

Department of Chemistry  
Nesamony Memorial Christian College, Marthandam  
**B. Sc. Chemistry**  
**Course Outcome**

<b>Semester – I      B. Sc. Chemistry</b>					
<b>Part</b>	<b>Course Name</b>	<b>Course Code</b>	<b>Credit</b>	<b>Hours</b>	<b>Course Outcome</b>
Part - III	Core Course – I: <b>General Chemistry-1</b>	FCCH11	5	5	On completion of the course the students should be able to <b>CO1</b> explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds. <b>CO2</b> classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects inorganic compounds, types of reagents. <b>CO3</b> apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, $\Delta x, \Delta p$ electronegativity, percentage ionic character and bond order. <b>CO4</b> evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects <b>CO5</b> construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.
	Core Course - II: <b>Quantitative inorganic estimation</b>	FCCHP1	3	3	On successful completion of the course the students should be able to <b>CO1</b> explain the basic principles involved in titrimetric analysis. <b>CO2</b> compare the methodologies of different titrimetric analysis <b>CO3</b> calculate the concentrations of unknown solutions in different ways. <b>CO4</b> develop the skill to estimate the amount of a substance present in a given solution.
Part - IV	<b>SEC-1: Food chemistry</b>	FSCH11	2	2	On completion of the course the students should be able to <b>CO1</b> explain the types of food adulterants. <b>CO2</b> know about first aid and food poisons. <b>CO3</b> discuss about food colours, sweeteners and preservatives. <b>CO4</b> know the types of beverages. <b>CO5</b> discuss the sources of edible oils.

	Foundation Course: <b>Foundation course in Chemistry</b>	FFCH11	2	2	On completion of the course the students should be able to <b>CO1</b> learn about atom structure and periodic properties. <b>CO2</b> gain knowledge on types of chemical bonding <b>CO3</b> explain different states of matter <b>CO4</b> discussion on nomenclature and isomerism in organic compounds <b>CO5</b> knowledge on electromagnetic radiation and its interaction with matter
<b>Semester – II                      B. Sc. Chemistry</b>					
Part - III	Core Course –III : <b>General Chemistry-II</b>	FCCH21	5	5	On completion of the course the students should be able to <b>CO1</b> explain the concept of acids, bases and ionic equilibria; periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbons <b>CO2</b> discuss the periodic properties of sand p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids <b>CO3</b> classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p- block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons <b>CO4</b> explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements <b>CO5</b> assess the application of hard and soft acids indicators, buffers, compounds of s and p- block elements and hydrocarbons.
	Core Course -IV : <b>Qualitative Organic Analysis</b>	FCCHP2	3	3	On completion of the course the students should be able to <b>CO1</b> observe the physical state, odour, colour and solubility of the given organic compound. <b>CO2</b> identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis. <b>CO3</b> compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non-reducing sugars and explain the reactions behind it. <b>CO4</b> exhibit a solid derivative with respect to the identified functional group.
Part - IV	<b>SEC - 2: Dairy Chemistry</b>	FSCH21	1	2	On completion of the course the students should be able to <b>CO1</b> understand about general composition of milk–constituents and its physical properties. <b>CO2</b> acquire knowledge about pasteurization of Milk and various types of pasteurization -Bottle, Batch and HTST Ultra High Temperature Pasteurization. <b>CO3</b> learn about Cream and Butter their composition and how to estimate fat in cream and Ghee. <b>CO4</b> explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk. <b>CO5</b> have an idea about how to make milk powder and its drying process – types of drying

	SEC – 3: <b>Role of Chemistry in daily life</b>	FSCH22	1	2	On completion of the course the students should be able to <b>CO1</b> learn about the chemicals used in everyday life as well as air pollution and water pollution. <b>CO2</b> get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC, bakelite, polyesters, <b>CO3</b> acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats, also have an awareness about Cosmetics Toothpastes, face powder, soaps and detergents. <b>CO4</b> discuss about the fertilizers like urea, NPK fertilizers and superphosphate Fuel classifications, liquid and gaseous; nuclear fuel-examples and uses. <b>CO5</b> have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.
	Naan Mudhalvan-Cambridge course - English		2	2	
<b>Semester – III                      B. Sc. Chemistry</b>					
Part - III	Core Course –V : <b>General Chemistry-III</b>	EMCH31	4	4	On completion of the course the students should be able to <b>CO1</b> Explain the kinetic properties of gases by using mathematical concepts. <b>CO2</b> Describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations. <b>CO3</b> Investigate the radioactivity, nuclear energy and it's production, also the nuclear waste management. <b>CO4</b> Write the nomenclature, physical & chemical properties and basic mechanisms of halo organic compounds and alcohols. <b>CO5</b> Investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.
	Core Course -VI : <b>Qualitative inorganic analysis(mixture)</b>	EMCHP3	2	2	On successful completion of the course the students should be able to <b>CO1</b> acquire knowledge on the systematic analysis of simple salts. <b>CO2</b> identify the cations and anions in the unknown substance. <b>CO3</b> identify the cations and anions in the soil and water and to test the quality of water. <b>CO4</b> assess the role of common ion effect and solubility product.
Part - IV	SEC - 4: <b>Entrepreneurial skills in chemistry</b>	ESCH31	2	2	On completion of the course the students should be able to <b>CO1</b> identify adulterated food items by doing simple chemical tests. <b>CO2</b> prepare cleaning products and become entrepreneurs <b>CO3</b> educate others about adulteration and motivate them to become entrepreneurs

	EVS: <b>Environmental Studies</b>	EEVS31	2	2	Upon completion of this course, Students would have <b>CO1</b> To have a basic knowledge of Natural resources its classification, concepts, and natural resources of India. <b>CO2</b> To obtain knowledge on different types of ecosystem <b>CO3</b> To understand the values of biodiversity and conservation on global, national, and local scales <b>CO4</b> To gain knowledge on different types of pollution in the environment <b>CO5</b> To introduce the students in the field of Law and Policies and Acts both at the national and international level relating to environment.
	NAAN MUDHALVAN		2	2	
<b>Semester – IV      B. Sc. Chemistry</b>					
Part - III	Core Course –VII: <b>General Chemistry-IV</b>	EMCH41	4	4	On completion of the course the students should be able to <b>CO1</b> explain the terms and processes in thermodynamics; discuss the various laws of thermo dynamics and Thermo chemical calculations. <b>CO2</b> discuss the second law of thermodynamics and its application to heat engine; discuss third law and its application on heat capacity measurement. <b>CO3</b> investigate the chemistry of transition elements with respect to various periodic properties and group wise discussions. <b>CO4</b> discuss the fundamental organic chemistry of ethers, epoxides and carbonyl compounds including named organic reactions. <b>CO5</b> discuss the chemistry and named reactions related to carboxylic acids and their derivatives; discuss chemistry of active methylene compounds, halogen substituted acids and hydroxyl acids.
	Core Course -VIII: <b>Preparation of organic and inorganic compounds and determination of physical constants</b>	EMCHP4	2	2	On completion of the course the students should be able to <b>CO1</b> explain the method of preparation of organic compounds <b>CO2</b> discuss the preparation of inorganic compounds. <b>CO3</b> find out the physical constants of organic compounds. <b>CO4</b> explain the purification of crude sample.
Part - IV	SEC - 5: <b>Instrumental methods of chemical analysis</b>	ESCH41	2	2	On completion of the course the students should be able to <b>CO1</b> apply error analysis in the calibration and use of analytical instruments, explain theory, instrumentation and application of flame photometry and Atomic Absorption spectrometry <b>CO2</b> explain theory, instrumentation and application of UV visible and Infrared spectroscopy.

					<p><b>CO3</b> able to discuss instrumentation, theory and applications of thermal and electrochemical techniques</p> <p><b>CO4</b> explain the use of chromatographic techniques in the separation and identification of mixtures</p> <p><b>CO5</b> explain preparation of solutions, stoichiometric calculations.</p>
	VBE: <b>Value Based Education</b>	EVBE41	2	2	<p><b>CO1</b> Identify the contribution of social reformers and factors that influence social justice</p> <p><b>CO2</b> Compare and list the legal rights provided to women, children, Dalits, minorities and physically challenged as per human rights and Indian constitution</p> <p><b>CO3</b> Stay as a responsible citizen and raise voice for any violence against women</p> <p><b>CO4</b> analyze the prospects and challenges in mass media role of media in</p> <p><b>CO5</b> assess the influence of new media on children and youth and use them to inculcate communal harmony and social justice</p> <p><b>CO6</b> frame their own personal values based on social ethics to moderate the social issues and lead a secular society</p>
	NAANMUDHALVAN		2	2	
<b>Semester – V                      B. Sc. Chemistry</b>					
Part - III	Core – VII: <b>Organic Chemistry – II</b>	CMCH51	4	6	<p><b>CO1</b> Interpret the elements of symmetry and apply Cahn Ingold Prelog's rule.</p> <p><b>CO2</b> Discuss the geometrical configuration (Cis/Trans and /or E or Z) and know the conformational analysis</p> <p><b>CO3</b> Analyse the structure and reactions of Carbohydrates.</p> <p><b>CO4</b> Identify the aromatic organic compounds Using Huckel's rule and study the electrophilic and nucleophile substitution reactions</p> <p><b>CO5</b> List out the important heterocyclic compounds and analyse its aromatic characters.</p>
	Core – VIII: <b>Physical Chemistry – II</b>	CMCH52	4	6	<p><b>CO1</b> Explain the basic concepts of thermodynamics.</p> <p><b>CO2</b> Identify the importance of I, II &amp; III laws of thermodynamics</p> <p><b>CO3</b> Construct the phase diagram for different heterogeneous system in equilibrium.</p> <p><b>CO4</b> Find the applications of solubility product principle and explain different types of conductometric titrations in the laboratory to find the end point</p> <p><b>CO5</b> Discuss the various types of molecular spectroscopy and examine the molecules to be active in UV-Visible, IR, Raman Spectroscopy.</p>
	Major Elective – I: <b>Polymer Chemistry</b>	CECH51	4	4	<p><b>CO1</b> Classify the polymers based on their characters and structures.</p> <p><b>CO2</b> Explain the mechanisms and techniques of polymerization.</p> <p><b>CO3</b> Discuss the applications of various organic and inorganic polymers.</p> <p><b>CO4</b> Summarize the advantages and disadvantages of polymer processing and degradation techniques.</p> <p><b>CO5</b> List out the important applications of conducting polymers , biopolymers and explain the plastic waste management</p>

	Major Elective –II: <b>Applied Chemistry</b>	CECH54	4	4	<b>CO1</b> Define fuels and Explain various types of fuels <b>CO2</b> Choose the suitable paints, pigments, lubricants and adhesives for day to day life activities. <b>CO3</b> Analyze the highly useful fertilizers, pesticides, insecticides and fungicides to improve crop yield. <b>CO4</b> Discuss the oils, soaps and detergents which are necessary for human health and other activities <b>CO5</b> Outline the industrially important compounds for the human development activities.
	Major Practical -V: <b>Organic Analysis &amp; Physical Constant Determination</b>	CMCHP5	2	4	<b>CO1</b> Examine the elements other than carbon & Hydrogen present in the organic compounds. <b>CO2</b> Find the functional group present in the given organic compound <b>CO3</b> Determine the physical constant for the organic substances
	Major Practical-VI: <b>Gravimetric Estimation &amp; Inorganic Preparation</b>	CMCHP6	2	4	<b>CO1</b> Discuss the principle of gravimetric estimation and explain the procedure for the estimation of ions <b>CO2</b> Estimate the amount of metal ions available in the given solution and compare the accuracy with other methods. <b>CO3</b> Illustrate the procedure for the preparation of various metal complexes
Part - IV	Skill Based Common: <b>PERSONALITY DEVELOPMENT</b>	CCSB51	2	2	
<b>Semester – VI      B. Sc. Chemistry</b>					
Part - III	Core – IX: <b>Inorganic Chemistry – III</b>	CMCH61	4	5	<b>CO1</b> Apply the valency bond and crystal field theories to coordination compounds and analyse its spectral and magnetic properties <b>CO2</b> Compare the various substitution reactions of Coordination Compounds and deduct the stability of the complexes. <b>CO3</b> Discuss the various organometallic compounds and find its applications. <b>CO4</b> Analyse the characteristics of metal complexes using various Spectroscopy. <b>CO5</b> Identify the biologically important metals & compounds and analyze their uses.
	Core – X: <b>Organic Chemistry - III</b>	CMCH62	4	5	<b>CO1</b> Understand the reaction mechanism and effect of substituents of phenols and aromatic acid <b>CO2</b> Discuss various types of rearrangements. <b>CO3</b> Demonstrate various theories of colour and constituents and discuss the structure of naphthalene and anthracene. <b>CO4</b> Elaborate the structure of alkaloids and terpenoids. <b>CO5</b> Apply Woodward Fieser rule to conjugated dienes & $\alpha,\beta$ unsaturated ketones and IR & NMR spectroscopy to compounds

	Core – XI: <b>Physical Chemistry – III</b>	CMCH63	4	5	<p><b>CO1</b> Explain the applications of EMF measurements.</p> <p><b>CO2</b> Apply the rate constant expressions for various reactions.</p> <p><b>CO3</b> Discuss the applications of Le Chatelier’s Principle &amp; Hammett equation and Identify the applications of Interface chemistry</p> <p><b>CO4</b> Classify the molecules into various groups based on group theory.</p> <p><b>CO5</b> Explain the principles and applications of NMR, ESR &amp; NQR Spectroscopy.</p>
	Major Elective-III: <b>Nano Chemistry</b>	CECH62	4	4	<p><b>CO1</b> Define the different nanosized materials and analyze their peculiar properties.</p> <p><b>CO2</b> List out the various physical, chemical and biological methods of synthesis of nanomaterials</p> <p><b>CO3</b> Choose the suitable analytical techniques to characterize nanoparticles.</p> <p><b>CO4</b> Elaborate the various applications of nanomaterials and nanocomposites.</p> <p><b>CO5</b> Summarize the important nanocompounds and Explain their specific uses.</p>
	Major Practical – VII: <b>Physical Chemistry Experiments</b>	CMCHP7	2	4	<p><b>CO1</b> Explain the principles of physical chemistry experiments</p> <p><b>CO2</b> Determine the molecular weight and Critical Solution Temperature.</p> <p><b>CO3</b> Estimate the amount of substance by conductometric and potentiometric titrations.</p>
	<b>Major Project</b>	CMCH6P	7	7	
<b>Semester – I / III      Allied Chemistry</b>					
Part - III	<b>Chemistry for physical sciences-I</b> (for mathematics and physics students)	EECH11	3	4	<p>On completion of the course the students should be able to</p> <p><b>CO1</b> gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.</p> <p><b>CO2</b> evaluate the efficiencies and uses of various fuels and fertilizers organic reactions.</p> <p><b>CO3</b> explain the type of hybridization, electronic effect and mechanism.</p> <p><b>CO4</b> apply various thermodynamic principles, systems and phase rule.</p> <p><b>CO5</b> explain various methods to identify an appropriate method for the separation of chemical components</p>
	<b>Inorganic volumetric analysis – practical</b>	EECHP1	2	2	<p>On completion of the course the students should be able to</p> <p><b>CO1</b> gain an understanding of the use of standard flask and volumetric pipettes, burette.</p> <p><b>CO2</b> design, carry out, record and interpret the results of volumetric titration.</p> <p><b>CO3</b> apply their skill in the analysis of water/hardness.</p> <p><b>CO4</b> analyze the chemical constituents in allied chemical products</p>
	<b>Chemistry for Biological Sciences I</b> (For Botany and Zoology students)	EECH12	3	4	<p>On completion of the course the students should be able to</p> <p><b>CO1</b> state the theories of chemical bonding, nuclear reactions and its applications.</p> <p><b>CO2</b> evaluate the efficiencies and uses of various fuels and fertilizers.</p> <p><b>CO3</b> explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.</p> <p><b>CO4</b> demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.</p>

					<b>CO5</b> analyse various methods to identify an appropriate method for the separation of chemical components.
	<b>Inorganic volumetric analysis – practical</b>	EECH1P	2	2	On completion of the course the students should be able to <b>CO1</b> gain an understanding of the use of standard flask and volumetric pipettes, burette. <b>CO2</b> design, carry out, record and interpret the results of volumetric titration. <b>CO3</b> apply their skill in the analysis of water/hardness. <b>CO4</b> analyze the chemical constituents in allied chemical products
<b>Semester – II / IV      Allied Chemistry</b>					
Part - III	<b>Chemistry for physical sciences – II</b> (for mathematics and physics students)	EECH21	3	4	Course Learning Outcomes (for Mapping with PO's and PSs) On completion of the course the students should be able to <b>CO1</b> write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology. <b>CO2</b> explain the preparation and property of carbohydrate. <b>CO3</b> enlighten the biological role of transition metals, amino acids and nucleic acids. <b>CO4</b> apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells. <b>CO5</b> outline the various type of photochemical process.
	<b>Systematic analysis of inorganic salts</b>	EECHP2	2	2	On successful completion of the course the students should be able to <b>CO1</b> acquire knowledge on the systematic analysis of simple salts. <b>CO2</b> identify the cations and anions in the unknown substance. <b>CO3</b> identify the cations and anions in the soil and water and to test the quality of water. <b>CO4</b> assess the role of common ion effect and solubility product
	<b>Chemistry for Biological Sciences- II</b>	EECH22	3	4	On completion of the course the students should be able to <b>CO1</b> write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology. <b>CO2</b> explain the preparation and property of carbohydrate. <b>CO3</b> enlighten the biological role of transition metals, amino acids and nucleic acids. <b>CO4</b> apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells. <b>CO5</b> outline the various type of photochemical process.
	<b>Systematic analysis of inorganic salts</b>	EECH2P	2	2	On successful completion of the course the students should be able to <b>CO1</b> acquire knowledge on the systematic analysis of simple salts. <b>CO2</b> identify the cations and anions in the unknown substance. <b>CO3</b> identify the cations and anions in the soil and water and to test the quality of water. <b>CO4</b> assess the role of common ion effect and solubility product