AQAR – QUALITATIVE METRIC

2022 – 2023

Criterion 1 - Curricular Aspects

1. 1 -Curricula developed and implemented have relevance to the local, national, regional and global developmental needs which is reflected in Programme outcomes (POs), Programme specific outcomes (PSOs) and Course Outcomes (COs), of the Programmes offered by the Institution.

NAME OF THE PROGRAMME: M.SC CHEMISTRY

Programme Outcomes:

PO1	Firm hold and sound footing in theoretical and practical aspects of Chemistry
PO2	An overall comprehensive and an in-depth knowledge and equip learners to possess global competency
PO3	Diversified branches with deep rooting cultivate research aptitude that leads to innovative findings
PO4	Informative but application oriented inputs
PO5	Enhanced chances to take up careers in industries and other pivotal sector.

PO6	Rigorous training to tackle challenges in the academic and societal need based fields
PO7	Opportunity to be exposed to the current emerging trends in the field of Chemistry through activities such as workshops, seminars and projects.

Programme Specific Outcomes:

PSO 1	Equipped with an in-depth knowledge of varied fields namely Organic Chemistry, Inorganic Chemistry , Physical and nanochemistry.
PSO 2	Training in problem solving procedures enables to interpret the experimental data into structures and mechanisms.
PSO 3	Provides a tremendous exposure and cultivates analytical and synthesising measures necessary to take up project work in reputed institutions.
PSO 4	Programme renders diversified thinking thereby promotes creative skills.
PSO 5	Directed to solve the problems that cause a negative impact on surroundings to pursue salient steps to safeguard environment.
PSO 6	Application-oriented input sharpens the skill to undertake CSIR-NET exam.
PSO 7	Knowledge with practical dimensions becomes a driving power to undertake research in different

	areas At a global level.
PSO 8	Multi-layered input enables to avail opportunities at chemical, pharmaceutical industries.
PSO 9	Becomes a contributing force and development agent in society.

Course Outcomes:

Course Code	**Course Title**	**Nature of the Course (Local/National/Regional/Global)**	**Course Description**	**Course Outcomes**
19PG1C1	Inorganic Chemistry-I	Global	This course deals with the theories of bonding with the knowledge of the periodic properties of elements and the	CO1: To analyse all chemical species involved in organic and Inorganic reactions and to identify those as acid and bases. CO2: To classify the bonds as ionic and covalent and to compare the theories.

			various processes involved in nuclear Chemistry, reactors and the usefulness of radio isotopes.	CO3: To categorize the solid systems, to calculate the lattice energy and draw conclusions on their stability. CO4: To predict the structures and magnetic properties of Inorganic compounds. CO5: To gainindepth knowledge of nuclear reactions, reactors and the applications of radio isotopes in all fields.
19PG1C2	Organic Chemistry-I	Global	This paper focuses on all the important aspects of organic chemistry like	CO1: To interpret the concept of aromaticity and the main properties of aromatic compounds.

			aromaticity, reaction intermediates,chirality and heterocyclics.	CO2: Toexplore reactivity patterns of conjugated ,aromatic molecules and to evaluate the kinetics and thermodynamicscontrolled reactions. CO3: To define the fundamentals of chirality, prochirality, symmetry elements and applications of atropisomers. CO4: To comprehend of nucleophiles, electrophiles, electronegativity, and resonance CO5: To sketch the preparation and propertiesof heterocyclic compounds.

19PG1C3	Physical Chemistry-I	Global	This course gives detailed account of all the important concepts of electrochemistry and statistical thermodynamics.	CO1: To gain knowledge Kohlrausch's law and electrolytic conductance, Calculate the molar conductance ,degreeof dissociation and electrical potentialPossess thorough understanding of Debye-Huckel equation. CO2: To gain knowledge of Electrocatalysis andElectrosynthesis. CO3: Describe indetail about the three laws ofthermodynamics. CO4: Restate in their own words about theconcept of distribution, thermodynamicprobability and most

				probable distribution CO5: Correlate and explain the partial molarproperties, chemical potential
19PG1C4	Inorganic Qualitative Analysis	Global	This paper gives hands on experience of Qualitatively analysing the inorganic salts containing simple and rare earth metal cations.	CO1: To study the principle of distribution ofcommon and rare metal ions in different groups. CO2: To know the inter- and intra grouppprecipitation and separation of metal ions. CO3: To improve the skill in the qualitative analysis of rare metal ions in differentgroups. CO4: To identify the methodology to analyse ametal ion in the presence of another metalion.

19PG1C5	Organic Qualitative Analysis& Preparation-I	Global	This course gives hands on experience of qualitatively analyzing organic compounds and to synthesis simple organic compounds.	CO1: To be skilled in the separation of binaryorganic mixtures. CO2: To gain knowledge on the skills of doingmicro level analysis. CO3: To know the methods of qualitativeanalysis of organic compounds CO4:To learn about the preparation of suitablederivative of the organic functional groups CO5: To prepare organic compounds.
21C1EDC	Analysis Of Soil, Water,	Regional	This paper is an inter disciplinary optional	CO1: Acquire the complete knowledge of

	Food,Cosmetics And Oil		paper focuses on all the important aspects of theory about soil, water, food chemistry, cosmetics andoil.	soil and its texture CO2: Develop idea about water and its treatment CO3: Idetify different types of food colour, aditives and food adulterants CO4: Learn the ingredients required for the preparation of various types of shampoos, skin powder, nail polish. CO5: Understand the need of detoxification of oil and various adulterants present in oil.
19PG2C6	Inorganic Chemistry-II	Global	This paper enables the students to	CO1: Compare the stabilities of complexes using stability constants and to identify the types of isomers

			understand the chemistry of complexes and their characterization and reaction mechanisms.	CO2: To describe the theories of co-ordinationcompounds to understand the colours andmagnetic properties and their position inthe spectrochemical series CO3: Investigate the structures of complexes using IR,NMR , ESR and other spectral techniques. CO4: Possess a thorough understanding of electronic spectra of complexes. CO5: To arrive at the mechanisms of substitution reactions in six and four coordinated complexes using kinetic studies

19PG2C7	Organic Chemistry-II	Global	This course enables the students to get a thorough knowledge of elimination and addition reactions, conformational analysis and selective organic name reactions and rearrangements, study of organic spectroscopy and their applications in structural elucidation of organic compounds.	CO1: To comprehend the mechanism of elimination and substitution reactions and to apply the stereochemistry in E1, E2,ionic and pyrolytic eliminations. CO2: To interpret the concept of nucleophilic and free radical addition reactions andmetal hydride reduction and todiscriminate the reactivity of organometalicreagents. CO3: To explore reactivity patterns of Substitutedcyclohexanes and to employconformational reactivity in cis and transdecalins and to apply conformations in SN1, SN2, ionic, pyrolytic eliminations and NGP

				reactions. CO4: To acquire a complete knowledge of the principles of UV, IR spectroscopy and toexamine the various functional groupspresent in organic molecules using λmax and IR frequency values . CO5: To differentiate the molecular rearrangements and to solve the simple problems and to recall the various naming reactions and to interpret the products.
19PG2C8	Physical Chemistry-II	Global	This paper provides an extensive study of the topics such as Chemical kinetics	CO1: To acquire knowledge about the basic concepts of chemical kinetics CO2: To identify and analyze the effect of physical parameters μ, D on rate of

			and Quantum mechanics.	reaction CO3: To derive rate constant for reactions usingLindemann, Hinshelwood, RRK, RRKM Theories. CO4: To develop a knowledge and understanding of the concept Normalisation and orthogonalisation and to solve Schrodinger wave equation for particle in a one dimensional box, three dimensional box and Rigid rotator. CO5: To apply variation and perturbation method to He atom.
19PG2C9	Inorganic Quantitative Analysis	Global	This course gives training to prepare inorganic complexes	CO1: To enable the students to acquire the quantitative skills in volumetric analysisand gravimetric analysis

			in a pure form and to estimate metal ions present in the solution.	CO2: To improve the skill in quantitative estimation of metal ions by various titricmethods. CO3: To identify the methodology to estimate a metal ion in the presence of another metal ion. CO4: To be skilled in synthesis of inorganiccomplexes.
19PG2C10	Organic Estimation & Preparation-II	Global	This course gives hands on experience of quantitatively analyzing organic compounds and to synthesis organic	CO1: To develop the ability for synthesizing organiccompounds by single stage. CO2: To develop the ability for synthesizingOrganiccompounds by double stage.

			compounds using two stages.	CO3: To study the reaction mechanism.
21C2EDC	Analysis Of Soil, Water, Food,Cosmetics And Oil	Regional	This paper is an inter disciplinary optional paper focuses on all the important aspects of theory about soil, water, food chemistry, cosmetics andoil.	CO1: Acquire the complete knowledge ofsoil and its texture. CO2:Develop idea about water and its treatment. CO3: Idetify different types of food colour, aditives and food adulterants. CO4: Learn the ingredients required for the preparation of various types of shampoos, skin powder, nail polish. CO5: Understand the need of detoxification of oil and various adulterants present in oil.

19PG3SICI	Internship	Global	This paper is designed to increase the problem solving, critical thinking and analytical reasoning skill of students.	CO1: To carry out scientific experiments CO2: To accurately record and analyze the results of such experiments.
19PG3C11	Organic Chemisty-Iii	Global	This paper provides an elaborate study of organic spectroscopy and their applications in structural elucidation of organic compounds. This paper also deals with reactions that	CO1: To acquire a complete knowledge of the basic principles of 1H-NMR, 13C-NMR and Mass spectroscopy CO2: To be acquainted with complete knowledge of photochemistry of ketone &cyclo addition reactions and to develop an understanding of the significance of the number, and splitting of signals in NMR

			are taking place under photochemical conditions and pericyclicreactionsan dterpenoids.	CO3: To be competent to assign structures to simple molecules on the basis of nuclear magnetic resonance spectra CO4: To distinguish the similarities and differences of Pericyclic reactions and Cyclo addition and sigmatropic reactions CO5: To apply the Spectral concepts to solve the problems, to elucidate the structures of simple organic compounds using the data from all the spectral techniques
19PG3C12	Physical Chemistry-III	Global	This course covers the detailed study of	CO1: To learn about symmetry elements and symmetry operations, the point

			group theory and its application and also covers the principles of surface chemistry, and a brief study of macromolecules.	groups and character table CO2: To Describe the selection rule for infrared-active and Raman active transitions, electronic transitions CO3: To analyse the hybridization of given compounds and to apply HMO theory to Ethylene and some conjugated systems CO4: To Classify of surface active agents, Polymers, and to derive Gibbs adsorption and BET isotherms CO5: To explain the kinetics of vinyl, cationic and anionic polymerizations and to determine the mass of polymers.

19PG3C13	Green Chemistry	Global	This course deals with principles of green chemistry, environmental performance, alternative energy sources and greener technologies.	CO1: To know about the alternative feedstock and to study about the process and advantages of alternative materials CO2: To get familiarise about the green chemistry technology CO3: To understand the need of alternative energy sources CO4: To learn different types of renewable energy sources CO5: Toacquire knowledge about the greener techniques in industries

19PG3CE1	Material Chemistry	Global	This course deals with study of synthesis, properties, structure and applications of nano particles.	CO1: To gain knowledge about the basic principles of nanochemistry and classification of nanomaterials. CO2: To describe several synthesis of inorganic nanoparticles, one-dimensional nanostructures (nanotubes, nanorods, nanowires), thin films, nanoporous materials, and nanostructured bulk materials, CO3: To criticize the importance of various instrumentation techniques such as NMR, IR, UV, X-ray diffraction, ESR etc., for elucidating the structures

				of nanomaterials. CO4: To depict the structure of carnonnanoatructures, organic nanopolymers and supra molecular structures CO5: To recognize the important role of nanomaterials in various fields.
19PG3CE2	Bio-Organic Chemistry	Global	This paper deals with the molecular drug designing, classification of proteins, enzymes	CO1: Understand concepts of molecular recognition and drug design CO2: Remember the synthesis and structure of Proteins and amino acids. CO3: Know the extraction and purification of enzymes and their

				application in catalysis. CO4: Categorize and analyze enzyme mechanisms. CO5: Analyze the structure and biological functions of Coenzymes.
19PG4C14	Physical Chemistry Practicals-I	Global	This course gives lab experience on physical experiments	CO1: Developed expertise relevant to the professional practice of chemistry CO2: Developed an understanding of the breadth and concepts of physical chemistry CO3: An appreciation of the role of

				physical chemistry in the chemical sciences and engineering CO4: Developed an understanding of the role of the chemist and chemical engineer in tasks employing physical chemistry CO5: An understanding of methods employed for problem solving in physical chemistry
19PG4C15	Inorganic Chemistry-III	Global	This course covers the structure and Bonding of organ metallic compounds and basic concepts of bioinorganic	CO1: Illustrate the structure and mode of bonding in organometallic complexes CO2: Apply the different electron counting procedures to predict the shape and stability of organometallic

			compounds	complexes CO3: Illustrate the mechanism of dioxygen binding in various oxygen carrier proteins CO4: Classify and identify the different types of metalloenzymes and metallo proteins based on their biological functions. CO5: Interpret the structure of borazines, boranes and carboranes.
19PG4C16	Organic Chemistry-IV	Global	This course paper deals with types of synthetic compounds, basic	CO1: To differentiate the carbon –carbon bond forming reactions and to interpret the products and to explore reactivity patterns of various coupling reactions

			concepts of photochemistry, nucleic acids and steroids	CO2:To elucidate the structural units of quinine, morphine, □-pinene and □-codinene CO3:To correlate the skeletal units of nucleotides and nucleosides- RNA and DNA CO4:To categorize the reducing and oxidizing agents and its applications. CO5:To Sketch the effective and logical synthetic route for the synthesis of new molecules
19PG4C17	Physical Chemistry-IV	Global	This paper deals with many	CO1: Describe the structure and mode of bonding in organometallic complexes

			spectroscopic techniques like Microwave, IR, Raman and Photoelectron, ESR, NQR and Mossbauer.	containing carbonyls, nitrosyls, carbenes, carbynes, alkenes, alkynes and also metallocene complexes CO2:Apply different electron counting procedures to predict the shape and stability of organometallic complexes CO3: Illustrate the mechanism of dioxygen binding in various oxygen carrier proteins CO4:Classify different types of metalloenzymes and metallo proteins based on their biological functions. CO5:Distinguish whether the given compound belongs to chain or ring or

				cage or cluster
19PG4CE3	Analytical Chemistry	Global	This course deals with chromatographic techniques, spectroscopic methods, applications of C-programms in chemistry	CO1: To acquire the complete knowledge of C language CO2: To develop logics which will help them to create programs, applications of chemistry problems in C. CO3:To explicate the theoretical principles of selected instrumental methods within electro analytical and spectrometric/spectrophotometric methods, and main components in such analytical instruments. CO4:To explain the confidence level and confidence limit, the sources of random

				errors and effects of random errors on analytical results. CO5:To illuminate the theoretical principles of various separation techniques in chromatography, and typical applications of chromatographic techniques
19PG4CE4	Chemical Engineering	Global	This paper deals with analytical methods. It also deals with programming in C language and its applications to solve problems in chemistry	CO1: To write C- Program using various features of C- language CO2: To categorize the various conditioning methods in water treatment CO3:To apply the principles involved in spectrophotometric analysis.

				CO4:To compare the mechanism between dry corrosion and wet corrosion CO5:To synthesize some industrially important polymers
19PG4C18	Physical Chemistry Practicals- II	Global	This lab course is course gives lab experience on physical experiments	CO1: Experience in some scientific methods employed in basic and applied physical chemistry CO2: Developed skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry CO3: Developed skills in the scientific method of planning, developing,

				conducting, reviewing and reporting experiments CO4: Developed some understanding of the professional and safety responsibilities residing in working with chemical systems.
19PG4CPR	Project	Global	This paper is designed to increase the skill of students in problem solving, critical thinking and analytical reasoning as applied to scientific problems	CO1: To carry out scientific experiments CO2: To accurately record and analyze the results of such experiments.