Sree Narayana Mangalam College Maliankara

(Affiliated to Mahatma Gandhi University, Kottayam)

PROGRAMME OUTCOME

PROGRAMME SPECIFIC OUTCOME, COURSE OUTCOME

M.Sc. CHEMISTRY

Sree Narayana Mangalam College
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At the end of the Post Graduate Program at S.N.M College, Maliankara, a student will have developed:

POST GRADUATE PROGRAMME OUTCOMES

PO1:	**Subject competence and Problem Solving:** Understanding the respective subject matter to become subject experts in the field and solve problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired from the program of study is the sole intention of this program outcome. It enables the student at viewing multiple perspectives to analyse any situation/task at hand and derive feasible solutions by optimistically approaching a problem. This inculcates independent research aptitudes and strong decision
PO2:	**Research-related skills:** A sense of inquiry and capability for asking relevant/appropriate questions, problem solving, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.
PO3:	**Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.
PO4:	**Analytical reasoning:** Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

PO5:	**Scientific Reasoning:** Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
PO6:	**Self-directed Learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.
PO7:	**Critical Thinking:** Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PROGRAMME SPECIFIC OUTCOMES

At the end of M.Sc Chemistry at S.N.M College, Maliankara, a student will have developed:

PSO1	Gains complete knowledge about all fundamental aspects of all the elements of chemistry
PSO2	Illustrate broad knowledge and understanding of fundamental and advanced concepts in different areas of chemistry.
PSO3:	Execute critical thinking and theoretical concepts for efficient problem solving and seeking solutions to difficulties that emerge in various fields of chemistry and interdisciplinary fields.
PSO4:	Apply different methodology to conduct chemical synthesis, analysis and other chemical investigation; and apply appropriate understanding.
PSO5:	Ability to identify, design and conduct appropriate experiments, interpret data obtained, draw pertinent conclusions and communicate all these effectively.

COURSE OUTCOMES

SEMESTER I

CH 50 01 01: Organometallics and Nuclear Chemistry

At the end of this course, a student will have developed ability to:

CO1:	Discuss the synthesis, structure and bonding in Organometallic compounds
CO2:	Differentiate different types of reactions of Organometallic compounds
CO3:	Describe catalysis by Organometallic compounds
CO4:	Outline techniques and applications of nuclear chemistry
CO5:	Classify various bioinorganic compounds

CH 50 01 02: Structural and Molecular Organic Chemistry

At the end of this course, a student will have developed ability to:

CO1:	Explain the basic concepts of organic chemistry.
CO2:	Illustrate the principles of physical organic chemistry.
CO3:	Recognize the importance of organic photochemical reactions.
CO4:	Demonstrate the reactivity and stability of organic molecules based on structure, including conformation and stereochemistry

CH 50 01 03: Quantum Chemistry and Group Theory

At the end of this course, a student will have developed ability to:

CO1:	Evaluate symmetry elements in a molecule and classify molecules into point groups and evaluate symmetry elements in a crystal and classify crystals into point groups
CO2:	Apply group theoretical rules to derive group multiplication tables, matrix representations, classes, character tables of point groups
CO3:	Understand and Familiarize with the main aspects of the historical development of quantum mechanics and understand the central concepts and principles in quantum mechanics
CO4:	Solve the Schrödinger equation for simple systems in one to three dimensions

CO5:	Understand the concepts of angular momentum and spin, as well as the rules for quantization and addition of these
CO6:	Evaluate symmetry elements in a molecule and classify molecules into point groups and evaluate symmetry elements in a crystal and classify crystals into point groups

CH 50 01 04: Thermodynamics, Kinetic Theory and Statistical

At the end of this course, a student will have developed ability to:

CO1:	Relate the thermodynamic properties of the system and the chemical composition.
CO2:	Understand the interrelationship between partial molar properties of phase equilibrium
CO3:	Calculate change in thermodynamic properties, equilibrium constants, partial molar quantities, chemical potential. Identify factors affecting equilibrium constant.
CO4:	Calculate excess thermodynamic properties
CO5:	Apply phase rule and, draw phase diagrams for one, two and three component systems,
CO6:	Acquire knowledge of basics of statistical mechanics and compare statistical methods
CO7:	Apply statistics to understand the thermodynamic properties of macroscopic systems
CO8:	Understand Debye and Einstein theory of heat capacity of solids.
C09:	Explain T 3 dependence of heat capacity of solids at low temperatures

SEMESTER II

CH 50 02 01: Coordination Chemistry

At the end of this course, a student will have developed ability to:

CO1:	Learn about the theories, bonding and structure of coordination compounds
CO2:	Learn about the reactions of coordination compounds
CO3:	Learn about the electronic spectra and magnetism of coordination compounds
CO4:	Learn about the stereochemistry of coordination compounds
CO5:	Describe the co-ordination chemistry of lanthanoids and actinoids

CH 50 02 02: Organic Reaction Mechanisms

At the end of this course, a student will have developed ability to:

CO1:	Describe the mechanisms of different types organic reactions.
CO2:	Explain the chemistry of carbanions, carbocations, carbenes, carbenoids, nitrenes and arynes
CO3:	Understand the chemistry of radical reactions and its applications.
CO4:	Explain the basics and applications of concerted reactions.

CH 50 02 03: Chemical Bonding and Computational Chemistry

At the end of this course, a student will have developed ability to:

CO1:	Understand different approximation techniques used in molecular quantum mechanics
CO2:	Dentify and explain the main similarities and differences between computational approaches such as HF (hartreefock), semi-empirical, DFT (Density Functional Theory) and force field methods.
CO3:	Describe and identify the various methods' advantages / disadvantages for simulating/modeling various scientific problems.
CO4:	Understand Quantum Mechanical and principles of Molecular Orbital theory, Hückel Molecular Orbital Theory, Valence bond theory and hybridization

CH 50 02 04: Molecular Spectroscopy

At the end of this course, a student will have developed ability to:

CO1:	Know the fundamentals of interactions of electromagnetic radiation with matter
CO2:	A detailed study Rotational and Vibrational spectroscopy diatomic and polyatomic molecules, Raman effect and Raman spectroscopy
CO3:	An understanding of Electronic spectroscopy of molecules
CO4:	Learn fundamentals of photo electron spectroscopy , Lasers and its applications
CO5:	Learn about the principle and theories NMR , EPR, Mossbauer and mass spectroscopy
CO6:	Acquire skill in solving problems.

SEMESTER III

CH 50 03 01: Structural Inorganic Chemistry

At the end of this course, a student will have developed ability to:

CO1:	Describe the structure, reactions and phase transitions of solid state
CO2:	Explain the electrical, magnetic and optical properties of solids.
CO3:	Explain the structure and applications of inorganic chains, rings, cages and clusters, and organometallic polymers.
CO4:	Describe the synthesis of solids and applications of magnetic nano particles

CH 50 03 02: Organic Syntheses

At the end of this course, a student will have developed ability to:

CO1:	Describe the applications of oxidation and reduction techniques in organic syntheses.
CO2:	Illustrate modern synthetic methods and applications of reagents.
CO3:	Explain different methods for the construction of carbocyclic and heterocyclic ring systems.
CO4:	Understand the principles and applications of protecting groups in chemistry.
CO5:	Apply retrosynthetic analysis to design the synthesis of a target molecule.

CH 01 03 01: Chemical Kinetics, Surface Chemistry and Crystallography

At the end of this course, a student will have developed ability to:

CO1:	Understand theories, mechanism and, kinetics of reactions and solve numerical problems
CO2:	The learners should be able to apply elementary laws of chemical kinetics and analyze reaction mechanisms and collision processes
CO3:	Solve problems on rate/rate constants/efficiency for (i) complex reactions (ii) unimolecular and bimolecular reactions,
CO4:	Learn the theories of surface chemistry and their applications.
CO5:	Learn different methods for characterization of surfaces.
CO6:	Learn about the methods of crystal structure determination, liquid crystals and its applications.
CO7:	Acquire skill in solving problems.

CH 50 03 03: Spectroscopic Methods in Chemistry

At the end of this course, a student will have developed ability to:

CO1:	Apply knowledge of molecular structure determination using UV-visible, IR, mass and NMR spectroscopic techniques to identify and/or characterise chemical compounds from experimental data
CO2:	Calculate λmax of a compound,
CO3:	Apply IR frequency table to determine the functional groups present in the molecule,
CO4:	Interpret mass spectrum of compound from fragmentation
CO5:	Combined Spectroscopic approach for problem solving and structural analysis

SEMESTER IV

CH 80 04 01: Advanced Inorganic Chemistry

At the end of this course, a student will have developed ability to:

CO1:	Apply the principles of group theory in co-ordination complexes
CO2:	Identify the structure of an inorganic solid using IR, Raman, Mossbauer and EPR spectroscopic techniques.
CO3:	Explain the concepts of inorganic photochemistry
CO4:	Describe the structure and properties of Nanomaterials
CO5:	Explain the chemistry of acids, bases, non-aqueous solvents and metal-organic frameworks
CO6:	Explain the chemistry of fullerenes and metallo-supramolecular structures.
CO7:	Understand Debye and Einstein theory of heat capacity of solids.
CO8:	Explain T 3 dependence of heat capacity of solids at low temperatures

CH 80 04 02: Advanced Organic Chemistry

At the end of this course, a student will have developed ability to:

CO1:	Illustrate the principles of biosynthesis, biomimetic synthesis.
CO2:	Illustrate the principles of green synthesis and stereoselective transformations.
CO3:	Describe the structure and applications of natural products and biomolecules.
CO4:	Explain the mechanism of drug action and drug designing.
CO5:	Apply the methodology of research.

CH 80 04 03: Advanced Physical Chemistry

At the end of this course, a student will have developed ability to:

CO1:	Understand the principle and applications of photochemistry , solar cells and its application
CO2:	Explain the instrumentation and working principle of fluorescence spectroscopy, FES, AAS and AES,
CO3:	Learn about electron diffraction and neutron diffraction techniques
CO4:	Write equations representing electrochemical cell
CO5:	Understand various theories in electrochemistry
CO6:	Explain various overpotential involved during the operation of the cell.
CO7:	Understand corrosion and its mechanism
CO8:	Apply the principles of electrochemistry in real world problems
CO9:	Learn about about some analytical techniques such as polarography, amperometry and coulometry
CO10:	Understand theories of irreversible thermodynamic systems