> <p>2. Apply different electron counting rules to predict the shape/geometry of low and high nuclearity metal carbonyl clusters</p> <p>3. Identify the different types of organometallic reactions and apply the above concepts to explain different catalytic reactions</p> <p>4. Able to understand fundamental reaction types and mechanisms and how to combine these to understand efficient catalytic processes in small scale and large scale by homogeneously/heterogeneously</p>
IV (practical )	CHE3L07& CHE4L10	Inorganic chemistry practical III & Inorganic chemistry practical	<p>The students will be able to</p> <p>1. Quantitatively separate and estimate ions in a binary mixture using volumetric, gravimetric and colorimetric techniques.</p> <p>2. Understand solvent extraction technique.</p> <p>3. Expertise in Ion- exchange separation and estimation of binary mixtures</p> <p>4. Prepare inorganic complexes.</p>
	CHE3L08& CHE4L11	Organic chemistry Practical III & Organic chemistry	<p>1. Students develop skill in the estimation of reducing sugar, amino group, phenolic group and esters volumetrically.</p> <p>2. Students develop skill in the estimation of vitamin C, drugs and anti-biotics colorimetrically.</p>

		Practical IV	3.Students develop skill in the estimation the extraction of natural products and purification by column chromatography and TLC
			4.Students develop skill in the preparation of chromatographic plate and chromatographic paper for the separation and identification of various organic compounds.
			5. Students develop skill in theTLC plate activation and identification of compoundsdyes, food additives, food colours, amino acids, sugars, pesticides and herbicides
	CHE3L09& CHE4L12	Physical chemistry practical III & Physical chemistry practical IV	The students are expected to
			1.Verify experimentally the fundamental concepts related to kinetics
			2.Understand ,apply and verify various adsorption isotherms related to adsorption from solution
			3. Construct phase diagram for three components systems
			4. familaralize computational chemistry programme firefly and apply the programmes for the calculation of energy ,prediction of geometry,frequency etc

