MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA

A College with Potential for Excellence

NAAC Accredited & ISO 21001: 2018 Certified

PROGRAMME REGISTER: 2023-26

DEPARTMENT OF CHEMISTRY

INDEX

PROGRAMME OUTCOMES
(POs) 2023-26

Students of all Undergraduate Programmes at the time of graduation will be able to possess

PO1: Essential Knowledge:

Have comprehensive discipline knowledge and understanding, the ability to engage with different schools of thought and to apply their knowledge in practice including in multidisciplinary or multi-professional contexts.

PO2: Creative, Critical Thinking and Problem-Solving Abilities:

Be effective problem-solvers, able to apply critical and evidence-based thinking to conceive innovative responses to future challenges.

PO3: Teamwork and Communication Skills:

Convey ideas and information effectively to a range of audiences for a variety of purposes and contribute in a positive and collaborative manner to achieving common goals.

PO4: Motivated, Self-directed, and Life-long Learning:

Exhibit life-long skills; broad-based multiple career oriented general skills; self and field-based learning skills; digital skills; preparedness for living, learning and working in any environment.

PO5: Professionalism and Leadership Readiness:

Engage in professional behaviour and have the potential to be entrepreneurial and take leadership roles in their chosen occupations and communities.

PO6: Intercultural and Ethical Competency:

Be responsible and effective global citizens whose personal values and practices are consistent with their roles as responsible members of society.

PO7: Self-awareness and Emotional Intelligence:

Be self-aware and reflective, flexible and resilient and act with integrity and take responsibility for their actions as empowered women.

PO8: Social Responsibility and Effective Citizenship:

Exhibit social responsibility and compassionate commitment; Be sensitive to and demonstrate institution in matters of environment, gender and other social issues to promote an equitable society and sustainable development.

PROGRAMME SPECIFIC OUTCOMES

(PSOs) 2023-26

At the end of the programme students will be able to possess/exhibit:

PSO1: Quantitative Analysis:

Interpret principles, classifications, concepts, theories and mechanisms learnt.

PSO2: Practical and Analytical Skills:

Analyse hypotheses, procedures, properties, experimental facts and draw conclusions.

PSO3: Logical and Critical Thinking:

Apply knowledge and techniques in sample analysis, problem-solving, results, and production.

PSO4: Teamwork and Communication:

Develop communicative competence, creative and critical thinking, practical, technical and employability skills, social sensibility and responsibility.

Course Outcomes

(COs) 2023-26

S.No.	Sem	Course Code	Course Title	Course Outcomes (COs)
1	I	23SCCCEA14	Essentials and Applications of Mathematical, Physical & Chemical Sciences	**CO1:** Apply mathematical principles to solve various problems across complex numbers, trigonometry, vectors, and statistical analysis involving data sets.
				CO2: Summarize key physics principles, including measurements, motion, thermodynamics, wave behaviour, electromagnetism, atomic structure, and theories of the universe.
				CO3: Outline the fundamental concepts of chemistry and their relevance in daily life.
				CO4: Elaborate the interconnectedness of math, physics and chemistry and explain how they predict phenomena in diverse contexts.
				CO5: Discuss about computer evolution, including the internet, network types and understand ethical issues in network security, cryptography, privacy and data protection.
2	I	23SCCCAS14	Advances in Mathematical Physical & Chemical Sciences	**CO1:** Identify the applications of mathematics in physics and chemistry to solve real-world problems.
				CO2: Explain renewable energy generation, storage, energy-efficient materials and recent advancements in nanotechnology, biophysics, medical physics, and materials science.
				CO3: Outline computer-aided drug design, Nano sensors, chemical biology, the impact of chemical pollutants on ecosystems and human health, and methods for dye removal using catalysis.
				CO4: Elaborate the interconnectedness of math, physics and chemistry and apply these principles to explain phenomena in diverse contexts.
				CO5: Summarize the advanced computer science topics, such as number systems, signals, error detection and correction, multiplexing, transmission media, and networking devices.
3	I	23MDCCS12	Principles of Chemical Sciences	**CO1**: Outline the classification, principles, theories and nuclear reactions of atoms and molecules

				CO2: Classify and study the bonding, periodic properties of elements.
				CO3: Explain the types and properties of salts, importance of chemistry in daily life.
4	II	23CHCCGI23	General & Inorganic Chemistry	**CO1:** Outline the structure of atom, electronic configuration, classification of elements and periodic properties
				CO2: Explain properties, lattice energy and stability of ionic compounds.
				CO3: Summarize the concepts, theories of bonding and molecular structures
				CO4: Understand theories of acids and bases and types of chemical reactions
				CO5: Solve concept-based problems
5	II	23CHP1AS21	Qualitative Analysis of Simple Salt - Practical	**CO1:** Analyze simple salt by adapting systematic procedure
				CO2: Apply the concepts of common ion effect, solubility product to qualitative analysis
				CO3: Use glassware, equipment, chemicals and follow experimental procedures in the laboratory.
6	II	23CHCCIC23	Inorganic Chemistry I	**CO1:** Outline classification, preparations and molecular structures of listed compounds of p-block elements
				CO2: Elaborate the characteristic properties of d and f – block elements.
				CO3: Explain the fundamental concepts of radioactivity, nuclear reactions and applications
				CO4: Solve concept-based problems
7	II	23CHP2IC21	Inorganic Chemistry I - Practical	**CO1**: Prepare the listed inorganic compounds applying standard procedures.
				CO2: Determine melting point of the given compound.
				CO3: Use glassware, equipment, chemicals and follow experimental procedures in the laboratory.
8	III	23CHCCFO33	Fundamentals in Organic Chemistry	**CO1:** Explain the organic reagents, intermediates, electron displacement concepts and their applications.

				CO2: Outline the preparations, physical and chemical properties of alkanes, cycloalkanes, alkenes, alkynes
				CO3: Summarize the mechanisms of certain chemical reactions
				CO4: Discuss the concept of aromaticity, orientation of substitution with relevant examples.
				CO5: Solve concept-based problems
9	III	23CHP3OA31	Organic Qualitative Analysis - Practical	**CO1:** Adapt systematic procedure and perform organic compound analysis to identify the organic functional group and name of the compound.
				CO2: Determine the boiling/melting point of the given organic compound.
				CO3: Use glassware, equipment, chemicals and follow experimental procedures in the laboratory.
10	III	23CHCCOC33	Organic Chemistry (Halogens & Oxygen Organic Compounds)	**CO1:** Outline the preparations and properties of alkyl, aryl halides, alcohols and phenols.
				CO2: Summarize the preparative methods and characteristic reactions of carbonyl compounds, carboxylic acids and active methylene compounds.
				CO3: Discuss the molecular structure, physical and chemical properties of carbohydrates.
				CO4: Write the listed mechanisms and named reactions
				CO5: Solve concept-based problem
11	III	23CHP4OP31	Organic Preparations - Practical	**CO1:** Perform organic synthesis for the compounds mentioned in the syllabus.
				CO2: Execute common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.
				CO3: Use glassware, equipment, chemicals and follow experimental procedures in the laboratory.
12	III	23CHCCPC33	Physical Chemistry I (Solutions & Electrochemistry)	**CO1:** Elucidate the concepts and laws pertaining to behaviour of liquid solutions.
				CO2: Outline the colligative properties and determination methods of molar mass.
				CO3: Explain various photo processes and the laws of photochemistry.
				CO4: Summarize the electrochemical concepts and their applications in electro analytical techniques.
				CO5: Solve concept-based problems

13	III	23CHP5PC31	Physical Chemistry I - Practical	**CO1:** Determine CST of Phenol-water system and examine the effect of electrolyte on CST.
				CO2: Perform potentiometric and conductometric titrations for quantitative estimations.
				CO3: Use glassware, equipment, chemicals and follow experimental procedures in the laboratory.
14	III	23CHCCIP33	Inorganic & Physical Chemistry	**CO1:** Summarize the theories of bonding and isomerism of complex compounds.
				CO2: Elaborate the inorganic reaction mechanism and stability of metal concepts.
				CO3: Outline the classification of organometallic compounds and discuss the metal carbonyls.
				CO4: Explain the concepts and laws of thermodynamics and deduce thermodynamic relations.
				CO5: Solve concept-based problems
15	III	23CHP6IA31	Qualitative Inorganic Analysis - Practical	**CO1:** Analyze Mixture salt by adapting systematic procedure
				CO2: Apply the concepts of common ion effect, solubility product to qualitative analysis
				CO3: Use glassware, equipment, chemicals and follow experimental procedures in the laboratory.
16	IV	23CHCCPC43	Physical Chemistry II (States of Matter, Phase Rule & Surface Chemistry)	**CO1:** Summarize the theories of bonding and isomerism of complex compounds.
				CO2: Elaborate the inorganic reaction mechanism and stability of metal concepts.
				CO3: Outline the classification of organometallic compounds and discuss the metal carbonyls.
				CO4: Apply phase rule to mentioned systems
				CO5: Solve concept-based problems.
17	IV	23CHP7PC41	Physical Chemistry II - Practical	**CO1:** Determine surface tension and viscosity of given liquids.
				CO2: Verify Freundlich adsorption isotherm.
				CO3: Use glassware, equipment, chemicals and follow experimental procedures in the laboratory.
18	IV	23CHCCGP43	General & Physical Chemistry	**CO1:** Draw molecular representations and explain the concepts of optical isomerism.
				CO2: Outline the role of metals in biological systems.
				CO3: Describe the concepts of ionic equilibrium, common

				ion effect and solubility product with applications.
				CO4: Deduce expression for rate constants, summarize theories of reaction rates and enzyme catalysis.
				CO5: Solve concept-based problems
19	IV	23CHP8VA41	Volumetric Analysis - Practical	**CO1:** Outline the theoretical and experimental aspects of volumetric analysis.
				CO2: Perform volumetric analysis for quantitative estimations.
				CO3: Use glassware, equipment, chemicals and follow experimental procedures in the laboratory.
20	IV	23CHCCOS43	Nitrogen Containing Organic Compounds & Spectroscopy	**CO1:** Elucidate the reaction mechanisms in Amines
				CO2: Outline the classification, preparations and properties of amino acids, nitro compounds
				CO3: Discuss the molecular structure, physical and chemical properties of heterocyclic compounds.
				CO4: Use UV-Visible, IR spectral data to Interpret the molecular structures of simple molecules.
				CO5: Solve concept-based problems.
21	IV	23CHP9OS41	Organic Preparations & IR Spectral Analysis - Practical	**CO1:** Prepare listed organic compounds
				CO2: Analyze IR spectra of given functional group compounds to interpret the molecular structure.
				CO3: Use glassware, equipment, chemicals and follow experimental procedures in the laboratory.

Mapping of COs with PSOs & POs

S.No.	Sem	Course Code	Course Title	COs	PSOs	POs
1	I	23SCCCEA14	Essentials and Applications of Mathematical, Physical & Chemical Sciences	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4,
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO7, PO8
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO7, PO8
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
2	I	23SCCCAS14	Advances in Mathematical Physical & Chemical Sciences	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO7, PO8
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO7, PO8
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
3	I	23MDCCS12	Principles of Chemical Sciences	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO8
4	II	23CHCCGI23	General & Inorganic Chemistry	CO1	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO2	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO3	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO4	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
5	II	23CHP1AS21	Qualitative Analysis of Simple Salt - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5

				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
6	II	23CHCCIC23	Inorganic Chemistry I	CO1	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO2	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO3	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
7	II	23CHP2IC21	Inorganic Chemistry I - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
8	III	23CHCCFO33	Fundamentals in Organic Chemistry	CO1	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO2	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO3	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO4	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
9	III	23CHP3OA31	Organic Qualitative Analysis - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
10	III	23CHCCOC33	Organic Chemistry (Halogens & Oxygen Organic Compounds)	CO1	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO2	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO3	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO4	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
11	III	23CHP4OP31	Organic Preparations - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
12	III	23CHCCPC33	Physical Chemistry I	CO1	PSO1, PSO2, PSO3	PO1, PO2, PO4

			(Solutions & Electrochemistry)	CO2	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO3	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO4	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
13	III	23CHP5PC31	Physical Chemistry I - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
14	III	23CHCCIP33	Inorganic & Physical Chemistry	CO1	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO2	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO3	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO4	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
15	III	23CHP6IA31	Qualitative Inorganic Analysis - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
16	IV	23CHCCPC43	Physical Chemistry II (States of Matter, Phase Rule & Surface Chemistry)	CO1	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO2	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO3	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO4	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
17	IV	23CHP7PC41	Physical Chemistry II - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
18	IV	23CHCCGP43	General & Physical Chemistry	CO1	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO2	PSO1, PSO2, PSO3	PO1, PO2, PO4

				CO3	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO4	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
19	IV	23CHP8VA41	Volumetric Analysis - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
20	IV	23CHCCOS43	Nitrogen Containing Organic Compounds & Spectroscopy	CO1	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO2	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO3	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO4	PSO1, PSO2, PSO3	PO1, PO2, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
21	IV	23CHP9OS41	Organic Preparations & IR Spectral Analysis - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5

Mapping of Courses with PSOs

Course Title	PSO1 Quantitative Analysis	PSO2 Practical and Analytical Skills	PSO3 Logical, Critical Thinking	PSO4 Teamwork and Communication
Essentials and Applications of Mathematical, Physical & Chemical Sciences (EA)	✔	✔	✔	✔
Advances in Mathematical Physical & Chemical Sciences (AS)	✔	✔	✔	✔
Principles of Chemical Sciences (CS)	✔	✔	✔	✔
General & Inorganic Chemistry (GI)	✔	✔	✔	✔
Qualitative Analysis of Simple Salt – Practical (AS)	✔	✔	✔	✔
Inorganic Chemistry I (IC)	✔	✔	✔	✔
Inorganic Chemistry I – Practical (IC)	✔	✔	✔	✔
Fundamentals in Organic Chemistry (FO)	✔	✔	✔	✔
Organic Qualitative Analysis – Practical (OA)	✔	✔	✔	✔
Organic Chemistry (Halogens & Oxygen Organic Compounds) (OC)	✔	✔	✔	✔
Organic Preparations – Practical (OP)	✔	✔	✔	✔
Physical Chemistry I (Solutions & Electrochemistry) (PC)	✔	✔	✔	✔
Physical Chemistry I – Practical (PC)	✔	✔	✔	✔
Inorganic & Physical Chemistry (IP)	✔	✔	✔	✔
Qualitative Inorganic Analysis – Practical (IA)	✔	✔	✔	✔
Physical Chemistry II (States of Matter, Phase Rule & Surface Chemistry) (PC)	✔	✔	✔	✔
Physical Chemistry II – Practical (PC)	✔	✔	✔	✔
General & Physical Chemistry (GP)	✔	✔	✔	✔
Volumetric Analysis – Practical (VA)	✔	✔	✔	✔
Nitrogen Containing Organic Compounds & Spectroscopy (OS)	✔	✔	✔	✔

Organic Preparations & IR Spectral Analysis – Practical (OS)	✔	✔	✔	✔

Mapping of Courses with POs

Course	PO1 Essential Knowledge	PO2 Creative, Critical thinking and Problem-solving abilities	PO3 Teamwork and Communication skills	PO4 Motivated, Self-directed and Life-long Learning	PO5 Professionalism and Leadership Readiness	PO6 Intercultural and Ethical Competency	PO7 Self-awareness and Emotional Intelligence	PO8 Social Responsibility and Effective Citizenship
EA	✔	✔	✔	✔			✔	✔
AS	✔	✔	✔	✔			✔	✔
CS	✔	✔	✔	✔				✔
GI	✔	✔	✔	✔				
AS	✔	✔	✔	✔	✔			
IC	✔	✔	✔	✔				
IC	✔	✔	✔	✔	✔			
FO	✔	✔	✔	✔				
OA	✔	✔	✔	✔	✔			
OC	✔	✔	✔	✔				
OP	✔	✔	✔	✔	✔			
PC	✔	✔	✔	✔				
PC	✔	✔	✔	✔	✔			
IP	✔	✔	✔	✔				
IA	✔	✔	✔	✔	✔			
PC	✔	✔	✔	✔				
PC	✔	✔	✔	✔	✔			
GP	✔	✔	✔	✔				
VA	✔	✔	✔	✔	✔			
OS	✔	✔	✔	✔				
OS	✔	✔	✔	✔	✔			