



# Fatima College

(Autonomous)

*Re-Accredited with 'A++'(CGPA 3.61) by NAAC (Cycle- IV)*

*College with Potential for Excellence (2004 - 2019)*

*101 - 150 Rank Band in India Ranking 2021 (NIRF)*

Mary Land, Madurai - 625018, Tamil Nadu.



## FATIMA COLLEGE (AUTONOMOUS), MADURAI – 625018

2020 - 2021

**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: M. SC CHEMISTRY**

**PROGRAMME CODE: PSCH**

**PROGRAMME OUTCOMES:**

**Students will have**

**PO1:** Firm hold and sound footing in theoretical and practical aspects of Chemistry

**PO2:** An overall comprehensive and an in-depth knowledge and equip learners to possess global competency

**PO3:** Diversified branches with deep rooting cultivate research aptitude that leads to innovative findings

**PO4:** Informative but application oriented inputs

**PO5:** Enhanced chances to take up careers in industries and other pivotal sectors

**PO6:** Rigorous training to tackle challenges in the academic and societal need based fields



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**PO7:** Opportunity to be exposed to the current emerging trends in the field of Chemistry through activities such as workshops, seminars and projects.

## **PROGRAMME SPECIFIC OUTCOMES:**

**PSO1 :** Equipped with an in-depth knowledge of varied fields namely Organic Chemistry, Inorganic Chemistry , Physical and nanochemistry.

**PSO1 :** Training in problem solving procedures enables to interpret the experimental data into structures and mechanisms.

**PSO2 :** Provides a tremendous exposure and cultivates analytical and synthesising measures necessary to take up project work in reputed institutions.

**PSO3 :** Programme renders diversified thinking thereby promotes creative skills.

**PSO4 :** Directed to solve the problems that cause a negative impact on surroundings to pursue salient steps to safeguard environment,.

**PSO5 :** Application-oriented input sharpens the skill to undertake CSIR-NET exam.

**PSO6 :** Knowledge with practical dimensions becomes a driving power to undertake research in different areas at a global level.



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**PSO7 :** Multi-layered input enables to avail opportunities at chemical, pharmaceutical industries.

**PSO8 :** Becomes a contributing force and development agent in society.

COURSE CODE	COURSE TITLE	NAME OF THE COURSE (LOCAL/ NATIONAL/ REGIONAL/ GLOBAL)	COURSE DESCRIPTION	COURSE OUTCOMES
19PG1C1	INORGANIC CHEMISTRY-I	Global	This course deals with the theories of bonding with the knowledge of the periodic properties of elements and the various processes involved in nuclear Chemistry, reactors and the usefulness of radio isotopes.	CO 1. To analyse all chemical species involved in organic and Inorganic reactions and to identify those as acid and bases  CO 2. To classify the bonds as ionic and covalent and to compare the theories



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				<p>CO 3. To categorize the solid systems, to calculate the lattice energy and draw conclusions on their stability</p> <p>CO 4. To predict the structures and magnetic properties of Inorganic compounds</p> <p>CO 5. To gain indepth knowledge of nuclear reactions, reactors and the applications of radio isotopes in all fields</p>
19PG1C2	ORGANIC CHEMISTRY-I	Global	This paper focuses on all the important aspects of organic chemistry like aromaticity, reaction intermediates,	CO 1. To interpret the concept of aromaticity and the main properties of aromatic



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			chirality and heterocyclics.	<p>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. To define the fundamentals of chirality, prochirality, symmetry elements and applications of atropisomers.</p> <p>CO 4. To comprehend of nucleophiles, electrophiles, electronegativity, and resonance</p> <p>CO 5. To sketch the preparation and</p>
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				properties of heterocyclic compounds.
19PG1C3	PHYSICAL CHEMISTRY-I	Global	This course gives detailed account of all the important concepts of electrochemistry and statistical thermodynamics.	<p>CO 1. To gain knowledge Kohlrausch's law and electrolytic conductance</p> <p>CO 2. Calculate the molar conductance, degree of dissociation and electrical potential Possess thorough understanding of Debye-Huckel equation</p> <p>CO 3. To gain knowledge of Electro catalysis and Electrosynthesis</p> <p>CO 4. Describe in detail about the three laws of thermos</p>



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				dynamics  CO 5. Restate in their own words about the concept of distribution, thermodynamic probability and most probable distribution
19PG1C4	INORGANIC QUALITATIVE ANALYSIS	Global	This paper gives hands on experience of Qualitatively analysing the inorganic salts containing simple and rare earth metal cations.	CO 1. To study the principle of distribution of common and rare metal ions in different groups.  CO 2. To know the inter- and intra group precipitation and separation of metal ions.  CO 3. To improve the skill in the qualitative analysis of rare



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				metal ions in different groups.  CO 4. To identify the methodology to analyse a metal ion in the presence of another metalion.
19PG1C5	ORGANIC QUALITATIVE ANALYSIS	Global	This course gives hands on experience of qualitatively analysing organic compounds and to synthesis simple organic compounds.	CO 1. To be skilled in the separation of binary organic mixtures  CO 2. To gain knowledge on the skills of doing micro level analysis  CO 3. To know the methods of qualitative analysis of organic compounds  CO 4. To learn about the preparation of suitable derivative of the





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				organic functional groups  CO 5. To prepare organic compounds.
19C1EDC	ESSENTIALS OF LIFE	Regional	This paper is an inter disciplinary optional paper gives an account of preparation of house hold items, various analytical techniques such as, volumetric methods, and chromatographic methods	CO 1. To acquire knowledge of common medicine.  CO 2. To express the concentration of solution in volumetric analysis.  CO 3. To differentiate column and TLC technique.  CO 4. To classify the different types of polymers and its characteristics.  CO 5. To analyze the different



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				types of soil and differentiate natural fertilizer from artificial fertilizer.
19PG2C6	INORGANIC CHEMISTRY-II	Global	This paper enables the students to understand the chemistry of complexes and their characterization and reaction mechanisms.	<p>CO 1. Compare the stabilities of complexes using stability constants and to identify the types of isomers</p> <p>CO 2. To describe the theories of co-ordination compounds to understand the colours and magnetic properties and their position in the spectrochemical series</p> <p>CO 3. Investigate the structures of complexes using IR,NMR ,E SR and other spectral techniques</p>



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				<p>CO 4. To possess a thorough understanding of electronic spectra of complexes</p> <p>CO 5. To arrive at the mechanisms of substitution reactions in six and four coordinated complexes using kinetic studies</p>
19PG2C7	ORGANIC CHEMISTRY-II	Global	This course enables the students to get a thorough knowledge of elimination and addition reactions, conformational analysis and selective organic name reactions and rearrangements, study of	<p>CO 1. To comprehend the mechanism of elimination and substitution reactions and to apply the stereochemistry in E1, E2, ionic and pyrolytic eliminations.</p> <p>CO 2. To interpret the concept of nucleophilic and free radical</p>



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			organic spectroscopy and their applications in structural elucidation of organic compounds.	<p>addition reactions and metal hydride reduction and to discriminate the reactivity of organometallic reagents.</p> <p>CO 3. To explore reactivity patterns of substituted cyclo hexanes and to employ conformational reactivity in cis and trans decalins and to apply conformations in SN1, SN2, ionic, pyrolytic eliminations and NGP reactions.</p> <p>CO 4. To acquire a complete knowledge of the principles of UV, IR spectroscopy and to examine the various functional groups present in organic</p>
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				<p>molecules using <math>\lambda_{\text{max}}</math> and IR frequency values .</p> <p>CO 5. To differentiate the molecular rearrangements and to solve the simple problems and to recall the various naming reactions and to interpret the products.</p>
19PG2C8	PHYSICAL CHEMISTRY-II	Global	This paper provides an extensive study of the topics such as Chemical kinetics and Quantum mechanics.	<p>CO 1. To acquire knowledge about the basic concepts of chemical kinetics</p> <p>CO 2. To identify and analyze the effect of physical parameters <math>\mu</math>, <math>\eta</math>, D on rate of reaction</p> <p>CO 3. To derive rate constant for</p>



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				reactions using Lindemann, Hinshelwood, RRK, RRKM Theories  CO 4. To develop a knowledge and understanding of the concept Normalisation and orthogonalization and to solve Schrodinger wave equation for particle in a one dimensional box, three dimensional box and Rigid rotator.  CO 5. To apply variation and perturbation method to He atom.
19PG2C9	INORGANIC QUANTITATIVE	Global	This course gives training to prepare inorganic complexes	CO 1. To enable the students to acquire the quantitative skills



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	ANALYSIS		in a pure form and to estimate metal ions present in the solution.	in volumetric analysis and gravimetric analysis CO 2. To improve the skill in quantitative estimation of metal ions by various titric methods CO 3. To identify the methodology to estimate a metal ion in the presence of another metalion. CO 4. To be skilled in synthesis of inorganic complexes.
19PG2C10	ORGANIC PRACTICALS-II	Global	This course gives hands on experience of quantitatively analyzing organic compounds and to synthesis organic compounds using	CO 1. To develop the ability for synthesizing organic compounds by single stage. CO 2. To develop the ability for synthesizing organic



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			two stages.	compounds by double stage. CO 3. To study the reaction mechanism.
19C2EDC	ESSENTIALS OF LIFE	Regional	This paper is an interdisciplinary optional paper gives an account of preparation of house hold items, various analytical techniques suchas, volumetric methods, and chromatographic methods	CO 1. To acquire knowledge of common medicine. CO 2. To express the concentration of solution in volumetric analysis. CO 3. To differentiate column and TLC technique. CO 4. To classify the different types of polymers and its characteristics. CO 5. To analyze the different types of soil and differentiate natural fertilizer from





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				artificial fertilizer.
19PG3C11	ORGANIC CHEMISTRY-III	Global	This paper provides an elaborate study of organic spectroscopy and their applications in structural elucidation of organic compounds. This paper also deals with reactions that are taking place under photochemical conditions and pericyclic reactions and terpenoids.	<p>CO 1. To acquire a complete knowledge of the basic principles of <math>^1\text{H}</math>-NMR, <math>^{13}\text{C}</math>-NMR and Mass spectroscopy</p> <p>CO 2. To be acquainted with complete knowledge of photochemistry of ketone &amp; cyclo addition reactions and to develop an understanding of the significance of the number, and splitting of signals in NMR</p> <p>CO 3. To be competent to assign structures to simple molecules on the basis of nuclear magnetic resonance spectra</p>



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				<p>CO 4. To distinguish the similarities and differences of Pericyclic reactions and Cyclo addition and sigmatropic reactions</p> <p>CO 5. To apply the Spectral concepts to solve the problems, to elucidate the structures of simple organic compounds using the data from all the spectral techniques</p>
19PG3C12	PHYSICAL CHEMISTRY-III	Global	This course covers the detailed study of group theory and its application and also covers the principles of surface chemistry, and a brief study of macromolecules.	<p>CO 1. To learn about symmetry elements and symmetry operations, the point groups and character table</p> <p>CO 2. To Describe the selection rule for infrared-active and Raman active transitions, electronic</p>



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				transitions CO 3. To analyse the hybridization of given compounds and to apply HMO theory to Ethylene and some conjugated systems CO 4. To Classify of surface active agents, Polymers, and to derive Gibbs adsorption and BET isotherms CO 5. To explain the kinetics of vinyl, cationic and anionic polymerizations and to determine the mass of polymers.
19PG3C13	GREEN CHEMISTRY	Global	This course deals with principles of green	CO 1. To know about the alternative feedstock and to study about



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			chemistry, environmental performance, alternative energy sources and greener technologies.	the process and advantages of alternative materials CO 2. To get familiarise about the green chemistry technology CO 3. To understand the need of alternative energy sources CO 4. To learn different types of renewable energy sources CO 5. To acquire knowledge about the greener techniques in industries
19PG3CE1	MATERIAL CHEMISTRY	Global	This course deals with study of synthesis, properties, structure and applications of nano particles.	CO 1. To gain knowledge about the basic principles of nanochemistry and classification of nanomaterials. CO 2. To describe several synthesis



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				<p>of inorganic nanoparticles, one-dimensional nanostructures (nanotubes, nanorods, nanowires), thin films, nanoporous materials, and nanostructured bulk materials,</p> <p>CO 3. To criticize the importance of various instrumentation techniques such as NMR, IR, UV, X-ray diffraction, ESR etc., for elucidating the structures of nanomaterials.</p> <p>CO 4. To depict the structure of carbon nanostructures, organic nanopolymers and supra molecular structures</p>
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				CO 5. To recognize the important role of nanomaterials in various fields.
19PG3CE2	BIO-ORGANIC CHEMISTRY	Global	This paper deals with the molecular drug designing, classification of proteins, enzymes	<p>CO 1. Understand concepts of molecular recognition and drug design</p> <p>CO 2. Remember the synthesis and structure of Proteins and amino acids.</p> <p>CO 3. Know the extraction and purification of enzymes and their application in catalysis.</p> <p>CO 4. Categorize and analyze enzyme mechanisms.</p> <p>CO 5. Analyze the structure and biological functions of</p>



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				Coenzymes.
19PG4C14	PHYSICAL CHEMISTRY PRACTICALS-I	Global	This course gives lab experience on physical experiments	<p>CO 1. Developed expertise relevant to the professional practice of chemistry</p> <p>CO 2. Developed an understanding of the breadth and concepts of physical chemistry</p> <p>CO 3. An appreciation of the role of physical chemistry in the chemical sciences and engineering</p> <p>CO 4. Developed an understanding of the role of the chemist and chemical engineer in tasks employing physical chemistry</p>



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				CO 5. An understanding of methods employed for problem solving in physical chemistry
19PG3SICI	INTERNSHIP	Global	This paper is designed to increase the problem solving, critical thinking and analytical reasoning skill of students.	CO 1. To carry out scientific experiments CO 2. To accurately record and analyze the results of such experiments.
19PG4C15	INORGANIC CHEMISTRY-III	Global	This course covers the structure and Bonding of organ metallic compounds and basic concepts of bioinorganic compounds	CO 1. Illustrate the structure and mode of bonding in organometallic complexes CO 2. Apply the different electron counting procedures to predict the shape and stability of organometallic complexes CO 3. Illustrate the mechanism of





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				<p>dioxygen binding in various oxygen carrier proteins</p> <p>CO 4. Classify and identify the different types of metalloenzymes and metallo proteins based on their biological functions.</p> <p>CO 5. Interpret the structure of borazines, boranes and carboranes.</p>
19PG4C16	ORGANIC CHEMISTRY-IV	Global	This course paper deals with types of synthetic compounds, basic concepts of photochemistry, nucleic acids and steroids	CO 1. To differentiate the carbon – carbon bond forming reactions and to interpret the products and to explore reactivity patterns of various coupling reactions



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				<p>CO 2. To elucidate the structural units of quinine, morphine, <math>\alpha</math>-pinene and -codinene</p> <p>CO 3. To correlate the skeletal units of nucleotides and nucleosides- RNA and DNA</p> <p>CO 4. To categorize the reducing and oxidizing agents and its applications.</p> <p>CO 5. To Sketch the effective and logical synthetic route for the synthesis of new molecules</p>
19PG4C17	PHYSICAL CHEMISTRY-IV	Global	This paper deals with many spectroscopic techniques like Microwave, IR, Raman and Photoelectron, ESR,	CO 1. Describe the structure and mode of bonding in organo metallic complexes containing carbonyls, nitrosyls, carbenes,



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			NQR and Mossbauer.	<p>carbynes, alkenes, alkynes and also metallocene complexes</p> <p>CO 2. Apply different electron counting procedures to predict the shape and stability of organometallic complexes</p> <p>CO 3. Illustrate the mechanism of dioxygen binding in various oxygen carrier proteins</p> <p>CO 4. Classify different types of metalloenzymes and metallo proteins based on their biological functions.</p> <p>CO 5. Distinguish whether the given compound belongs to chain or ring or cage or cluster</p>
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19PG4CE3	ANALYTICAL CHEMISTRY	Global	This course deals with chromatographic techniques, spectroscopic methods, applications of C-programmes in chemistry	<p>CO 1. To acquire the complete knowledge of C language</p> <p>CO 2. To develop logics which will help them to create programs, applications of chemistry problems in C.</p> <p>CO 3. To explicate the theoretical principles of selected instrumental methods within electro analytical and spectrometric/spectrophotometric methods, and main components in such analytical instruments.</p> <p>CO 4. To explain the confidence level and confidence limit, the sources of random errors and</p>
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				effects of random errors on analytical results.  CO 5. To illuminate the theoretical principles of various separation techniques in chromatography, and typical applications of chromatographic techniques
19PG4CE4	CHEMICAL ENGINEERING	Global	This paper deals with analytical methods. It also deals with programming in C language and its applications to solve problems in chemistry	CO 1. To write C- Program using various features of C- language  CO 2 To categorize the various conditioning methods in water treatment  CO 3 To apply the principles involved in spectrophotometric analysis.



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				CO 4. To compare the mechanism between dry corrosion and wet corrosion  CO 5. To synthesize some industrially important polymers
19PG4C18	PHYSICAL CHEMISTRY PRACTICALS- II	Global	This lab course is course gives lab experience on physical experiments	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  CO 3. Developed skills in the scientific method of planning,



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				developing, conducting, reviewing and reporting experiments  CO 4. Developed some understanding of the professional and safety responsibilities residing in working with chemical systems.
19PG4CPR	PROJECT	Global	This paper is designed to increase the skill of students in problem solving, critical thinking and analytical reasoning as applied to scientific problems	CO 1. To carry out scientific experiments  CO 2. To accurately record and analyze the results of such experiments.