



**Sree Narayana Mangalam College Maliankara**  
*(Affiliated to Mahatma Gandhi University, Kottayam)*

**PROGRAMME OUTCOME**  
**PROGRAMME SPECIFIC OUTCOME, COURSE OUTCOME**

**B.Sc Chemistry**

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

## UNDER GRADUATE PROGRAMME OUTCOMES

<p><b>PO1:</b></p>	<p><b>Problem solving and critical thinking:</b> Critical thinking skills help the students understand and assess a situation based on all the facts and information available. With the help of critical thinking skills, students can sort and organise information, data and facts to define and solve a problem. This program outcome can ensure that the students receive ample opportunities to work on these skills by providing them with pragmatic modes of learning in their respective subjects.</p>
<p><b>PO2:</b></p>	<p><b>Global Perspective and social interaction:</b> This program outcome ensures that the students attain an ability to respect the viewpoints of those from diverse cultures, races, ages, genders, religions and lifestyles to build collaborative relationships and communicate effectively. The ability to appreciate, value, and learn from other cultures and perspectives. It also suggests in recognising instances of unhealthy influences around them and the relying on inspirations of growth and stability. .</p>
<p><b>PO3:</b></p>	<p><b>Ethics:</b> This program outcome helps in adhering to basic ethical values combined with strong subject awareness that promises in creating a complete package of genuine result guaranteeing individuals. To be ethical means that you respect, care and love hard work and consider it a valuable quality. Ethics in work place means dependable, productive, collaborative, passionate and openness to team work.</p>
<p><b>PO4:</b></p>	<p><b>Environment and Sustainability:</b> This program outcome makes students aware of, sensitive to, and knowledgeable about the environment and its interconnectedness to social and economic systems, while encouraging them to develop attitudes of concern and motivation, as well as practical, complex systems and critical thinking skills to identify and solve environmental problems. An individual can be called educated when he/she recognises and shows respects to other forms of living things.</p>
<p><b>PO5:</b></p>	<p><b>Effective Citizenship:</b> This program outcome develops the student's capacity to feel socially responsible to her community and to take</p>

	<p>corresponding action to support its assets and to deal with its concerns. It also develops ability to demonstrate empathetic social concern and equity-based national development.</p>
<b>PO6:</b>	<p><b>Effective Communication:</b> This program outcome create ability to communicate effectively and possess scientific temper and modern outlook of the world. Ability to speak, reading, writing and listening carefully are the three most important communication skills to be developed by every individual for their life journey.</p>
<b>PO7:</b>	<p><b>Life-long learning:</b> Engage in life-long learning to acclimatize themselves in an ever-changing world. We need to continually keep our skills sharp and up to date so that we have an edge in all we do.</p>

## PROGRAMME SPECIFIC OUTCOMES

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

<b>PSO1</b>	Understand the fundamental concepts, principles and processes underlying the academic field of chemistry, its different subfields (analytical, inorganic, organic and physical), and its linkages with related disciplinary areas/subjects.
<b>PSO2</b>	Gain the knowledge of Chemistry through theory and practical experiments.
<b>PSO3:</b>	To explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions.
<b>PSO4:</b>	Create an awareness of the impact of chemistry on the environment, society and development outside the scientific community.
<b>PSO5:</b>	Understand safety of chemicals, transfer and measurement of chemicals, preparation of solution
<b>PSO6</b>	Experiment, analyse and draw conclusions from qualitative, quantitative and synthetic laboratory exercises in chemistry.

## COURSE OUTCOMES

### SEMESTER I

#### CH1CRT01- General and Analytical Chemistry

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

<b>CO1:</b>	Remember the evolution of chemistry as a discipline of science
<b>CO2:</b>	Understand the periodic properties of elements
<b>CO3:</b>	Understand the basics concepts of chemistry and fundamental principles of analytical chemistry.
<b>CO4:</b>	To familiarize different chromatographic methods.
<b>CO5:</b>	Develop statistical treatment of data analysis and familiarization of software packages for analysis and graphical representation of data.

### SEMESTER II

#### CH2CRT02- Theoretical and Inorganic Chemistry

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

<b>CO1:</b>	Explain different models of atoms
<b>CO2:</b>	Calculate Radius, Energy, velocity of an electron
<b>CO3:</b>	Discuss octet rule and its limitations
<b>CO4:</b>	Classify different types of bonds
<b>CO5:</b>	Predict the shape and hybridisation of molecules
<b>CO6:</b>	Draw molecular orbitals of homo and hetero diatomic molecules
<b>CO7:</b>	Understand about various intermolecular forces
<b>CO8:</b>	Discuss the Chemistry of s, p, d and f block elements

### CH4CRP01: Volumetric Analysis

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

<b>CO1:</b>	Standardize various solutions
<b>CO2:</b>	Prepare standard solutions
<b>CO3:</b>	To find the concentrations of unknown solutions using Acidimetry and Alkalimetry
<b>CO4:</b>	Estimate the mass of ferrous iron in Mohr's salt and crystalline ferrous sulphate using permanganometry
<b>CO5:</b>	Estimate the mass of ferrous and ferric iron using dichrometry

### SEMESTER III

### CH3CRT03: Organic Chemistry-I

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

<b>CO1:</b>	Explain the basic concepts of organic chemistry
<b>CO2:</b>	Identify how stereochemistry affects a chemical reaction
<b>CO3:</b>	Assess reaction mechanisms to predict the outcome of reactions
<b>CO4:</b>	Analyse various concerted reactions

### SEMESTER IV

### CH4CRT04: Organic Chemistry-II

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

<b>CO1:</b>	Reproduce the various synthetic methods leading to alcohols, carbonyl compounds and carboxylic acids
<b>CO2:</b>	Predict the reactivity of alcohols and carbonyl compounds
<b>CO3:</b>	Devise synthetic procedures based on rearrangements

<b>CO4:</b>	Understand and explain organic reaction mechanisms.
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### CH4CRP02 : Qualitative Organic Analysis

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

<b>CO1:</b>	Determine the physical constants of solids and liquids – melting and boiling points
<b>CO2:</b>	Detect the presence of elements-Nitrogen, Sulphur and Halogens and presence of unsaturation and aromatic character
<b>CO3:</b>	Study the reactions of the following functional groups
<b>CO4:</b>	Identify the given organic compound by systematic analysis
<b>CO:5</b>	Prepare solid derivatives for organic compounds

## SEMESTER V

### CH5CRT05: ENVIRONMENT, ECOLOGY AND HUMAN RIGHTS

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

<b>CO1:</b>	Students can able to acquire the importance of Environmental Studies - Need for public awareness. Natural resources and its classification
<b>CO2:</b>	Students will able to understand the nature associated problems
<b>CO3:</b>	Analyze social issues related to the environment.
<b>CO4:</b>	Introduce the meaning, concept and development to Human Rights and its National Perspective

### CH5CRT06: Organic Chemistry-III

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

<b>CO1:</b>	Understand the chemistry of nitro-compounds and amines. Distinguish primary, secondary and tertiary amines in mixture of amines. Explain the stereochemistry of amines and preparation and applications of diazonium salts.
<b>CO2:</b>	Define heterocyclic compounds and their aromaticity. Explain the synthesis and reactions of heterocyclic compounds.
<b>CO3:</b>	Identify active methylene compounds and to explain its preparation, isomerism and applications
<b>CO4:</b>	Classify carbohydrates and to illustrate its structure and properties. Show the inter-conversion of aldoses and ketoses. Categorize carbohydrates into mono, di and polysaccharides.
<b>CO5:</b>	Discuss the classification uses and mode of action of various drugs.
<b>CO6:</b>	Verify colour and constitution, explain the classification, preparation and applications of Dyes.
<b>CO7:</b>	Discuss the classification, polymerization mechanism and Recycling of plastics.

### CH5CRT07: Physical Chemistry - I

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

<b>CO1:</b>	Understand in detail the properties of real and ideal gases
<b>CO2:</b>	Derive the kinetic gas equation, critical constants from van der Waals equation.
<b>CO3:</b>	Be able to do research in X-ray crystallography
<b>CO4:</b>	Explain the applications of surface chemistry and colloidal state



## CH5CRT08: Physical Chemistry - II

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

<b>CO1:</b>	Discuss and interpret experiments that reveal the wave properties of matter, as well as how this motivates replacing classical mechanics with a wave equation
<b>CO2:</b>	Solve the Schrödinger equation for simple systems in one to three dimensions analytically and use these solutions to calculate associated probabilities, expectation values as well as give concise physical interpretations and reasoning underlying the mathematical results.
<b>CO3:</b>	Describe the basics behind interaction between light and matter and account for the most common spectroscopic methods and their possibilities and limitations for studies of molecules in the MW, IR, Raman, NMR, ESR and UV-Vis areas
<b>CO4:</b>	Account for different types of electronic transitions and deexcitation process and electronic states.
<b>CO5:</b>	Understand how nuclear spins are affected by a magnetic field, and be able to explain what happens when radiofrequency radiation is absorbed

## CH5OPT01: CHEMISTRY IN EVERYDAY LIFE

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

<b>CO1:</b>	Know the importance of chemistry in everyday life.
<b>CO2:</b>	Understand the chemistry of food additives and flavours and its effect on human health
<b>CO3:</b>	Understand the chemistry of soaps, synthetic detergents and their environmental effects.
<b>CO4:</b>	Understand the chemistry of plastics, paper and dyes
<b>CO5:</b>	Understand the hazards of plastics and other synthetic materials on human health and environment and acquaint the methods for its reduction

<b>CO6:</b>	Understand the chemistry of and drugs; their action and possible side effects
<b>CO7:</b>	Explain the application of chemistry in agriculture and need of green methods

## SEMESTER VI

### CH6CRT09 : Inorganic Chemistry

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

<b>CO1:</b>	The content given will make a student to develop the basic knowledge of coordination chemistry, chemistry of transition and inner transition elements.
<b>CO2:</b>	Students are able to understand complexes and their industrial importance
<b>CO3:</b>	Students will able to understand the chemistry aspects of biological functions in living system
<b>CO4:</b>	Illustrate the structure classification and functions of vitamins and steroids

### CH6CRT09 : Organic Chemistry - IV

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

<b>CO1:</b>	Classify various terpenoids and alkaloids
<b>CO2:</b>	Explain the classification and properties of lipids, soaps, detergents
<b>CO3:</b>	Determine the structure of proteins
<b>CO4:</b>	Determine the molecular mass and structure of a compound using the Principle and applications NMR and mass spectrometry
<b>CO5:</b>	Predict the structure of molecules by using Principle and applications of UV/Visible and IR spectroscopy

### CH6CRT10 : Physical Chemistry - III

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

<b>CO1:</b>	Students will be able to apply the laws of kinetics during research
<b>CO2:</b>	Students are expected to apply the knowledge gained during research and also in industries
<b>CO3:</b>	Recall the concepts of acids, bases and buffer solutions and also explain different phase systems
<b>CO4:</b>	Discuss various terms in chemical kinetics and catalysis

### CH6CRT11 : Physical Chemistry - IV

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

<b>CO1:</b>	The students will be able to apply the knowledge gained to research and /or in industries
<b>CO2:</b>	Students are able to categorize conductance
<b>CO3:</b>	Explain the basic principles of photochemistry and different photochemical reactions
<b>CO4:</b>	Determine the point groups of different molecules

## CH6CBT02 : Nanochemistry and Nanotechnology

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

<b>CO1:</b>	Understand about nanoparticles and various Nanostructures
<b>CO2:</b>	Describe and use different approaches in Nanoparticle synthesis
<b>CO3:</b>	Characterize materials in Nanometre dimension
<b>CO4:</b>	Discuss and correlate nanotechnological aspects in the field of health care, and electronics
<b>CO5:</b>	Determine the use of Nanomaterials in medical field

## CH6CRP03: Qualitative Inorganic Analysis

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

<b>CO1:</b>	Identify various ions present in a given inorganic sample
<b>CO2:</b>	Show techniques like precipitation and centrifugation
<b>CO3:</b>	Identify and eliminate interfering anions in a given sample
<b>CO4:</b>	Identification of acidic and basic radicals

## CH6CRP04: Organic Preparations and Basic Laboratory Techniques

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

<b>CO1:</b>	Explain the basic laboratory techniques employed in organic chemistry
<b>CO2:</b>	Identify various purification techniques
<b>CO3:</b>	Deduce the quantitative yield of reactions
<b>CO4:</b>	Devise new synthetic methodologies

## CH6CRP05 : Physical Chemistry Practical

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

<b>CO1:</b>	By carrying out both electrical and non-electrical physical practicals.
<b>CO2:</b>	Find out CST of phenol-water system, Transition temperature of any hydrated salt and molecular weight of any substance.
<b>CO3:</b>	Measure eutectic temperature and follow kinetics of reaction.
<b>CO4:</b>	Perform conductometric and potentiometric titrations for calculating concentration and the amount present in the given solution.
<b>CO5:</b>	Determine cell constant and equivalent conductance.

## CH6CRP06: Gravimetric Analysis

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

<b>CO1:</b>	Demonstrate techniques like precipitation and filtration
<b>CO2:</b>	Show drying and incineration process
<b>CO3:</b>	Calculate mass of a substance in the given solution
<b>CO4:</b>	Estimate the mass of an ion in the given solution

# COMPLIMENTARY COURSE

## SEMESTER I

### CH1CMT01: Basic Theoretical and Analytical Chemistry

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

<b>CO1:</b>	<b>Define the concept of atom</b>
<b>CO2:</b>	Discuss the theories substantiate for the concept. Describe the type of bonds in molecules and the concept of hybridisation
<b>CO3:</b>	Discuss about the electronic arrangements in atoms and periodic properties
<b>CO4:</b>	Calculate the concentration of a solution in terms of normality, molarity, molality & parts per million
<b>CO5:</b>	Define the concept of acids & bases with various theories and introduce the term pH
<b>CO6:</b>	Apply the analytical techniques in a chemistry lab
<b>CO7:</b>	Explain the types of chromatography for the separation of compounds

## SEMESTER II

### CH2CMT02: BASIC ORGANIC CHEMISTRY

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

<b>CO1:</b>	Explain the basic concepts of organic chemistry
<b>CO2:</b>	Identify how stereochemistry affects a chemical reaction
<b>CO3:</b>	Assess their idea about mechanisms to predict the outcome of reaction
<b>CO4:</b>	Analyse various polymers
<b>CO5:</b>	Understand the concept of isomerism and classification of molecules accordingly

## CH2CMP01: VOLUMETRIC ANALYSIS

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

<b>CO1:</b>	Prepare standard solutions
<b>CO2:</b>	To find the concentrations of unknown solutions using Acidimetry and Alkalimetry
<b>CO3:</b>	To use redox reactions in volumetric titrations
<b>CO4:</b>	To Use acidified Potassium permanganate as an oxidising agent in redox titrations

## SEMESTER III

## CH3CMT04: INORGANIC AND ORGANIC CHEMISTRY

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

<b>CO1:</b>	Understand the basics of nuclear chemistry and heterocyclic compounds
<b>CO2:</b>	Recognize various types of food additives.
<b>CO3:</b>	Identify the formulations of various drugs used in the treatment of diseases.
<b>CO4:</b>	Choose different fertilizers and pesticides for their specific agricultural purposes.
<b>CO5:</b>	Explain the chemical side of biological processes such as photosynthesis and respiration
<b>CO6:</b>	Create awareness among the public about the toxicity and environmental hazards of synthetic pesticides and insecticides.

## SEMESTER IV

### CH4CMT06: ADVANCED BIO ORGANIC CHEMISTRY

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

<b>CO1:</b>	Recall the classification and properties of oils, fats, lipids, carbohydrates, amino acids, peptides, proteins, amino acids, terpenoids and alkaloids.
<b>CO2:</b>	Understand the biological functions of oils, fats, lipids, carbohydrates, amino acids, peptides, proteins, amino acids, terpenoids and alkaloids.
<b>CO3:</b>	Formulate the synthesis, regulation, transport of vitamins, steroids and hormones.
<b>CO4:</b>	Identify nucleic acid structure

### CH4CMP03: ORGANIC CHEMISTRY PRACTICALS

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

<b>CO1:</b>	Determine the physical constants of solids and liquids – melting and boiling points
<b>CO2:</b>	Detect the presence of elements-Nitrogen, Sulphur and Halogens and presence of unsaturation and aromatic character
<b>CO3:</b>	Study the reactions of the following functional groups
<b>CO4:</b>	Identify the given organic compound by systematic analysis