DEPARTMENT OF CHEMISTRY

Programme Specific Outcomes (PSOs) – M. Sc Chemistry Programme

	Programme specific outcomes
PSO1	Provide theoretical background and develop practical skills for analysing materials using modern analytical methods and instruments.
PSO2	Inculcateaproblemsolvingapproachbycoordinatingthedifferentbranchesof chemistry.
PSO3	Becomesprofessionallyskilledforhigherstudiesin researchinstitutionsandtowork in chemicalindustries
PSO4	In-depthknowledgehelpstoqualifyincompetitiveexams

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	Programme specific outcomes
PSO1	Development of skills on using softwares like Gaussian, Gamessetc which is useful in molecular modeling, drug designing, etc.
PSO2	Development of skills on using softwares like Chemdraw, Chemwindow, ISIS draw, etc which is useful in drawing purposes, structural predictions, etc.
PSO3	Training on computational chemistry
PSO4	Case study and analysis on any relevant issues in the nearby society(for example water analysis, soil analysis, acid/alkali content analysis, sugar content analysis, etc)
PSO5	Community linking programme relevant to the area of study(For example Training for society on soap/perfume making, waste disposal, plastic recycling, etc)

Course Outcomes

Semester	Course Code	Course Name	Course outcomes
I	CHE1C01	Quantum Mechanicsand Computational Chemistry	• CO1:Explainatomicstructurebasedonquantummechanicsand explain periodicproperties of the atoms
			• CO2:Understand the concept of quantummechanics
			• CO3: Solve theproblems related to 1D box
			• CO4:Explain role ofoperators in quantum
			• CO5:Understand the concept of Computational Chemistry
			• CO6:Detaileddiscussion of postulates of quantum mechanics– State function or wave function postulate, Born interpretation of the

			wave function, well behaved functions, ortho normality of wave functions
			• CO7:Understand Quantum Mechanics of Translational & Vibrational Motions
			• CO8:Explain the ApproximationMethods inQuantumMechanics
			• CO9:Simple calculations using Gaussian programme
			• CO10:ClassificationofComputationalChemistry methods
I	CHE1C02	Elementaryinorganic chemistry	• CO1:Explaindifferentacidbasetheories
			• CO2:Classificationofacidsandbasesashardand soft.
			• CO3:Chemistryofnonaqueoussolvents
			• CO4:Understand NuclearandRadiationChemistry
			• CO5: **S**tudy of Chemistry ofNanomaterials
			• CO6:Chemistry of Transition and Inner Transition Elements
			• CO7: Structure of Zeolites and use of Zeolites as molecularsieves
I	CHE1C03	Structure and reactivityof organicCompounds	• CO1:Understand the Structure and Bonding in Organic Molecules
			• CO2:Preparation of aromatic and antiaromatic compounds
			• CO3:Describereaction mechanism of organic reactions and various reaction intermediates
			• CO4: ConformationalAnalysis
			• CO5: Asymmetric Synthesis
			• CO6:Explain optical isomerism of compounds that do not contain an asymmetric carbon atom.
I	CHE1C04	Thermodynamics, kinetics, and catalysis	• CO1:To understand the concepts of thermodynamics and it'srelation to statistical thermodynamics.
			• CO2:Understand Thermodynamics of Solutions
			• CO3:Understand Thermodynamics of Irreversible Processes
			• CO4:Study the Kinetics of reactions involving reactive atom sand free radicals
			• CO5:ExplainRice-Herzfeld mechanism and steady state approximation
			• CO6:Explain Principle of crossed molecular beams

I	CHE1L01 & CHE2L04	Inorganicchemistrypractical I&II	• CO1 **:** An ability to analyse the cation mixture
			• CO2:Ability to estimate the ions by complex ometric titrations
			• CO3Ability to estimation of compounds by intensity of colour using colorimetric methods
I	CHE1L02 & CHE2L05	Organic chemistry Practical I&II	• CO1- Familiarize the methods for the Separation and Purification of Organic Compounds
			• CO2-Ability to Separate and identify the components of organic binary mixtures
I	CHE1L03 & CHE2L06	Physical chemistry practical I &II	• CO1 :To enable the students to develop analytical skills in determining the physical properties (physical constants).
			• CO2:To develop skill in setting up an experimental method to determine the physical properties
			• CO3:To understand the principles of Refractometry, Potentiometry and Conductometry.
II	CHE2C05	Group Theory and Chemical Bonding	• CO1: To understand the foundations ofGroup Theory & Molecular Symmetry
			• CO2:Familiarise the Representations of Point Groups& Corresponding Theorems
			• CO3: Enable the students to applyGroup Theory to Molecular Spectroscopy and Chemical Bonding
			• CO4: Study of Chemical Bonding in diatomic and polyatomic molecules.
II	CHE2C06	Coordination chemistry	• CO1:To predict the stability of Coordination Compounds by various effects.
			• CO2: Explain various theories of Bonding in Coordination Compounds
			• CO3:Demonstrate the Electronic Spectra and Magnetic Properties of Complexes
			• CO4:Characterization of Coordination Complexes
			• CO5: To elucidate Reaction Mechanism of Metal Complexes
II	CHE2C07	Reaction mechanism in Organic Chemistry	• CO1:To understand aliphatic and aromatic, nucleophilic and electrophilic substitution with mechanism and kinetics
			• CO2:To develop an ability to understand addition and elimination reactions with mechanism and stereo chemical aspect

			• CO3:To understand the competition between substitution and elimination reactions according to the conditions of reagents and substrate
			• CO4 : Students will be able to understand all the nucleophilic condensations reactions of carbonyl compounds
			• CO5 : To impart the students in depth knowledge about the basic concepts and theory of pericyclic reactions and to get an idea about the orbital overlap in chemical reaction
			• CO6 : To enable the students to acquire proper knowledge about photochemical reactions with mechanism
			• CO7 : The students will be able to understand acyl-oxygen and alkyl-oxygen bond fission in ester hydrolysis according to the conditions.
II	CHE2C08	Electrochemistry, solid state chemistry, and Statistical Thermodynamics	• CO1:Describe Debye –Huckel equation , limiting and extended forms
			• CO2:Calculate effect of ionic strength on ion reaction rates
			• CO3:Compare the efficiency of electro chemical cells with heat engines
			• CO4:Explain the advantages and limitations of lead-acid, Ni-Cd and Ni-MH cells.
			• CO5:State the different theories of Hydrogen over voltage
			• CO6:Explain Polarography and dropping mercury electrode
			• CO7:Explain symmetry elements, symmetry operations and crystal systems.
			• CO8:Derive Braggs equation and explain the applications
			• CO9 :Explain the stoichiometric and non stoichiometric defects in crystals
			• CO10 :Explain Maxwell Boltzman statistics
			• CO11 :Explain classical and quantum theories of heat capacities of solids and Einstein's theory of atomic crystals
			• CO12 :Explain the relationship between Maxwell-Boltzman, Bose-Einstein and Fermi Dirac statistics

III	CHE3C09	Molecularspectroscopy	• CO1:To understand the theory and application of rotational spectra of diatomic and polyatomic molecules
			• CO2: To study the principle and major theories of vibrational,electronic and raman spectroscopy.
			• CO3:To study chemical shift,coupling , ,shielding and desheilding in NMR specrtoscopy
			• CO4:To understand the basic principles of ESR and Mossbauerspecroscopy
			• C05 :To study CD and ORD.Also basic ideas of vibrational spectroscopy
			• CO6:To study interpretation of NMR spectra of organic molecules
			• CO7:To understand the advanced NMR techniques
			• CO8 :To study the principle behind Mass spectroscopy as well as Structural determination of organic compounds using spectroscopic techniques
III	CHE3C10	Organom-etallic & Bio-inorganic chemistry	• CO1:Toillustratethe use of 18 and 16 electron rule .also to study the properties and synthesis of metal carbonyls
			• CO2:Tostudy the structure and synthesis of Organometallic Compounds of Linear and Cyclicπ- Systems
			• CO3:To study major Organometallic Reactions and Catalysis
			• C04:To account the structure of carbonyl clusters using electron count rules
			• CO5:To understand electron transport in biological systems
			• CO6:To study Metallo enzymes and electron carrier metallo proteins.
III	CHE3C11	Reagents and Transformations in Organic Chemistry	• CO1:To study different types of reagents used for oxidation and mechanism of oxidations
			• CO2:To study different types of reagents used for reduction and mechanism of reductions
			• CO3:To study the applications of some specifc reagents
			• CO4:To study the structure and synthesis of protein, DNA and RNA
			• CO5:To understand the basics of Hetero cyclic chemistry and supramolecular chemistry

			• CO6:To study different types of rearrangement reactions
III	CHE3E01	Synthetic organic chemistry(Elective)	• CO1:Toundertand the use of Reagents forOxidationandReduction
			• CO2:To study Synthetic applications of organometallic and organo-nonmetallic reagents including Reagents based on chromium,nickel, palladium,silicon, andborn
			• CO3:To understand and study the named Reactions ofcarbonylgroupsin aldehydes,ketones, carboxylic acids, esters, acyl halides, amides.
			• CO4:To study different Coupling Reactions
			• CO5:TO understand how to carried out a multy step synthesis
			• CO6:Generalprinciplesof retrosynthetic analysis. Synthons and reagents, donor and accept or synthons, umpolung, protecting group chemistry and functional group interconversions
IV	CHE4C12	Instrumental Methods ofAnalysis	• CO1:To treat Statistical data by f-test,t- test and q test
			• CO2:To understand different analytical techniques
			• CO3:To understand potentiometry,ion selective electrodes & polarography
			• CO4:To study the principle behind amperometry,coulometry and anodic stripping voltammetry
			• CO5:To study the instrumentation of spectrophotometry, nephelometry and turbidometry, fluorimetry, UV-visible, IR spectrophotometry AES and AAS
			• CO6:To study the Theory,instrumentationandapplicationsof:- Atomicfluorescencespectrometry,X-ray methods-X-rayabsorption and X-raydiffraction,photoelectronspectroscopy,Auger, ESCA. SEM, TEM, and AFM
			• CO7:To study the Theory, instrumentation and applications of TG,DTA,DSC ,and thermometric titrations
			• CO8:To understand the principle and applications of different chromatographic techniques

IV	CHE3L7 & CHE4L10	Inorganic ChemistryPractical III &IV	• CO1:To familiarize the Estimation involving quantitative separation of suitable binary mixtures of ionsin solution by volume tricolor imetricor gravimetric methods .
			• CO2:To understand Colorimetric estimations of Ni,Cu,FeandMo,after separation from other ions insolution by solvent extraction
			• CO3:To understand how to determine the Hardness ofwater
			• CO4: Preparation of inorganic complexes
IV	CHE3L8 & CHE4L11	Organic Chemistry Practical III & IV	• CO1:To study the Determination of Acid value,iodine value and saponification value of oils
			• CO2:To study how to Extract chlorophyll by TLC
			• CO3:Practicalapplication of PC and TLC, preparation of TLC plates, activation, identification of the following classes of compounds using one-and two-dimensional techniques. Identificationby usingsprayreagents
IV	CHE3L9 & CHE4L12	Physical ChemistryPractic alIII & IV	• CO1:Determination of specific reaction rate and Arrhenius parameter of of acid hydrolysis of anester (methylacetateor ethyl acetate) and concentration of the given acids.
			• CO2:Verification of Langmuir adsorption isotherm
			• CO3:Determination of phase diagram of aternary liquid system
			• CO4:Determination of molecular mass of absolute (urea,glucose,canesugar,mannitol)by studying the depression in freezing point of a liquid solvent (water, benzene)
			• CO5:Determination of specific rate of inversion of cane sugar in presence of HCL.
			• CO6:Investigation of complex formation between Fe(III)and thiocyanate.
			• CO7:Single point energy alculations of simple molecules like H_2O and NH_3 at the HF/3-21G level of theory.

IV	CHE4E06	Naturalproducts& PolymerChemistry (Elective)	• CO1:To understand the Classification and isolation of Natural Products & essential oils
			• CO2:To study the the Classification and structure elucideation of some terpenoids and steroids
			• CO3:To study the the Classification and structure elucideation of alkaloids and flavanones
			• CO4:To understand different types of dyes and pigments
IV	CHE4E08	Organometallic Chemistry	• CO1:To understand main group and transition metal organometallics
			• CO2:To study Bonding and reactions of metal carbonyls
			• CO3:To study the synthesis, Structure, reactivity and applications of main group or ganometallic compounds. Metalcomplexes of NO,H_2,CS,RNC and Phosphines Metalcarbenes and carbynes
			• CO4:To study the structure &bonding of organometallic pi complexes
			• CO5:To understand the Applications of organometallic compounds inorganic synthesis and homogeneous catalysis
			• CO6:To study different organometallic reactions
			• CO7:To understand the application of organometallic compounds in heterogeneous catalysis
			• CO8:To study about organometallic polymers
IV	CHE4P01	Research Project	• CO1:To understand the scientific methods of research project.
			• CO2:To apply the scientific method in life situations.
			• CO3:To analyse scientific problems systematically.