



# FATIMA COLLEGE

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*Affiliated to Madurai Kamaraj University*  
*Re-Accredited with 'A++' by NAAC (Cycle - IV)*  
Mary Land, Madurai - 625018, Tamil Nadu

## AQAR – QUALITATIVE METRIC

2023 - 2024

### Criterion 1 - Curricular Aspects

**1.1.1 Curricula developed and implemented have relevance to the local, national, regional and global developmental needs which is reflected in Programme outcomes (POs), Programme specific outcomes (PSOs) and Course Outcomes (COs), of the Programmes offered by the Institution.**

**Name of the Programme: B.SC.CHEMISTRY**

**Programme Code: UACH**

### **Programme Outcomes:**

<b>PO1</b>	Have firm foundations in the fundamentals and application of current chemical and scientific theories.
<b>PO2</b>	Are skilled in problem solving, critical thinking and analytical reasoning.
<b>PO3</b>	Are able to identify and solve chemical problems and explore new areas of research.
<b>PO4</b>	Are able to communicate the results of their work to chemists and non-chemists.
<b>PO5</b>	Students will be able to explain that chemistry is an integral part in addressing social, economic, and environmental problems.
<b>PO6</b>	Students turn out to be globally competent there by establishing themselves as attractive professionals.



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## Programme Specific Outcomes:

<b>PSO 1</b>	Thorough understanding of all basic concepts and theories pertaining to Chemistry
<b>PSO 2</b>	A comprehensive view of bonding, structure, reactivity and stability of chemical species.
<b>PSO 3</b>	An overall perspective view of physical principles that govern all physical and chemical transformations.
<b>PSO 4</b>	Basic knowledge about instrumentation involving UV, IR, ESR and NMR.
<b>PSO 5</b>	Hands on experience of laboratory experiments both qualitative and quantitative
<b>PSO 6</b>	Project undertaking enables presentation of results and strengthens the learners in lab to land procedures that nurture societal need and environmental protection.
<b>PSO 7</b>	Diversified informative sources that equip learners to enter varied fields.
<b>PSO 8</b>	Additional in-puts of using appropriate software related to Chemistry and chemical calculations.



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## Course Outcomes:

Course Code	Course Title	Nature of the Course (Local/National/Regional/Global)	Course Description	Course Outcomes
23C1CC1	GENERAL CHEMISTRY-I	Global	This course helps the students to acquire a thorough knowledge of the basics of organic and inorganic chemistry.	CO1: to Explain the atomic structure, wave particle duality of matter, periodic properties, bonding, and properties of compounds. CO2: classify the elements in the periodic table, types of bonds, reaction intermediate electronic effects in organic compounds, types of reagents CO3: construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and



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				<p>organic reaction mechanisms.</p> <p>CO4: apply the theories of atomic structure, bonding, to calculate energy of aspect raltransition, <math>\Delta x</math>, <math>\Delta p</math>electro negativity, percentage eionic character and bond order</p> <p>CO5: evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure activity and electronic effects</p>
23C1CC2	INORGANIC ESTIMATION AND PREPARATIONS	Global	This paper gives a basic understanding of volumetric analysis & Inorganic complex preparation to major students as Core practical.	<p>CO1: explain the basic principles involved in titrimetric analysis and inorganic preparations.</p> <p>CO2: compare the methodologies of different titrimetric analysis.</p>
23C1GEZ1	CHEMISTRY FOR BIOLOGICAL SCIENCES I	Global	This paper gives a basic understanding of chemistry to other major students as	CO 1: Construct MO diagrams for homonuclear diatomic molecules



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	(ZOOLOGY)		allied paper.	<p>CO 2: Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.</p> <p>CO 3: Evaluate the efficiencies and uses of various fuels and fertilizers.</p> <p>CO 4: Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.</p> <p>CO 5: Analyse various methods to identify an appropriate method for the separation of chemical components.</p>
23C1GEN1	CHEMISTRY FOR BIOLOGICAL SCIENCES I (HOME SCIENCE)	Global	This paper gives a basic understanding of chemistry to other major students as allied paper.	<p>CO 1: Construct MO diagrams for homonuclear diatomic molecules</p> <p>CO 2: Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.</p>



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				<p>CO 3: Evaluate the efficiencies and uses of various fuels and fertilizers.</p> <p>CO 4: Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.</p> <p>CO 5: Analyse various methods to identify an appropriate method for the separation of chemical components.</p>
23C1GEZ2	CHEMISTRY PRACTICALS FOR BIOLOGICAL SCIENCES I (ZOOLOGY)	Global	This course trains the students to estimate the solutions quantitatively by different techniques.	<p>CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.</p> <p>CO 2: design, carry out, record and interpret the results of volumetric titration.</p> <p>CO 3: apply their skill in the analysis of water/hardness.</p> <p>CO4: analyze the chemical constituents in allied chemical products</p>



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23C1GEN2	CHEMISTRY PRACTICALS FOR BIOLOGICAL SCIENCES I (HOME SCIENCE)	Global	This course trains the students to estimate the solutions quantitatively by different techniques.	CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.  CO 2: design, carry out, record and interpret the results of volumetric titration.  CO 3: apply their skill in the analysis of water/hardness.  CO4: analyze the chemical constituents in allied chemical products
23C1SE1	FOOD CHEMISTRY	National	This course aims at giving an overall view of the Types of food,  Food adulteration and poisons  Food additives and preservation	CO1:learn about Food adulteration - contamination of Wheat, Rice, Milk, Butter  CO2: get an awareness about food poisons like natural poisons (alkaloids - nephrotoxin) pesticides, DDT, BHC, Malathion  CO3: get an exposure on food additives, artificial sweeteners, Saccharin, Cyclamate and



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				<p>Aspartate in the food industries.</p> <p>CO4: acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples.</p> <p>CO5: study about fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats –MUFA and PUFA</p>
23C1FC	FOUNDATION COURSE IN CHEMISTRY	national	<p>This course provides a detailed description of the basics of chemistry, especially atom, determination of molecular weight and role of organic chemistry and the gravimetric analysis</p>	<p>CO1Gain a basic knowledge about the basic concepts of chemistry</p> <p>CO2Knowledge about the determination of boiling point and molecular weight determination</p> <p>CO3Understanding the concept of detection of elements carbon &amp; nitrogen- estimation of elements carbon &amp;nitrogen.</p> <p>CO4Know about the Gravimetric</p>





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				analysis and selective precipitant, use of sequestering agents  CO5Gain a knowledge in major compounds of living beings-biochemical techniques
23C2CC3	GENERAL CHEMISTRY II	Global	This paper deals with the theories of acids and bases, chemistry of III, IV, V & VI group elements and hydrocarbons	CO1: 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  CO2: discuss the periodic properties of sand p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids  CO3: classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons



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				<p>CO4: explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements</p> <p>CO5: assess the application of hard and soft acids indicators, buffers, compounds of s and p-block elements and hydrocarbons</p>
23C2CC4	QUALITATIVE ORGANIC ANALYSIS AND PREPARATION	Global	This paper involves the analysis of inorganic mixtures of acid and basic radicals qualitatively and preparation of organic compounds.	<p>CO1: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.</p> <p>CO2: 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.</p> <p>CO3: exhibit a solid derivative</p>



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				with respect to the identified functional group.  CO4 :: Prepare an Organic Compound with Practical Experience
23C2GEZ3 / 23C2GEN3	CHEMISTRY FOR BIOLOGICAL SCIENCES II (FOR ZOOLOGY AND HOME SCIENCE STUDENTS)	Global	This paper gives a basic understanding of chemistry to other major students as allied paper.	CO 1:Estimate the hardness of water samples  CO 2:Distinguish the monosaccharides and disaccharides  CO 3:Explain the role of amino acids in biological systems  CO 4:Gain knowledge in electrochemical reactions and corrosion  CO 5:Differentiate thermal and photochemical reactions



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23C2GEZ4 / 23C2GEN4	CHEMISTRY PRACTICALS FOR BIOLOGICAL SCIENCES II  (FOR ZOOLOGY AND HOME SCIENCE STUDENTS)	Global	This paper involves the analysis of inorganic mixtures of acid and basic radicals qualitatively.	CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.  CO 2: design, carry out, record and interpret the results of volumetric titration.  CO 3: apply their skill in the analysis of water/hardness.  CO4: analyze the chemical constituents in allied chemical products
23C2SE2	DAIRY CHEMISTRY  (SKILL ENHANCEMENT)	National	This paper provide an understanding of the bioactive role, chemical interactions of milk constituents their components	CO1:understandaboutgeneralcompositionofmilk– constituentsanditsphysicalproperties  CO2:acquire knowledge about pasteurization of  Milk and various types of pasteurization –  Bottle, Batch and HTST Ultra High



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				<p>Temperature Pasteurization.</p> <p>CO3:learn about Cream and Butter their composition and how to estimate fat in cream and Ghee</p> <p>CO4:explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.</p> <p>CO5:haveanideaabout howtomak emilkpowderanditsdryingproces s-typesofdryingprocess</p>
23C2SE3	COSMETICS AND PERSONAL CARE PRODUCTS	National	This paper provide an understanding of the constituents of cosmetics and personal care products	<p>CO1: To know about the composition of various cosmetic products</p> <p>CO2: To understand chemical aspects and applications of hair care and dental care and skin care products.</p> <p><b>CO3:</b> To understand chemical aspects and applications of perfumes and skincare</p>



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				<p>products.</p> <p><b>CO4:</b>To understand the methods of beauty treatments, their advantages, and disadvantages.</p> <p>CO5:understand the hazards of cosmetic products.</p>
19C3CC7	ORGANIC AND INORGANIC CHEMISTRY	Regional	<p>This paper deals with the concept of aromaticity and the inorganic chemistry part of the paper deals with the general characteristics of elements</p>	<p>CO 1. To interpret the concept of aromaticity and the main properties of aromatic compounds.</p> <p>CO 2. To explore reactivity patterns of conjugated, aromatic molecules and to evaluate the kinetics and thermodynamics controlled reactions.</p> <p>CO 3. Explain types of oxides and oxyacids, their structure and reactivity in halogens</p> <p>CO 4. Discuss the properties d block elements &amp; triads of transition elements.</p>



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				CO 5. Recognize the role of oxidizing agents, reducing agents, group reagents and complexing agents, and inferences with theory behind practicals.
19C3CC8	PHYSICAL CHEMISTRY-I (Gaseous state, Solutions, dilute solutions, radio activity & Nuclear transformations and nuclear chemistry)	Regional	This course provides a detailed study of Gaseous state, Solutions, Theory of dilute, solutions and Radio activity	CO 1. Gain a basic knowledge about the kinetic theory of gases, gaseous laws, types of velocities and properties of gases CO 2. Distinguish between ideal and non-ideal solutions CO 3. Derive the relationship between molar mass of a non-volatile solute and colligative properties CO 4. Calculate the mass defect, packing fraction and binding energy for any nuclei CO 5. Predict the growing rate, mechanism and age of plants using radioactive elements



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19C3SB1	AGRICULTURAL CHEMISTRY	Global	The Course gives an introduction to soil and fertilizers and also gives the effect of pesticides.	<p>CO 1. Define the term soil</p> <p>CO 2. Describe the various types of fertilizers and their uses</p> <p>CO 3. Realise the requirements of manures and fertilizers for better production of various types of crops</p> <p>CO 4. Examine the adverse effect of pesticides</p> <p>CO 5. Calculate the amount of calcium and magnesium present in various types of soils</p>
19C3SB1(A)	DIARY CHEMISTRY	National	This paper provide an understanding of the bioactive role, chemical interactions of milk constituents their components	<p>CO1. To understand The Composition, physical and chemical properties of milk.</p> <p>CO2. To Know the minerals and vitamins present in the milk.</p> <p>CO3.To Gain the skills to develop milk powder processing</p>





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				CO4.To Gain knowledge about the chemistry of milk and milk products
19P3ACC1	ALLIED CHEMISTRY-I (Theory behind chemical bonding, quantitative and qualitative analysis, kinetics of chemical reactions and thermodynamics)	National	This paper deals with topics namely bonding and shapes of molecules. Certain physical chemistry portions such as chemical kinetics, thermodynamics are included	<p>CO 1. To comprehend the fundamental theories of Valence Bond, types of overlapping and VSEPR.</p> <p>CO 2. To categorize the reactions involved in volumetric analysis</p> <p>CO 3. To analyze the various organic compounds qualitatively</p> <p>CO 4. To recognize the theories of chemical kinetics.</p> <p>CO 5. To highlight the importance of thermodynamics and its related functions.</p>
19C3CC9	INORGANIC QUALITATIVE ANALYSIS	National	This course involves the analysis of inorganic mixtures of	CO 1. Gain the knowledge of appearance, colour, physical state, and odour of inorganic



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			acid and basic radicals qualitatively.	substances CO 2. Distinguish whether the given compound is interfering or non-interfering radicals. CO 3. Perform the confirmatory test for various acid and basic radicals present in the given inorganic compound. CO 4. Recognize the usage of apparatus and laboratory reagents. CO 5. Avoiding hazardous experiments by doing microlevel eco friendly experiments.
19P3ACC2	Allied chemistry practicals-I	National	This course trains the students to estimate the solutions quantitatively by different techniques.	CO 1. Describe the principles and procedures of various titrimetric methods CO 2. Identify suitable indicators for a particular reaction CO 3. Know the various terms



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				<p>such as standard solution, normality, molality, molarity, equivalent weight and molecular weight.</p> <p>CO 4. Select the specific titric method to estimate the amount of analyte present in the given solution.</p> <p>CO 5. Apply the expressions and equations to calculate the strength of solutions.</p>
19C4CC10	INORGANIC CHEMISTRY-III (Coordination Chemistry)	Global	The Course enables the students to gain knowledge on the chemistry of coordination compounds, carbonyl compounds and "F" block elements.	<p>CO 1. Know the structure and bonding of important coordination compounds</p> <p>CO 2. Apply the rules to calculate the magnetic properties of complexes and how magnetic moments can be employed for the interpretation of their structure</p> <p>CO 3. Get an overview about the reaction mechanism</p>



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				<p>of metal complexes</p> <p>CO 4. Import the skills to elucidate the structure and mode of bonding in organometallic compounds</p> <p>CO 5. Gain knowledge about the chemistry of Lanthanides and Actinides</p>
19C4CC11	<p>PHYSICAL CHEMISTRY-II (Chemical Kinetics, Solid State and distribution Law)</p>	Regional	<p>This course provides an elaborate study of chemical kinetics, solid state and distribution law.</p>	<p>CO 1. To determine integrated rate expression for zero order, first order, second order reactions and their respective half-life period expressions with examples</p> <p>CO 2. To study the various factors which affect the rate of a chemical reaction such as concentration, temperature, and solvent</p> <p>CO 3. To learn the crystal diffraction and experimental techniques used to characterize</p>



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				<p>the solid crystals</p> <p>CO 4. To recognize and give the lattice parameter relationships for the seven crystal systems</p> <p>CO 5. To value the Nernst distribution law - its thermodynamic derivation, modification of law when solute undergoes association, dissociation and chemical combination with one of the solvents</p>
19C4SB2	DYES AND PIGMENTS	NATIONAL	This paper highlights the uses of dyes in our day today life.	<p>CO 1. Know and comprehend the principle and theories of dyes</p> <p>CO 2. Identify the chromophoric groups and auxochromes present in the dyes</p> <p>CO 3. Classify the of dyes whether natural or synthetic</p> <p>CO 4. Predict the structure of dyes</p>



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				CO 5. Recognise the applications of dyes in various industries
19C4SB2(A) )	HEALTH CHEMISTRY	National	This course deals with the basic knowledge about the significances of health and hygiene in every day human life.	CO1.To Acquire the basic knowledge about the significances of food and hygiene  CO2.To Classify the given drugs whether they belong to antipyretics,analgesics, depressants etc  CO 3. To Interpret the structure and mechanism of enzyme action  CO4.To Catagorize and identify the function of the different types of harmones  CO 5. To Analyse the reason for common diseases affecting the human body



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19C4CC12	ORGANIC QUALITATIVE ANALYSIS	Global	This paper involves the analysis of inorganic mixtures of acid and basic radicals qualitatively.	<p>CO 1. Gain the knowledge of appearance, colour, physical state, and odour of organic substances</p> <p>CO 2. Distinguish whether the given compound is Aliphatic or Aromatic and Saturated or Unsaturated.</p> <p>CO 3. Perform the confirmatory test for various functional groups present in the given organic compound.</p> <p>CO 4. Recognize the usage of apparatus and laboratory reagents.</p> <p>CO 5. Avoiding hazardous experiments by doing microlevel eco friendly experiments.</p>
19P4ACC3	ALLIED CHEMISTRY-II (Periodic table and atomic properties, electro chemistry-I, II,	National	This course gives a detailed study of periodic properties, electrochemistry &	<p>CO 1. Understand the periodicity in periodic table</p> <p>CO 2. Understand the different types of conductances and their</p>



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	Catalysis and photochemistry)		photochemistry.	relations and the effect of dilution.  CO 3. Use Nernst equation to calculate the electrode potential and emf of electrochemical cells. Study the applications of electrochemical measurements  CO 4. Understand the basics of photochemistry using laws of photochemistry and Jablonsky diagram  CO 5. Derive the rate constants of certain photochemical reactions.
19P4ACC4	ALLIED CHEMISTRY PRACTICALS	National	This course trains the students to estimate the solutions quantitatively by different techniques.	CO 1. Gain the knowledge of appearance, colour, physical state and odour of organic substances.  CO 2. Distinguish whether the given compound is Aliphatic or Aromatic and Saturated or Unsaturated.





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				<p>CO 3. Perform the confirmatory test for various functional groups present in the given organic compound.</p> <p>CO 4. Recognize the usage of apparatus and laboratory reagents.</p> <p>CO 5. Relate the experimental observations with theory behind practicals.</p>
19C5CC13	Organic chemistry –III (Aldehydes And Ketones, Carboxylic Acids And Their Derivatives, stereoisomerism, Amines And Diazo Compounds And Carbohydrates)	Regional	This course provides an elaborate study of the preparation, reactions and synthetic application of organic compounds	<p>CO 1.Toanalyze the synthetic importance of reactive methylene compounds</p> <p>CO 2.To generalize the characteristic features of optical isomers and geometrical isomers</p>
	PHYSICAL CHEMISTRY –III (Thermodynamics,	Global	This course provides an elaborate study of the thermodynamics,	CO 1. To predict the feasibility of chemical reactions applying II law of thermodynamics



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19C5CC14	Phase Rule & Group Theory)		Phase Rule and Group theory	CO 2. To explain the absolute entropy of substances and to calculate it
19C5CC15	INORGANIC PRACTICALS (Gravimetric Analysis)	National	This paper deals with the preparation of some inorganic complexes and gravimetric estimation of metal ions	CO 1. Acquire the knowledge of concept of gravimetric estimations. CO 2. Recognise the role of reagents in chemistry.
22C5CC16	CONVENTIONAL AND GREEN SYNTHESIS	Global	This paper deals with the preparation of some organic Compounds via greener routes	CO 1. Recognize the usage of apparatus and laboratory reagents. CO 2. Relate the experimental observations with theory behind practicals.
19C5ME1	SPECTROSCOPY	Global	This paper will be of much use of the students to take up higher studies.	CO 1. To identify various functional groups present in organic molecules using IR frequency. CO 2.To predict the number and nature of protons/ carbons in organic molecules in <sup>1</sup> H-NMR/



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				13C-NMR spectroscopy
19C5ME2	BIO CHEMISTRY	Regional	This course gives an overview of classification of enzyme and mechanism of enzyme action	CO 1.To identify the various metabolic reactions CO 2. To understand the importance of nucleic acids
19C5SB3	MEDICINAL CHEMISTRY	Global	This paper highlights the causes of common diseases the role of vitamin for the healthy life and the importance of hormones	CO 1.To study the mechanism of drug action CO 2.To determine the designing and binding of drugs with receptors
19C5SB4	NANO CHEMISTRY	Global	This paper deals with study of synthesis, properties, structure and applications of nano particles.	CO 1. Learn about the background on Nanoscience . CO 2. Understand the synthesis of nanomaterials and their application and the impact of nanomaterials on environment
19C6CC17	Organic chemistry –IV (Polynuclear Hydrocarbons,	Regional	This paper includes the topics, Polynuclear Hydrocarbons,	CO 1. To explicate the structures of Citral, Dipentene and Camphor.



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	Heterocyclic Compounds, Amino Acids And Proteins)		Heterocyclic Compounds, Amino Acids and Proteins, Alkaloids and terpenes.	CO 2. To distinguish the properties of quinolin and isoquinoline.
19C6CC18	PHYSICAL CHEMISTRY-IV (Electrolytic Conductance And Electrochemistry)	Regional	This course gives a detailed study of electrochemistry & photochemistry	CO 1. Calculate the cell potential for a nonstandard cell. CO 2. Know the chemical reactions used in a lead-acid battery
19C6ME3	ADVANCED ORGANIC CHEMISTRY	Global	The course is offered to expose the advanced topics in the field of organic chemistry.	CO 1. To sketch Frontier molecular orbitals in photochemistry. CO 2. To differentiate the molecular rearrangements and to solve the simple problems
19C6ME4	POLYMER CHEMISTRY	Global	The course is offered to expose the advanced topics in the field of polymer chemistry	CO 1. To understand the theories and mechanism of different types of polymerisation processes. CO 2. To study the applications of the above techniques to synthesize different natural and



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				synthetic polymers.
19C6ME5	ADVANCED PHYSICAL CHEMISTRY	Global	The course is offered to expose the advanced topics in the field of physical chemistry.	CO 1. To understand the theories behind the spectral techniques like MW.IR,NMR and ESR CO 2. To study the applications of the above techniques to elucidate the structures of molecules
19C6ME6	ADVANCED INORGANIC CHEMISTRY	Global	The course is offered to expose the advanced topics in the field of Bioinorganic chemistry.	CO 1. To understand the theories behind inorganic photochemistry and electroanalytical techniques. CO 2. To study the applications of the above techniques to elucidate the structures of Bio-inorganic molecules
19C6SB5	COMPUTERS IN CHEMISTRY	Global	This course deals with the use of computers in molecular modelling and drug design and also covers the use of internet and its application in	CO 1. To write programs to determine lattice energy, half-life, normality, molarity, molality CO 2. To present structure based drug designing in both 2D and 3D



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			data search.	
19C6SB6	GREEN CHEMISTRY	Global	This course highlights the need for green chemistry approach which is the need of hour to protect the environment from hazardous chemical pollution.	CO 1. To differentiate between yield and atom economy CO 2. To interpret the concept of Stereo selectivity, Chemo selectivity and Regio selectivity
19C6CC19	PHYSICAL PRACTICALS	Global	This paper involves the experimental studies on Rast method, determination of transition temperature, phase diagrams, &electro chemistry	CO 1.Experience in some scientific methods employed in basic and applied physical chemistry CO 2. Developed skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry