

**M.P.Moothedath Memorial Sree Narayana Trusts College
Shoranur**

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

DEPARTMENT OF CHEMISTRY

Name of the Programme	B.Sc. Chemistry
Programme Outcome	The purpose of the B.Sc Chemistry course is to provide a fundamental idea of the theory and laboratory resources to prepare students for careers as professionals in the field of chemistry, for graduate study in chemistry and related fields. Students will employ critical thinking and the scientific method to design, carry out, record and analyze the results of chemical experiments and get an awareness of the impact of chemistry on the environment, society, and other cultures outside the scientific Community.
Programme Specific Outcome	<ol style="list-style-type: none">1. Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry.2. Solve the problem and also think methodically, independently and draw a logical conclusion.3. Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions.4. Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.5. Find out the green route for chemical reaction for sustainable development.6. To inculcate the scientific temperament in the students and outside the scientific community.7. Use modern techniques, decent equipments and Chemistry software's

Course Outcome :Core

Semester	Course Code	Course Name	Credit	Course outcome
I	CHE1B01	Theoretical And Inorganic Chemistry - I	2	<ul style="list-style-type: none">• Be able to design and carry out scientific experiments and accurately record and analyze the results of experiments.• Gain skills in problem solving, critical thinking and analytical reasoning as applied to scientific problems in chemistry.• Appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.• Understand the fundamentals of nuclear decay and the properties of an atomic nucleus that make it unstable and undergo nuclear decay.
II	CHE2B02	Theoretical And Inorganic	2	<ul style="list-style-type: none">• Understand the structures and properties of inorganic molecular species.• Understand the bonding fundamentals for both ionic and covalent compounds, including electronegativities, bond distances and bond energies using MO diagrams and thermodynamic data.• Be able to Predict the geometries of

		Chemistry - II		<p>simple molecules</p> <ul style="list-style-type: none"> • Understand the limitations of classical mechanics at molecular length scales • Understand the differences between classical and quantum mechanics • Gain the connection of quantum mechanical operators to observables
III	CHE3B03	physical chemistry I	3	<ul style="list-style-type: none"> • To understand the properties of gaseous state and how it links to thermodynamics system • To understand the concepts of thermodynamics and its relation to statistical thermodynamics • To apply the symmetry operations to categorize different molecules
IV	CHE4B04	Organic chemistry I	3	<ul style="list-style-type: none"> • To apply the concepts of stereo chemistry to different compounds • To understand the basic concepts of reaction mechanism • To analyze the mechanism of a chemical reaction • To analyze the stability of different aromatic system
IV	CHE4B05 (P)	Inorganic Chemistry Practical	4	<ul style="list-style-type: none"> • To develop skills in quantitative analysis and preparing inorganic complexes • To understand the principles behind quantitative analysis • To apply appropriate techniques of volumetric quantitative analysis in estimation • To analyze the strength of different

				solution
V	CHE5B06	Inorganic Chemistry - III	3	<ul style="list-style-type: none"> • To understand the principles behind qualitative and quantitative analysis • To understand basic processes of metallurgy and to analyze the merits of different alloys • To understand the applications of different inorganic polymers • To analyze different polluting agents • To apply the principles of solid waste management
V	CHE5B07	Organic Chemistry II	3	<ul style="list-style-type: none"> • To understand the difference between alcohols and phenols • To understand the importance of ethers and epoxides • To apply organometallic compounds in the preparation of different functional groups • To apply different reagents for the inter conversions of aldehydes, carboxylic acids and acid derivatives • To apply active methylene compounds in organic preparations
V	CHE5B08	Physical chemistry II	3	<ul style="list-style-type: none"> • To apply the concept of kinetics, catalysis and photochemistry to various chemical and physical processes • To characterize different molecules using spectrum methods • To understand various phase transitions and its applications
VI	CHE6B09	Inorganic Chemistry IV	3	<ul style="list-style-type: none"> • To understand the principles behind

				<p>different instrumental methods to distinguish between lanthanides and actinides</p> <ul style="list-style-type: none"> • To understand the importance of metals in living system appreciate the importance of CFT • To distinguish geometrics of coordination compounds
VI	CHE6B10	Organic Chemistry III	3	<ul style="list-style-type: none"> • To elucidate the structure of symbol organic compounds using spectral techniques • To understand the basic structure and test for carbohydrates • To understand the basic components and importance of DNA • To understand the basic structure and applications of alkaloids and terpenes • To distinguish different pericyclic reactions
VI	CHE6B11	Physical Chemistry III	3	<ul style="list-style-type: none"> • To understand the basic concepts of electro chemistry • Understand the importance of colligative property • To relate the properties of material or solids to the geometrical properties and chemical composition
VI	CHE6B12	Advanced And Applied Chemistry	3	<ul style="list-style-type: none"> • Students Gains a better knowledge about the new vistas in chemistry such as Nanochemistry, Supramolecular chemistry and combinatorial chemistry. • Gains an environmental concern by

				<p>studying Green chemistry and an insight in to how chemistry try to upgrade the standard of living in this world.</p> <ul style="list-style-type: none"> • Able to understand about the computational techniques used in chemistry. • Gains an understanding about various applications of inorganic and organic materials such as cement, fertilizers, petroleum products, pharmaceuticals, cleansing agents etc. used in daily life.
VI	CHE6B13 (E2)	(Elective Course) Polymer Chemistry	3	<ul style="list-style-type: none"> • Gains an exposure to Polymers-types, properties and reactions, techniques and processing. • Applications of commercial polymers
VI	CHE6B14(P)	Physical Chemistry Practical	4	<ul style="list-style-type: none"> • Students acquire practical skill in physical chemistry experiments Such as Viscosity, refractometry, Conductance, Potentiometry, and pH-metry etc.
VI	CHE6B15(P)	Organic Chemistry Practical	4	<ul style="list-style-type: none"> • To develop talent in organic preparations to ensure maximum yield • To apply the concept of melting or boiling pints to check the purity of compounds • To analyze and characterize symbol organic functional group • To analyze individual amino acids from a mixture using chromatography
VI	CHE6B16(P)	Inorganic Chemistry Practical - II	4	<ul style="list-style-type: none"> • Acquire practical skill in quantitative gravimetric analysis and Colorimetric analysis

VI	CHE6B17(P)	Inorganic Chemistry Practical-III	4	<ul style="list-style-type: none"> • Acquire practical skill in qualitative analysis of inorganic cations and anions • Acquire practical skill in preparation of inorganic complexes
VI	CHE6B18(Pr)	Project Work	2	<ul style="list-style-type: none"> • To develop research temper among students. • To familiarize with the principles and working of analytical instruments

Course Outcome : Complementary

Semester	Course Code	Course Name	Credit	Course outcome
I	CHE1C01	General Chemistry	2	<ul style="list-style-type: none"> • To familiarize with the history, basic concepts and theories of chemistry. • To gain basic knowledge of qualitative and quantitative analysis. • To make a clear picture about atomic structure by understanding the impact of quantum revolution. • To analyze various theories of chemical bonding. • To understand the concepts of nuclear chemistry from the bottom and its applications to various emerging fields. • To understand the biological aspects of chemistry and applications in biological systems.
II	CHE2C02	Physical Chemistry	2	<ul style="list-style-type: none"> • To gain detailed knowledge of laws of thermodynamics.

				<ul style="list-style-type: none"> • To understand the principles and properties of gaseous, liquid and solid states. • To understand what are solutions and to be familiar with colligative properties and their applications. • To understand different laws of electrochemistry and its applications in relevant areas. • To compare different electrochemical cells.
III	CHE3C03	Organic Chemistry	2	<ul style="list-style-type: none"> • To understand basic concepts of organic chemistry with a knowledge of different electron displacement effects and reaction intermediates. • To familiarize conformations of some simple molecules and understand the concepts of optical and geometrical isomerism with examples. • To understand preparation, reactions and applications of halogen compounds, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, nitro compounds, amines and diazonium salts. • To familiarize with various important naming reactions of organic chemistry. • To understand the chemistry of biological molecules like carbohydrates, lipids, proteins and nucleic acids including their classification, structure and

				<p>applications.</p> <ul style="list-style-type: none"> • To familiarize with natural products particularly alkaloids and terpenes with example.
IV	CHE4C04	Physical And Applied Chemistry	2	<ul style="list-style-type: none"> • To understand what are colloids, their classification, preparation, properties and applications. • To understand of concepts and theories of chemical kinetics in detail and differentiate theories of catalysis. • To familiarize various chromatographic techniques, their principle and applications. • To gain deep knowledge of principle of different spectroscopic techniques like IR, UV-Visible and NMR spectroscopy. • To understand classifications, structure and applications of various polymers with examples. • To understand different type of pollutions in its chemical aspect as familiarizing the reasons of pollution and find out how to reduce them. • To understand deeply how chemistry is related to day to day life.
IV	CHE4C05(P)	Chemistry Practicals	4	<ul style="list-style-type: none"> • To develop awareness of handling laboratory instruments and laboratory safety like first aid and treatment of fires. • To develop analytical skills in volumetric analysis.

				<ul style="list-style-type: none"> • To understand the principles behind the gravimetry and to apply it in quantitative analysis. • To develop talent in inorganic qualitative analysis. • To determine physical constants like melting and boiling points.
--	--	--	--	--

Course Outcome : Open Course

Semester	Course Code	Course Name	Credit	Course outcome
V	CHE5D01	Environmental Chemistry	2	<ul style="list-style-type: none"> • Demonstrate knowledge of chemical and biochemical principles of fundamental environmental processes in air, water, and soil. • Recognize different types of toxic substances & responses and analyze toxicological information. • Apply basic chemical concepts to analyze chemical processes involved in different environmental problems (air, water & soil). • Describe water purification and waste treatment processes and the practical chemistry involved. • Describe causes and effects of environmental pollution by energy industry and discuss some mitigation strategies. • Explain energy crisis and different aspects of sustainability.

				<ul style="list-style-type: none"> • Discuss local and global environmental issues based on the knowledge gained throughout the course.
--	--	--	--	--

Name of the Programme: M.Sc. Chemistry

Programme Outcome	<ul style="list-style-type: none"> • To give students a comprehensive understanding of the principles of Chemistry • To gain the skill to design and carry out scientific experiments and interpret the data • To understand the interdisciplinary nature of Chemistry and to be aware of the emerging fields in Chemistry • To build a scientific temper and to learn the necessary skills to succeed in research or industrial field. • To be able to define and resolve new problems in Chemistry and participate in the future development of Chemistry
Programme Specific Outcome	<ul style="list-style-type: none"> • Gains complete knowledge about all fundamental aspects of all the elements of chemistry • Understands the background of organic reaction mechanisms, complex chemical structures, instrumental method of chemical analysis, molecular rearrangements and separation techniques. • Appreciates the importance of various elements present in the periodic table, coordination chemistry and structure of molecules, properties of compounds, structural determination of complexes using theories and instruments. • Gathers attention about the physical aspects of atomic structure, dual behavior, reaction pathways with respect to time, various

	<p>energy transformations, molecular assembly in nanolevel, significance of electrochemistry, molecular segregation using their symmetry.</p> <ul style="list-style-type: none"> • Learns about the potential uses of analytical industrial chemistry, medicinal chemistry and green chemistry. • Carry out experiments in the area of organic analysis, estimation, separation, derivative process, inorganic semi micro analysis, preparation, conductometric and potentiometric analysis
--	---

Course Outcome : Theory, Practicals and Project

Semester	Course Code	Course Name	Credit	Course outcome
I	CH1CO1	Quantum Chemistry And Group Theory	3	<ul style="list-style-type: none"> • To introduce the concept of Quantum mechanics among students • To learn the theory and application of Quantum Chemistry • Analyze the various possibilities of the concept in future research • To learn different Quantum mechanical models, co-ordinate systems, wavefunction etc • To learn the basic principles of group theory and molecular symmetry • To learn the method of representation of a point group and reduction formula • To analyse the relation between quantum mechanics and group Theory
I	CH1CO2	Elementary Inorganic	3	<ul style="list-style-type: none"> • To distinguish between different acid

		Chemistry		<p>base concepts</p> <ul style="list-style-type: none"> • To analyse the molecular structure and bonding in molecules • To learn the preparation, reactions and bonding in Boron hydrides • To understand the different allotropic forms of C, S, P, As, Sb, Bi etc • To study the synthesis structure and uses of various compounds of main group elements • To familiarize with the structure of nucleus, fission, fusion reactions etc • To understand the interaction of radiation with matter
I	CH1CO4	Thermodynamics, Kinetics And Catalysis	3	<ul style="list-style-type: none"> • To learn the basic theories and equations in Thermodynamics. • To study the kinetic aspects of chemical reactions via molecular reaction dynamics • To study thermodynamics of ideal and non ideal solutions • To study homogeneous and heterogeneous catalysis
II	CH2CO5	Applications Of Quantum Mechanics And Group Theory	3	<ul style="list-style-type: none"> • To learn the different approximation methods in Quantum mechanics • To study the Quantum mechanics of many electron atoms • To apply the theories of quantum mechanics in bonding of diatomic and polyatomic molecules • To learn molecular vibrations of

				<p>molecules and apply group theory in molecular spectroscopy</p> <ul style="list-style-type: none"> • To apply group theory in chemical bonding
II	CH2CO6	Co-Ordination Chemistry	3	<ul style="list-style-type: none"> • To analyse the stability of coordination complexes • To learn theories of bonding in coordination • To familiarise with electronic and magnetic properties of complexes • To study characterisation techniques in coordination complexes • To study the mechanisms of reactions of met complexes in detail • To analyse the mechanisms of redox and photochemical reactions of complexes
II	CH2CO7	Reaction Mechanism In Organic Chemistry	3	<ul style="list-style-type: none"> • An advanced understanding of various reaction mechanisms in organic chemistry • A deep knowledge about pericyclic and photochemical reactions • Advanced awareness about natural products.
II	CH2CO8	Electrochemistry, Solid State Chemistry And Statistical Thermodynamics	3	<ul style="list-style-type: none"> • To study the dynamic electrochemistry • To learn ionic interactions and equilibrium electrochemistry • To study the crystal structure, imperfections and electronic structure of solids

				<ul style="list-style-type: none"> To learn quantum statistics of statistic thermodynamics
II	CH1PO1 & CH2PO4	Inorganic Chemistry Practicals I & II	4	<ul style="list-style-type: none"> Awareness about separation and identification of rare cations and complexometric as well as colorimetric analysis
II	CH1PO2 & CH2PO5	Organic Chemistry Practicals I & II	4	<ul style="list-style-type: none"> Separation and identification of organic compounds. Two stage preparations organic compounds
II	CH1PO3 & CH2PO6	Physical Chemistry Practicals I & II	4	<ul style="list-style-type: none"> To acquire practical skills in physical chemistry experiments such as Solubility, Phase equilibria, Viscosity, Distribution, Refractometry, Conductometry, Potentiometry
II	CH2VO1	Viva	2	<ul style="list-style-type: none"> To assess the student ability to communicate with another person To supplement the information obtained through other evaluation techniques To identify and analyse the students presence of mind To acquire the soundness of knowledge through various forms of questions To diagnose the students limitation and weakness and take remedial action

III	CH3CO9	Molecular Spectroscopy	3	<ul style="list-style-type: none"> Advanced awareness about various spectroscopic techniques –IR, Raman, Electronic, NMR, Mossbauer, ESR. Applications of spectroscopy in the structural elucidation of compounds
III	CH3C10	Organometallic And Bioinorganic Chemistry	3	<ul style="list-style-type: none"> To learn the historical background and Nomenclature of organometallic compounds To study the organometallic compounds with linear and cyclic pi system To get knowledge about different reactions of organometallic compounds and catalysis To study about metal clusters and carbonyl clusters To learn the importance of bio-inorganic chemistry in various phases of biological system
III	CH3C11	Reagents And Transformations In Organic chemistry	3	<ul style="list-style-type: none"> Advanced awareness about mechanism and applications of various reagents used in organic synthesis A better understanding of Polymers, heterocyclic compounds. Gains an advanced awareness about molecular rearrangements and transformations
III	CH3E01	Synthetic organic chemistry	3	<ul style="list-style-type: none"> To learn the reagents used for oxidation and reduction reactions To familiarize with various

				<p>organometallic and organonon-metallic reagents</p> <ul style="list-style-type: none"> • To introduce different coupling reactions in organic chemistry • To introduce the concept of Retro-synthetic analysis and multi-step synthesis
IV	CH4C12	Instrumental Methods Of Analysis	4	<ul style="list-style-type: none"> • Advanced awareness about various analytical procedures. • Advanced awareness about instrumental methods in chemical analysis
IV	CH4C13	Advanced Topics In Chemistry	4	<ul style="list-style-type: none"> • Acquire an understanding of recent advances in chemistry such as nanomaterials, green chemistry, computational quantum chemistry, supramolecular chemistry, Medicinal chemistry, Combinatorial chemistry
IV	CH4EO5	Industrial Catalysis(Elective)	4	<ul style="list-style-type: none"> • Acquire knowledge about various catalytic methods such as Bio catalysis, Phase transfer catalysis • Awareness about Oil based chemistry and its applications in industries
IV	CH3PO8 & CH4P11	Organic Chemistry Practicals III & IV	4	<ul style="list-style-type: none"> • Volumetric and colorimetric estimation of organic compounds. • Identification as well as separation of mixtures by chromatographic

				techniques.
IV	CH3PO9 & CH4P12	Physical Chemistry Practicals III & IV	4	<ul style="list-style-type: none"> • Experimental techniques using Chemical kinetics, adsorption, Phase equilibria, Cryoscopy, Polarimetry and spectrophotometry.
IV	CH4PrO1	Research Project	4	<ul style="list-style-type: none"> • Gains hands on various analytical instruments (research) • Learns the steps involved in solving a problem • Understands the formatting of table work • Enters in the first step of research aptitude • Visualizes the steps of project work presentation
IV	CH4VO2	Viva	2	<ul style="list-style-type: none"> • Demonstrate that the project work is your own work. • Confirm that you understand what you have studied and can defend it verbally. • Establish whether the student knowledge is of sufficiently high standard to merit the award of the degree.