MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE

(An Autonomous College)

Affiliated to Periyar University, Salem | Accredited by **NAAC** with '**A**' Grade

Recognized by **UGC** under Section 2(f) & 12 (B)

MUTHAYAMMAL
COLLEGE OF ARTS
AND SCIENCE
(Autonomous)
A UNIT OF VANETRA GROUP
ESTD-1994
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DEGREE OF MASTER OF SCIENCE

Learning Outcomes - Based Curriculum Framework
- Choice Based Credit System

Syllabus for M.Sc., Chemistry

(Semester Pattern)

(For Candidates admitted from the academic year 2021 -2022 and onwards)

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS), RASIPURAM

VISION

To redefine the scope of higher education by infusing into each of our pursuits, initiatives that will encourage intellectual, emotional, social and spiritual growth, thereby nurturing a generation of committed, Knowledgeable and socially responsible citizens

MISSION

- To Ensure State of the world learning experience
- To espouse Value Based Education
- To empower rural education
- To instill the spirit of entrepreneurship and enterprises
- To create a resource pool of socially responsible world citizens

QUALITY POLICY

To Seek – To Strive – To Achieve greater heights in Arts and Science, Engineering, Technological and Management Education without compromising on the Quality of Education

DEPARTMENT OF CHEMISTRY

VISION

Department is dedicated to provide a high quality education in Chemistry for the students and to create young chemist to survive for social and scientific well-being.

MISSION

- To develop the department as a research ground for rural students
- To ensure that the department is equipped with highly sophisticated instruments

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Post Graduates will be able to promote learning environment to meet the industry expectation

PEO2: Post Graduates will be incorporated the critical thinking with good Communication and Leadership skills to become a self-employed

PEO3: Post Graduates will be upholding the human values and environmental sustenance for the betterment of the society

GRADUATE ATTRIBUTES

Graduate Attributes of M. Sc., Chemistry are:

GA 1: Academic Excellence

GA 2: Communication skills

GA 3: Critical Thinking

GA 4: Problem Solving

GA 5: Individual and Team work

GA 6: Moral and Ethics

GA 7: Environment and Sustainability

PROGRAMME OUTCOMES (POs)

PO1: Post graduates will attain profound proficiency and expertise

PO2: Post graduates will be ensured with corporative self – directed learning

PO3: Post graduates will acquire acumen to handle diverse contexts and function in domains of multiplicity

PO4: Post graduates will exercise intelligence in research Investigations and Introducing innovations

PO5: Post graduates will learn ethical values and commit to Professional ethics

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Gain sufficient knowledge in spectral, analytical, qualitative and quantitative techniques, which will be used in the chemical industry

PSO2: Adequate Laboratory skills to Plan, execute, record, interpret the observations and present the results of the chemical experiments

PSO3: Equip students with advanced knowledge and insight in all aspects of Chemistry

PSO4: Acquire problem-solving capacity, interpretation of results with the use of instruments, and devise new preparation techniques

PSO5: Aptitude and skills necessary to pursue research as a career and get trained for industrial entrepreneurship

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M.Sc. - Chemistry Abstract under LOCF-CBCS Pattern with effect from 2021-2022 Onwards

Structure of Credit Distribution as per the TANSCHE/UGC guidelines

S. No.	Study Components	Sem I		Sem II		Sem III		Sem IV		No.of Paper	Total Credit
		No.of Paper	Credit	No.of Paper	Credit	No.of Paper	Credit	No.of Paper	Credit		
1	DISCIPLINE SPECIFIC CORESES(DSC)-THEORY	3	12	2	9	3	15	1	5	9	41
2	DSC-PRACTICAL			3	9			3	9	6	18
3	DISCIPLINE SPECIFIC ELECTIVE COURSES(DSE)	1	4	1	4	1	4	1	4	4	16
4	PROJECT WORK							1	5	1	5
5	INTERNSHIP					1	2			1	2
6	GENERIC ELECTIVE COURSES(GEC)-EDC			1	4					1	4
7	HUMAN RIGHTS			1	2					1	2
8	ONLINE - COMPETITIVE EXAMINATION							1	2	1	2
	Cumulative Credits	4	16	8	28	5	21	7	25	24	90

Total No. of Subjects	24
Marks	**2200**

TOTAL CREDIT	90
EXTRA CREDIT	2
TOTAL CREDITS	92

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE(Autonomous) - Rasipuram - 637 408
Scheme of Examinations - LOCF-CBCS Pattern
(for the Students Addmited from the Academic Year:2021-2022 Onwards)
M.Sc. Chemistry

SEM	COURSE_CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
			Lect.	Lab.		CIA	ESE	TOTAL
I	21M1PCHC01	ORGANIC CHEMISTRY - I	5	-	4	25	75	100
I	21M1PCHC02	INORGANIC CHEMISTRY - I	5	-	4	25	75	100
I	21M1PCHC03	PHYSICAL CHEMISTRY - I	5	-	4	25	75	100
I	21M1PCHE01	POLYMER CHEMISTRY	5	-	4	25	75	100
I	21M2PCHP01	PRACTICAL : ORGANIC CHEMISTRY - I	-	4	-	-	-	-
I	21M2PCHP02	PRACTICAL : INORGANIC CHEMISTRY - I	-	3	-	-	-	-
I	21M2PCHP03	PRACTICAL : PHYSICAL CHEMISTRY - I	-	3	-	-	-	-
I		TOTAL	20	10	16	100	300	400
II	21M2PCHC04	ORGANIC CHEMISTRY - II	5	-	5	25	75	100
II	21M2PCHC05	PHYSICAL CHEMISTRY - II	5	-	4	25	75	100
II	21M2PCHE02	SPECTROSCOPY	5	-	4	25	75	100
II	21M2PCHP01	PRACTICAL : ORGANIC CHEMISTRY - I	-	3	3	40	60	100
II	21M2PCHP02	PRACTICAL : INORGANIC CHEMISTRY - I	-	3	3	40	60	100
II	21M2PCHP03	PRACTICAL : PHYSICAL CHEMISTRY - I	-	3	3	40	60	100
II	21M2PCSED1	FUNDAMENTALS OF COMPUTERS AND COMMUNICATION	4	-	4	25	75	100
II	21M2PHUR01	HUMAN RIGHTS	2	-	2	100	-	-
II		**TOTAL**	**21**	**9**	**28**	**320**	**480**	**700**
III	21M3PCHC06	ORGANIC CHEMISTRY - III	5	-	5	25	75	100
III	21M3PCHC07	INORGANIC CHEMISTRY - II	5	-	5	25	75	100
III	21M3PCHC08	PHYSICAL CHEMISTRY - III	5	-	5	25	75	100
III	21M3PCHE05	EXPERIMENTAL METHODS IN CHEMISTRY	5	-	4	25	75	100
III	21M4PCHP04	PRACTICAL : ORGANIC CHEMISTRY - II	-	3	-	-	-	-
III	21M4PCHP05	PRACTICAL : INORGANIC CHEMISTRY - II	-	4	-	-	-	-
III	21M4PCHP06	PRACTICAL : PHYSICAL CHEMISTRY - II	-	3	-	-	-	-
III	21M3PCHIS1	INTERNSHIP	-	-	2	100	-	-
III		**TOTAL**	**20**	**10**	**21**	**200**	**300**	**400**

N. Kithija

HEAD OF THE DEPARTMENT,
Department of Chemistry,
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RASIPURAM - 637 408,
NAMAKKAL DISTRICT

IV	21M4PCHC09	INORGANIC CHEMISTRY - III	5	-	5	25	75	100
IV	21M4PCHE07	MEDICINAL CHEMISTRY	5	-	4	25	75	100
IV	21M4PCHP04	PRACTICAL : ORGANIC CHEMISTRY - II	-	4	3	40	60	100
IV	21M4PCHP05	PRACTICAL : INORGANIC CHEMISTRY - II	-	4	3	40	60	100
IV	21M4PCHP06	PRACTICAL : PHYSICAL CHEMISTRY - II	-	4	3	40	60	100
IV	21M4PCHPR1	PROJECT WORK	-	8	5	50	150	200
IV	21M4PCHOE1	CHEMISTRY FOR COMPETITIVE EXAMINATIONS	-	-	2	100	-	-
IV		TOTAL	10	20	25	320	480	700
IV		OVERALL TOTAL	71	49	90	940	1560	2200
IV	21M4PCHEC1	MOOC Courses offered in SWAYAM / NPTEL	-	-	2	-	-	-

N. Nithiya

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PG – REGULATIONS

1. Internal Examination Marks - Theory

Components	Marks
CIA I & II	10
Attendance	5
Assignment	5
Seminar	5
Total	25

Attendance Percentage	Marks
96 %to 100%	5
91%to 95%	4
86%to 90%	3
81%to 85%	2
75%to 80%	1
Below 75%	0

2. Question Paper Pattern for CIA I, II AND ESE (for 75 Marks) (3 hours)

Section – A (10 Marks) **(Objective Type)** **10 x 1= 10 Marks**

Answer **ALL** Questions

ALL questions carry EQUAL Marks

Section – B (15 Marks)(Analytical Type)

Answer any THREE Questions out of FIVE **questions** **3 x 5=15 Marks**

ALL questions carry EQUAL Marks

SECTION-D (50 Marks)

Answer ALL the Questions 5 x 10 = 50 Marks

Either or Type.

ALL Questions Carry **EQUAL** Marks

Total **75 Marks**

(Syllabus for CIA-I 2.5 Unit, Syllabus for CIA-II All 5 Unit)

2a) Components for Practical CIA

Components	Marks
CIA –I	15
CIA - II	15
Observation Note	5
Attendance	5
Total	**40**

2b) Components for Practical ESE

Components	Marks
Completion of Experiments	50
Record	5
Viva	5
Total	**60**

3. Internship/Industrial Training, Mini and Major Project Work

Internship/ Field Work Industrial Training		**Project Work**		
Components	**Marks**	**Components**		**Marks**
CIA* [1] Work Diary Report Viva-voce Examination	 25 50 25	***CIA*** a)Attendance Marks b)Review Marks	 20 30	50
Total	**100**			
		ESE* [1] a)Final Report Marks b)Viva-voce Marks	 120 30	 150
		Total		**200**

***[1]**Evaluation of report and conduct of viva – voce will be done jointly by Internal and External Examiners

4. Components for Human Rights Course (CIA Only)

a) The Course Human Rights is to be treated as 100% CIA course which is offered in II Semester for I year PG students.
b) Total Marks for the Course = 100

Components	Marks
Two Tests	75
Assignments	25
Total	**100**

- In case the candidate fails to secure 50 marks, which is the passing minimum, he/she may have to reappear for the same in the subsequent semesters.

5. Guidelines for Competitive Exams- Online Mode- Online Exam 3 hours

Components	Marks
100 Objective Type Questions 100*1 = 100 Marks	100

Objective type Questions from Question Bank.

- The passing minimum for this paper is 50%
- In case, the candidate fails to secure 50% passing minimum, he/she may have to reappear for the same in the subsequent semesters.

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M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1PCHC01	ORGANIC CHEMISTRY - I	DSC THEORY - I	I	5	3	2	0	4
Objective	Students should learn about various concepts of organic chemistry, Effect of structure on reactivity, Alkaloids and stereochemistry.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Stereochemistry, ORD and CD:** Wedge, Fischer, Newmann and Saw-horse formulae and their inter conversion, R and S notation, axial chirality (biphenyls, allenes and spiranes), planar chirality (cyclophanes, ansa compounds and trans cyclooctene), chirality due to helical shape, stereo selective and stereo specific reactions, asymmetric synthesis- Cram's rule. Homotopic, enantiotopic and diastereotopic atoms,groups in organic molecules. ORD & CD curves, octant rule, cotton effect, axial halo ketone rule and its applications	K1,K2	12
II	**Reaction intermediates and aliphatic electrophilic substitution:** Reaction intermediates - Formation, stability and structure of carbonium ions, carbanions, carbenes, nitrenes and free radicals Aliphatic electrophilic substitution- SE1, SE2 and SEi mechanisms and electrophilic substitution by double bond shift, hydrogen electrophile-keto-enol tautomerism, halogen electrophile-halogenation of aldehydes and ketones, nitrogen electrophile-aliphatic diazonium coupling, sulphur electrophile- sulphonation and carbon electrophile- Stork-enamine reaction	K2,K3	12
III	**Effect of structure on reactivity:** Resonance and field effects, resonance and steric effects, quantitative treatment- the Hammett equation- linear free energy relationship, substituent constant and reaction constant and limitations of Hammett equation, Taft equation, thermodynamically and kinetically controlled reactions, Hammond's postulate, Non- kinetic methods of determining mechanism-isolation, trapping and detection of intermediates, isotopic labeling, crossover experiments, product analysis, stereo chemical evidence, kinetic method -kinetic isotope effect	K3	12
IV	**Aliphatic nucleophilic substitution:** The SN1, SN2, SNi and neighbouring group mechanisms, the neighbouring group participation by pi and sigma bonds, Non classical carbocations, nucleophilic substitution at an allylic, aliphatic trigonal and vinylic carbon. Reactivity- effect of substrates structure, attacking nucleophile, leaving group and reaction medium. Ambident nucleophile, Swain- Scott, Grunwald-Winstein relationship, phase transfer catalysis.	K4,K5	12

V	**Alkaloids and Anthocyanins:**Synthesis and structural elucidation of morphine, quinine, papaverine and reserpine. General nature of anthocyanins, structure of anthocyanidins, synthesis of pelargonidin chloride, cyanidin chloride, delphinidin chloride and peonidin chloride. Synthesis and structural elucidation of flavones and isoflavones.	K3,K6	12
Course Outcome	CO1: Learn about the concepts and importance of stereochemistry of organic compounds	**K1**	
	CO2: Understand the reaction intermediates and aliphatic electrophilic substitution	**K2**	
	CO3: Comprehend the effect of structure on reactivity	**K3**	
	CO4: Gain in-depth knowledge about aliphatic nucleophilic substitution reactions	**K5**	
	CO5: Learn about structural elucidation of alkaloids, flavones, isoflavones and anthocyanins	**K6**	

Learning Resources	
Text Books	1. Jerry March, Advanced Organic Chemistry Reactions, Mechanisms and Structure, Fourth Edition, John Wiley and Sons, 1992 2. Gould, Mechanism and structure in organic chemistry, Rinehart and Winston, INC, 1960. 3. Jagdamba Singh and Yadav, Advanced Organic Chemistry, Pragati Prakashan Publications, Sixth Edition, 2010.
Reference Books	1. P. S. Kalsi, Stereochemistry and Mechanism through solved problems, Second Edition, New Age International Publishers, 1994. 2. D. Nasipuri, Stereochemistry of Organic Compounds, Second Edition, New Age International Publishers, 1994. 3. S. M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry, First Edition, Macmillan, 1976.
Website Link	1. https://nptel.ac.in/courses/104/103/104103110/ 2. http://www.nptel.ac.in/courses/104/105/104105086/ 3. http://www.nptel.ac.in/courses/104/105/104105040/

L-Lecture T-Tutorial P-Practical C-Credit

M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1PCHC01	ORGANIC CHEMISTRY - I	DSC THEORY - I	I	5	3	2	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	L	S	M	M	S	M
CO2	M	M	M	M	M	S	M	M	S	M
CO3	M	L	M	M	M	M	M	S	S	S
CO4	S	M	M	M	M	S	M	S	M	S
CO5	S	M	L	M	S	S	S	L	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Unit IV- neighbouring group mechanisms Group discussions, Unit V- Synthesis- Seminar
Teaching and Learning Methods	Smart-Classroom, Google meet, Demo classes
Assesment Methods	Unit test, Internal examinations, Semester examinations

Designed By	Verified By	Approved By
MRS. A. DHIVYA	DR. P. SUMATHI	

A. Dhiya P. Sumathi

MOTHAYAMMAL COLLEGE OF ARTS & SCIENCE
RASIPURAM
637 408
Tamil Nadu

M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1PCHC02	INORGANIC CHEMISTRY - I	DSC THEORY - II	I	5	3	2	0	4
Objective	To learn about the basic concepts of structure and bonding, boron compounds and Nuclear chemistry.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Structure and Bonding:** Hard and Soft acids and bases- classifications, Acid-Base strength, hardness, symbiosis, Theoretical basis of Hardness and Softness, applications of HSAB. Rings-Phosphazenes- Structure, Craig and Peddock model, Dewar model, polyorgano phosphazenes, Polysulphur –nitrogen compounds. Inorganic polymers-Silicates-structure, Pauling's rule, properties, correlation and application; Molecular seives Polyacids- Isopolyacids of V, Cr, Mo and W; Heteropolyacids of Mo and W (only structural aspects)	K1,K2	12
II	**Bioinorganic chemistry:** Biological significances of metals- alkali and alkaline earth metals, Na/K pump, Transition metal storage and transport of Fe, Cu, Zn, Biological oxygen transport systems, Structure and function of heme and non- heme proteins (Mb, Hb, Hc, Hr), Non-redox metallo enzymes- carboxy peptidase and carbonic anhydrase. Functions of Fe, Cu, Fe, sulphur proteins, cytochrome C and cytochrome P-450, Fundamental reactions of metals with nucleic acids and nitrogen fixation.	K2,K3	12
III	**Boron compounds and Clusters:** Boron hydrides – polyhedral boranes, hydroborate ions – a general study of preparation, properties and structure, styx numbers, Wade's rules. Carboranes - types such as closo and nido- preparation, properties and structure. Metallocarboranes – a general study. Metal clusters– Chemistry of low molecularity metal clusters only – structure of Re2Cl8; multiple metal –metal bonds.	K5	12

IV	**Nuclear Chemistry – I:** The nucleus-subatomic particles and their properties-mass defect - binding energy - n/p ratio in stable and metastable nuclei-Different types of nuclear forces-Liquid drop model and shell model. Modes of radioactive decay-Theory of alpha decay, beta decay and gamma radiation, Orbital electron capture, nuclear isomerism-internal conversion. Detection and determination of activity-GM, Scintillation and Cherenkov counters. Particle Accelerators: Linear accelerator-cyclotron, synchrotron, betatron and bevatron carbocations, nucleophilic substitution at an allylic, aliphatic trigonal and vinylic carbon. Reactivity- effect of substrates structure, attacking nucleophile, leaving group and reaction medium. Ambident nucleophile, Swain- Scott, Grunwald-Winstein relationship, phase transfer catalysis.	K4	12
V	**Nuclear Chemistry – II:** Nuclear Reactions: Q-value, columbic barrier- nuclear cross section-different types of nuclear reactions-projectile capture-particle emission, spallation, fission and fusion-product distributions - Theories of fission, use of fission products, fissile and fertile isotopes - U-238, U- 235, Pu-239, Th-232 - stellar energy-synthesis of new elements. Radio-Isotopes: Applications-isotopes as tracers - neutron activation analysis and isotopic dilution analysis - uses in structure and mechanistic studies - Carbon dating – Radio pharmacology, Radiation protection and safety precautions - Disposal of nuclear waste.	K3	12
Course Outcome	CO1: Understand the concepts of structure and bonding in inorganic compounds	**K1**	
	CO2: Learn about the structure, properties and uses of bioinorganic compounds	**K2**	
	CO3: Comprehend the Boron compounds and clusters and interpret the styx numbers	**K5**	
	CO4: Learn about radioactive decay and nuclear reactors and applications	**K4**	
	CO5: Gain in-depth knowledge about nuclear reactions	**K3**	
Learning Resources			
Text Books	1. F. A Cotton & Wilkinson, Advanced Chemistry, Wiley Publishers, Sixth edition, 1999. 2. Emelius and Sharpe, Modern Aspects of Inorganic Chemistry, Routledge & Kegan Paul PLC., 1973 3. J. D. Lee, Concise Inorganic Chemistry, Oxford University Press, Fifth edition, 2008. 2. Gould, Mechanism and structure in organic chemistry, Rinehart and Winston, INC, 1960. 3. Jagdamba Singh and Yadav, Advanced Organic Chemistry, Pragati Prakashan Publications, Sixth Edition, 2010.		
Reference Books	1. H. A. O. Hill and P. Day, Physical Methods in Advanced Inorganic Chemistry, John Wiley, 1968. 2. G. S. Manku, Inorganic Chemistry, T. M. H. Co., 1984. 3. K. F. Purcell and J. C. Kotz, Inorganic Chemistry, WB Saunders Co., USA, 1977.		

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1PCHC02	INORGANIC CHEMISTRY - I	DSC THEORY - II	I	5	3	2	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	S	M	S	M	S
CO2	S	S	L	M	M	M	S	M	M	M
CO3	M	M	S	S	M	M	M	M	S	M
CO4	S	S	M	M	S	S	M	M	S	S
CO5	S	M	L	S	S	S	M	M	S	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Unit - IV Nuclear isomerism-Seminar, Unit - IV - Nuclear isomerism- Group discussion.
Teaching and Learning Methods	Chalk and talk, Online courses, Smart class room
Assesment Methods	Unit test, Internal assesment, Semester examination

Designed By	Verified By	Approved By
Mr. V. SANTHOSHKUMAR	Dr. N. NITHIYA	

N. Nithiya

Curriculum Development Cell
MCAS
(Autonomous)
Rasipuram

M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1PCHC03	PHYSICAL CHEMISTRY - I	DSC THEORY - III	I	5	3	2	0	4

Objective	To study in detail the basic concepts of classical thermodynamics , statistical thermodynamics, kinetics of reactions, quantum chemistry and group theory.

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Classical Thermodynamics – I:** Concept of chemical potential-Determination of chemical potential – Direct Method and Method of Intercepts – variation of chemical potential with temperature and pressure-Fugacity – Methods of determination of fugacity – Variation of fugacity with temperature and pressure. Standard states for gases, liquids, solids and components of solutions. Solution of electrolytes – Concept of ionic strength - mean ionic activity and mean ionic activity coefficient – determination of activity coefficient from freezing point, EMF and solubility measurements.	K1,K3	12
II	**Statistical Thermodynamics – I:** Concept of Mathematical probability and thermodynamic probability - States of maximum thermodynamic probability of systems involving energy levels. Distinguishable and indistinguishable particles-microstates and macrostates. Ensembles– definition- microcanonical, canonical and grand canonical ensembles. Maxwell's distribution law of molecular velocities - Evaluation of average velocity, root mean square velocity and most probable velocity from distribution law of molecular velocities - molecular velocities and energies of an ideal gas.	K1,K2	12
III	**Chemical Kinetics – I:** Theories of reaction rates-Hard sphere collision theory and transition state theory of reaction rates– Comparison of collision theory and activated complex theory – Lindemann and Hinshelwood theories of unimolecular reaction rates-Potential energy surface -Reactions in solutions – comparison between gas phase and solution reactions – cage effect-influence of solvent, ionic strength, and pressure on reactions in solution – Kinetic isotope effects.	K3	12

IV	**Quantum Chemistry – I:** Planck's theory of black body radiation – Photoelectric effect; de – Broglie equation – Heisenberg uncertainty principle – Compton effect; operators and commutation relations – quantum mechanical postulates – Schrodinger equation and its solution to the problem of a particle in one and three dimensional boxes – the harmonic oscillator.	K4	12
V	**Group Theory – I:** Symmetry elements and symmetry operations – Point groups – identification and representation of groups – comparison of molecular and crystallographic symmetry – Reducible and irreducible representation – Direct product representation – Great Orthogonality Theorem and its consequences – Character table and its uses.	K5	12
Course Outcome	CO1: To know the concepts of classical thermodynamics	**K1**	
	CO2: Understand statistical thermodynamics and molecular velocities	**K2**	
	CO3: Gain in depth knowledge about theories of chemical kinetics	**K3**	
	CO4: Comprehend basics of quantum mechanics and its application in chemistry	**K4**	
	CO5: To identified and determine the points groups in molecules	**K5**	
Learning Resources			
Text Books	1. S. Glasstone, Thermodynamics for chemists, Affiliated East West press, New Delhi, 1960. 2. J. Rajaram and J. C. Kuriacose, Thermodynamics for students of chemistry, Lal Nagin Chand, New Delhi, 1986. 3. J. Rajaram and J. C. Kuriacose, Kinetics and mechanism of chemical transformation, Macmillan India Ltd., 1993.		
Reference Books	1. W. J. Moore, Physical Chemistry, Orient Longman, London, 1972. 2. J. W. Moore and R. G. Pearson, Kinetics and Mechanism, 1981. 3. A.K. Chandra, Introductory Quantum Chemistry, Tata McGraw Hill.		
Website Link	1.http://mpbou.edu.in/slm/mscche1p4.pdf 2.http://uh.edu/engines/statistical thermodynamics.pdf 3.http://onlinelibrary.wiley.com/page/journal/1097461x/homepage/reviews_in_quantum_chemistr.htm		

L-Lecture T-Tutorial P-Practical C-Credit

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1PCHC03	PHYSICAL CHEMISTRY - I	DSC THEORY - III	I	5	3	2	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	M	M	S	S	S	M
CO2	S	S	M	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	S
CO4	S	L	M	S	M	S	M	M	M	M
CO5	S	S	S	L	S	M	M	S	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Unit - IV - De-Broglie equation-Seminar,Unit - IV - Kinetic isotope effects Group discussion
Teaching and Learning Methods	Chalk and talk, Online courses, Smart class.
Assesment Methods	Unit test, Internal assesment, Semester examination

Designed By	Verified By	Approved By
Mr.V. SANTHOSHKUMAR	Dr.P.SUMATHI	

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M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1PCHE01	POLYMER CHEMISTRY	DSE - I	I	5	3	2	0	4
Objective	To study the basic concepts in Polymers, molecular weight determination, polymer process and applications of commercial and conducting polymers.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Basic Concepts:** Monomers, repeat units, degree of polymerization, Linear, branched and network polymers, Addition polymerization, Condensation polymerization, Mechanism of free radical, cationic and anionic polymerization and co-ordination polymerization. Ziegler-Natta catalyst. Kinetics of free radical, cationic, anionic and co-polymerisation. Determination of Reactivity ratio, Reactivity ratio and co-polymerisation behaviour.	K1, K2 & K3	12
II	**Molecular Weight and Physical Properties:** Concept of Average molecular weight, number- average, weight- average molecular weight and viscosity- average molecular weights. Determination of molecular weight - viscosity, light scattering, osmotic and ultra centrifugation methods. Physical properties- crystalline melting point, glass transition temperature, relationship between Tm and Tg and Determination of Tg.	K2, K4	12
III	**Polymer Processing and Polymerization Techniques**: Polymers processing- Plastics, elastomers and fibres. Compounding, Processing techniques- calendering, die casting, injection molding, thermofoaming and fibre spinning. Polymerization techniques- Bulk polymerization, solution polymerization, suspension polymerization, emulsion polymerization and melt polycondesation.	K2	12
IV	**Commercial Polymers:** Synthesis and applications of polyethylene, polyvinyl chloride, polyamide, polyester, phenol resins, epoxy resins, silicone polymers, polybenoxazoles, polyimidazole, polyurethane, polymethylmethacrylate, poly (tetrafluoro ethylene) and polyacrylonitrile.	K2, K3	12

V	**Conducting Polymers:** Conducting polymers- Introduction, Electrochemical doping, Electrochemical synthesis and applications of polypyrrole, polythiophene, polyindole, polyaniline, polyacetylene and poly(p-phenylene).	K3, K4	12
Course Outcome	CO1: Get basic ideas about the monomer, polymers and polymerization.	K1	
	CO2: Understand the principles of molecular weight determination methods and apply them in determining the molecular weight of polymers	K2	
	CO3: Knowledge about polymer processing and polymer techniques	K3	
	CO4: Comprehend the various methods of preparing commercial polymers and it's applications	K4	
	CO5: Understand the synthesis and applications of conducting polymers	K4	

Learning Resources

Text Books	1. L. Gupta, Polymer Science, Pragathi Prakashan, 2019 2. R. Gowariker, N. V. Viswanathan, J. Sreedhar, Polymer Science, New Age International Private Limited, 1986. 3. K. Ahluwalia and Anuradha Mishra, A Text Book: Polymer Science, Ane Books, First Edition, 2008.
Reference Books	1. F. N. Billmeyer, Text Book of Polymer Science, Wiley-Interscience Publication, Third edition, 2007 2. P. J. Flory, Principles of Polymer Chemistry, Asian Books, First Edition, 2006. 3. George Odian, Principles of Polymerization, John Wiley, Fourth Edition, 2007.
Website Link	1. https://www.youtube.com/watch?v=k_RErdKwaAg 2. https://nptel.ac.in/courses/104105124 3. https://nptel.ac.in/courses/105106205

L-Lecture T-Tutorial P-Practical C-Credit

M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1PCHE01	POLYMER CHEMISTRY	DSE - I	I	5	3	2	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S	S	M	S	M	S
CO2	S	S	M	S	S	S	S	M	S	M
CO3	S	S	S	S	M	S	S	S	S	M
CO4	S	M	S	S	S	S	M	S	S	S
CO5	S	S	M	M	S	S	S	M	M	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Unit-III - Polymers processing - Seminar, Unit - II- Determination of molecular weight- Group discussion & Quiz.
Teaching and Learning Methods	Smart board classes, Google meet, Demo class, Online courses
Assesment Methods	Unit test, Internal test, Assignment, university examination

Designed By	Verified By	Approved By
Dr. N. SUDHA	Dr.P.SUMATHI	

MUTHAYAMMAL COLLEGE OF ARTS & SCIENCE PASIPURAM 637 408 Tamil Nadu

M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHC04	ORGANIC CHEMISTRY - II	DSC THEORY - IV	II	5	5	0	0	5
Objective	To understand the basic concepts of aromaticity, Elimination reaction, Aromatic electrophilic and Nucleophilic substitution reactions and Organic pericyclic reactions							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Aromaticity:** Aromaticity - Aromaticity in benzenoid, non-benzenoid, (2, 6, 10 & 18 electrons systems) and hetero cyclic compounds. NMR concept of Aromaticity and non-aromaticity, systems of 10 electrons and more than 10 electrons (14, 18) annulenes, concept of anti-aromaticity and homoaromaticity, anti-aromaticity in (12, 14) annulenes, non-aromaticity, alternate and non-alternant hydrocarbons, Aromaticity in fullerenes, Mobius Aromaticity.	K1, K2, K4	12
II	**Elimination and Free radicals:** The E1, E2, E1CB mechanisms, orientation of the double bond - Hofmann, Saytzeff and Bredt rules, competition between Elimination and substitution, mechanism of pyrolytic elimination, Chugaev and Cope Elimination reactions. Reactions of free radicals - polymerization, addition, halogenation, aromatic substitution and rearrangement. Reactivity - reactivity on aliphatic, aromatic substrate, reactivity in the attacking radical and effect of solvents.	K2, K3	12
III	**Aromatic electrophilic and nucleophilic substitution:** The arenium ion mechanism, orientation and reactivity in monosubstituted benzene ring - o, m, p- directing groups, ortho, para ratio, ipso attack, Vilsmeier-Haack, Jacobson and Scholl's reactions. The SNAr, SN1 and benzene mechanisms, Reactivity - effect of substrate structure, leaving group and attacking nucleophiles.	K1, K3	12
IV	**Organic Photo chemistry:** The fate of excited molecules, Jablonski diagram, Norrish type I and type II reactions, photo reduction of ketones, Paterno-Buchi reactions, photo chemistry of arenes, photo oxidation, (formation of peroxy compounds), photo isomerisation (cis-trans), photo addition of olefin and amines to aromatic compounds. Fries, di-pi methane rearrangements, rearrangement of 4, 4- diphenyl cyclohexadienone.	K2, K3	12

V	**Pericyclic reactions:** Classification, basic concept of orbital symmetry, Woodward-Hofmann rules. Electrocyclic reactions - concept of con- and dis- rotation, cyclisation of butadiene and 1,3,5 - hexatriene - correlation diagram and FMO approach. Cycloaddition reactions - supra-facial and antara-facial addition, theory of (2+2) and (4+2) cycloaddition reactions - correlation diagram and FMO approach. Sigmatropic migration of hydrogen and carbon, Sommelet-Hauser, Cope and Claisen rearrangements.	K3 &K4	12
Course Outcome	**CO1:** Learn about the aromaticity of organic compounds and analyze the organic structures	K1	
	CO2: Comprehend the organic reaction mechanisms of elimination reactions and free radicals	K2	
	CO3: Knowledge about the aromatic electrophilic and nucleophilic substitution reactions	K3	
	CO4: An exposure about Organic Photochemistry and the various concepts	K3	
	CO5: Analyze the electrocyclic & cycloaddition reactions in Pericyclic reactions	K4	
Learning Resources			
Text Books	1. Jerry March, Advanced Organic Chemistry - Reactions, Mechanisms and Structure, Fourth Edition, John Wiley and Sons, 1992. 2. Francis A. Carey, Organic Chemistry, Third Edition, The McGraw Hill Companies, Inc., 1996. 3. P. S. Kalsi, Organic Reactions and Mechanisms, Second Edition, New Age International Publishers, 2002.		
Reference Books	1. S. H. Pine, J. B. Hendrickson, D. J. Cram and G. S. Hammond, Organic Chemistry, Fourth Edition., McGraw Hill Company, 1980. 2. R. O. C. Norman, Principles of Organic Synthesis, Second Edition, Chapman and Hall, 1978. 3. L. F. Fieser and M. Fieser, Organic Chemistry, Asia Publishing House, Bombay, 2000.		
Website Link	1. https://nptel.ac.in/courses/104106077 2. https://nptel.ac.in/courses/104101005 3. https://nptel.ac.in/courses/122106029		

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHC04	ORGANIC CHEMISTRY - II	DSC THEORY - IV	II	5	5	0	0	5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	M	S	M	S	S	M	S	M	S
CO3	S	S	M	S	S	S	S	M	S	S
CO4	S	S	S	M	S	S	S	S	M	S
CO5	S	M	M	S	S	S	M	M	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion & Discussion on various mechanism
Teaching and Learning Methods	Smart board classes, Google meet, Demo class, Online courses
Assesment Methods	Unit test, Internal test, Assignment, university examination

Designed By	Verified By	Approved By
Dr. P. SUMATHI	Dr. P. SUMATHI	

Curriculum Development Cell MCAS Autonomous Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHC05	PHYSICAL CHEMISTRY - II	DSC THEORY - V	II	5	3	2	0	4
Objective	To gain knowledge about the distribution laws in statistical thermodynamics, partition function, kinetics of complex, fast reactions, principles of quantum chemistry and group theory.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Statistical Thermodynamics - II:** Classical statistics- Stirling's approximation formula, Maxwell Boltzmann distribution law- assumptions, derivation for the system having non- degenerate and degenerate energy levels. Quantum statistics: Bose-Einstein and Fermi-Dirac statistics - comparison of Maxwell Boltzmann, Bose Einstein and Fermi - Dirac statistics - entropy of boson - Application. Entropy of fermions, Applications - electron gas, fermi energy of free electrons at absolute zero.	K1,K2	12
II	**Partition functions:** Definition explanation- molecular partition function- molar partition function- Relationship between partition function and thermodynamic properties- internal energy, entropy, enthalpy, equilibrium constant, molar heat capacities of ideal gas molecules - translational, rotational, vibrational, and electronic partition functions- Sackur- Tetrode equation Equipartition of Principle of Energy: Calculation of heat capacities of ideal gases, Einstein and Debye theory of heat capacities of solids.	K2,K3	12
III	**Chemical Kinetics - II:** Kinetics of complex reactions - reversible reactions, consecutive reactions - Parallel reactions and Chain reactions - Rice-Herzfeld mechanism for hydrogen-bromine, gas phase pyrolysis of methane and formation of phosgene reactions- explosion limits. Study of fast reactions: Relaxation methods-temperature and pressure jump methods - Stopped flow technique, flash photolysis and Crossed molecular beam method.	K3	12
IV	**Quantum Chemistry -II:** Application of Schrödinger equation to rigid rotator and hydrogen atom -origin of quantum numbers - probability distribution of	K2 K3&K4	12

	electrons. Approximation methods - Perturbation and Variation methods - Slater determinantion - application to hydrogen and helium atom -- spin - orbit interaction - LS coupling and JJ coupling - ground state term symbols for simple atoms.		
V	**Group Theory - II:** Symmetry selection rules for vibrational, Electronic and Raman Spectra - determination of vibrational modes in non-linear molecules such as H_2O, NH_3, CH_4 and XeF_4 - symmetry of hybrid orbitals in non-linear molecules (H_2O, NH_3, CH_4, XeF_4 and PCl_5) - Electronic spectra of formaldehyde.	K4	12
Course Outcome	**CO1:** Learn about the basics and applications of statistical thermodynamics	K1	
	CO2: Be introduced about the partition functions and its types	K2	
	CO3: Knowledge about the kinetics of complex reactions and methods to study fast reactions	K3	
	CO4: An exposure about various approximations and application of Schrodinger equation used in Quantum Chemistry	K3	
	CO5: Be aware of the importance and applications of group theory to spectroscopy	K4	

Learning Resources

Text Books	1. Gurdeep raj, Advanced Physical Chemistry, Goel Publishing House, Meerut. 2. M. C. Gupta, Statistical Thermodynamics, Wiley Eastern Publications, First Edition, 1990. 3. Ashley, Classical and Statistical Thermodynamics Pearson Education, 2012
Reference Books	1. W. J. Moore, Physical Chemistry, Orient Longman, London, 1972. 2. J. W. Moore and R. G. Pearson, Kinetics and Mechanism, 1981. 3. A.K. Chandra, Introductory Quantum Chemistry, Tata McGraw Hill.
Website Link	1. https://youtu.be/BAXAxx1vGLQ 2. https://youtu.be/IaQdiZ4nt3s 3. https://youtu.be/R9S0de6jejI 4. https://youtu.be/3qiT5epKVuc

L- Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHC05	PHYSICAL CHEMISTRY - II	DSC THEORY - V	II	5	3	2	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	M	S	M	S	M	M
CO2	M	S	L	S	L	S	S	L	S	L
CO3	S	M	S	M	S	S	M	S	M	S
CO4	S	S	M	S	M	S	S	S	S	M
CO5	M	S	S	M	L	M	S	S	M	L
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Seminar Unit - V - symmetry of hybrid orbitals in non-linear molecules , Group discussion Unit- III - Relaxation methods,
Teaching and Learning Methods	Online courses, Smart class room
Assesment Methods	Unit test, Internal assesment, Semester examination

Designed By	Verified By	Approved By
Mr. P. AYYANAR	Dr. P. SUMATHI	

Curriculum Development Cell MCAS (Autonomous) Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHE02	SPECTROSCOPY	DSE - II	II	5	3	2	0	4
Objective	To study in detail about UV-VIS, IR, NMR, 13C NMR, EPR, Mossbauer spectroscopic and Mass spectrometry techniques and develop problem solving skills from various types of spectra.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**UV-VIS and IR spectroscopy:** UV-VIS- The nature of the electronic excitations, origin of UV band structure and the principle of absorption, chromophores and auxochromes, factors affecting intensity - solvent effects and position of absorption bands - dienes, polyenes and enones Woodward - Fisher rules for dienes, enones and aromatics - calculation of λmax for organic molecules - applications of UV spectroscopy. IR : IR absorption process, modes of stretching and bending vibrations, bond properties and their relations to absorption frequencies, Characteristic group frequencies of aliphatic and aromatic organic molecules, carbonyl, carboxylic acid, ester, alcohol, phenol and amides. Factors influencing vibrational frequencies, interpretation of IR spectra of organic molecules - applications of IR spectroscopy.	K1,K3	12
II	**NMR spectroscopy - I:** 1H NMR - principle - Shielding and deshielding - chemical shift, factors influencing chemical shift - magnetic anisotropy - Spin - spin splitting - (n+1rule), Coupling constant - Pascal's triangle, calculation of coupling constants, mechanism of coupling (one bond, germinal, vicinal and long range coupling), First order and non first order spectra - Chemical & magnetic equivalence, shift reagents, NMR instrumentation - Applications	K1,K3	12
III	**NMR spectroscopy - II:** 13C NMR - The C-13 nucleus - Chemical shifts - Modes of couplings and multiplicity - proton coupled 13C spectra, Homonuclear and heteronuclear decoupling - NOE - Broad band decoupling - Off resonance decoupling - intensity of signals, Chemical shift equivalence, equivalent carbons, chemical shifts of 13C nuclei, DEPT technique, comparison of 1H and 13C NMR, 2D NMR - COSY and HETCOR techniques - simple molecules and applications of 13C NMR.	K4	12

IV	**EPR and MOSSBAUER spectroscopy :** EPR - introduction, factors affecting the g - value, limitations, instrumentation, electron nucleus interaction, hyperfine interactions - isotropic and anisotropic coupling constants - spin Hamiltonian - applications Mossbauer spectroscopy - Principle, Instrumentation, Doppler shift, Isomer shift, Quadrupole splitting, Magnetic interaction, Magnetic hyperfine splitting and selection rules. Applications - Mossbauer spectra of high and low spin Fe and Sn compounds.	K4	12
V	**MASS Spectrometry and spectroscopic Applications :** Mass spectra - Basic principle, molecular ion peak, base peak, meta stable ion peak, isotopic peaks, Nitrogen rule, ring rule, Mc-Lafferty rearrangement, rules for fragmentation pattern, Examples of mass spectral fragmentation of organic compounds (alkanes, aromatic hydrocarbons, alkyl halides, aldehydes, ketones, alcohols, acids and esters). Spectroscopic applications: Structural elucidation of simple organic molecules using UV-VIS, IR, 1H NMR spectroscopy and Mass spectrometry.	K4	12
Course Outcome	**CO1:** Learn about the concepts, applications and instrumentation of UV-visible and IR spectroscopy.	K1	
	CO2: Understand the principle, concepts, instrumentation and applications of 1H NMR spectroscopy.	K2	
	CO3: Gain an in-depth knowledge about 13C NMR and its applications.	K4	
	CO4: Acquire knowledge about EPR and Mossbauer spectroscopy and its applications.	K4	
	CO5: Be introduced to the concepts and applications of Mass spectrometry and applications of spectroscopic techniques in identifying a structure of organic compound.	K4	

Learning Resources

Text Books	1. William Kemp, Organic Spectroscopy, Third Edition, ELBS Publications, 1975. 2. Jag Mohan, Organic Spectroscopy, Narosa Publishing House, Second Edition, 2009. 3. B. K. Sharma, Spectroscopy, Goel Publishing House, 2011
Reference Books	1. G. W. Ewing, Instrumental methods of chemical analysis, McGraw Hill pub,1975 2. R. S. Drago, Physical Methods in Inorganic Chemistry, Reinhold Saunders College Publishing, 1977. 3. R. M. Silverstein, F. X. Webster, Spectrometric Identification of Organic Compounds, Sixth Edition, John Wiley Publications, 2009
Website Link	1. https://nptel.ac.in/courses/104/108/104108124/ 2. https://nptel.ac.in/courses/104/101/104101117/ 3.https://nptel.ac.in/courses/104/108/104108097/ 4.https://nptel.ac.in/courses/104/101/104101099/

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHE02	SPECTROSCOPY	DSE - II	II	5	3	2	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	S	S	M	M	S
CO2	M	M	S	M	S	M	M	S	S	S
CO3	S	S	M	L	M	S	S	M	L	M
CO4	M	S	M	M	S	M	S	M	M	S
CO5	M	M	S	L	S	M	M	S	L	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Seminar Unit- II - Chemical shift , Group discussion Unit- II - Spin - spin splitting
Teaching and Learning Methods	Online courses, Smart class room
Assesment Methods	Unit test, Internal assesment, Semester examination

Designed By	Verified By	Approved By
M. SATHYA	Dr. P. SUMATHI	

Curriculum Development Cell MCAS Autonomous Rasipuram

M. Sc.,-Chemistry Syllabus -CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHP01	ORGANIC CHEMISTRY - I	DSC PRACTICAL - I	II	3	0	0	3	3
Objective	To learn the separation techniques and systematic analysis of organic mixtures and how to distinguish between aromatic-aliphatic, saturated-unsaturated compounds and to find out elements present and functional groups and develop the skill for the preparation of organic compounds involving the following reactions: hydrolysis, acetylation, bromination, nitration, benzoylation and oxidation motivate the students to understand the basic principles.							
S.No.	**List of Experiments / Programmes**					**Knowledge Levels**	**Sessions**	
1	I. Identification of components in a two component mixture and preparation of their derivatives. Determination of boiling point/melting point for components and melting point for their derivatives.					K1,K3 & K4	15	
2	II. Preparation: 1. Beta naphthyl methyl ether from beta-naphthol 2. s-Benzyl isothiuronium chloride from benzylchloride 3. Beta glucose penta acetate from glucose 4. ortho-Benzoyl benzoic acid from phthalicanhydride 5. Resacetophenone from resorcinol 6. Para - nitrobenzoic acid from para nitrotoluene 7. Meta - nitroaniline from meta dinitrobenzene 8. Methyl orange from sulphanilic acid 9. Anthraquinone from anthracene 10. Benzhydrol from benzophenone.					K4,K5	15	
Course Outcome	**CO1:** Get an insight into compound mixture separation and analysis of compounds and apply it for future applications					**K1**		
	CO2: To understand the separation techniques and systematic analysis of organic mixtures					**K2**		

	CO3: To distinguish between aromatic-aliphatic, saturated-unsaturated compounds and to find out elements present and functional groups	**K3**
	CO4: To develop skill for the preparation of organic compounds involving the following reactions: hydrolysis, acetylation, bromination, nitration, benzoylation and oxidation	**K4**
	CO5: To evaluate the idea about separation and recrystallisation.	**K5**

Learning Resources

Text Books	1. Raj K. Bansal, Laboratory manual of Organic Chemistry, Third Edition., New Age International (P) Ltd, 1996. 2. Gnanapragasam, Ramamurthy, Organic lab Manual, Viswanathan. S Publishers Pvt Ltd, 2009.
Reference Books	1.B. S. Furniss, A. J. Hannaford, P. W. G. Smith and A. R. Tatchell, Vogel's Practical Organic Chemistry, Fifth Edition., ELBS,1989.
Website Link	1.https://nptel.ac.in/content/storage2/courses/105101010/downloads/Lecture27.pdf 2. https://www.toppr.com/guides/chemistry/organic-chemistry/qualitative-analysis-of-organiccompounds/ 3. https://www.youtube.com/watch?v=7bmQkQW8bbs 4. https://www.youtube.com/watch?v=wRAo-M8xBHM

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M2PCHP01	ORGANIC CHEMISTRY - I	DSC PRACTICAL - I	II	3	0	0	3	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M	S	M	M	M	M
CO2	M	S	M	S	M	M	S	M	S	M
CO3	M	M	M	M	S	M	M	M	M	S
CO4	M	M	M	S	M	M	M	M	S	M
CO5	M	S	M	M	M	M	S	M	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion
Teaching and Learning Methods	Demonstrate practical techniques,Practical
Assesment Methods	Class Practical, Observation,Record, Model & End Semester Practical examinations

Designed By	Verified By	Approved By
Dr. N. SUDHA	Dr. P. SUMATHI	

Curriculum Development Cell MCAS (Autonomous) Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHP02	INORGANIC CHEMISTRY - I	DSC PRACTICAL - II	II	3	0	0	3	3
Objective	To improve the skill in the qualitative analysis of mixture of four cations containing two common and two rare and estimation of metal ions by colorimetric method.							
S. No.	**List of Experiments / Programmes**					**Knowledge Levels**		**Sessions**
1	Part I Semimicro qualitative analysis of mixtures containing the following cations to be tested W, Tl, Pb, Se, Te, Mo, Cu, Bi, Cd, Tl, Ce, Th, Zr, V, Cr, Fe, Ti, Zn, Ni, Co, Mn, Ca, Ba, Sr, Li and Mg.					K1, K3, K4		15
2	Part II Colorimetric analysis Visual and Photometric determination of Iron, Nickel, Manganese and Copper					K3, K4		15
Course Outcome	**CO1:** Get an insight into salt mixture and analyze the common and rare cations					**K1**		
	CO2: To understand the principles behind of mixture of cations					**K2**		
	CO3: Know about the methods involved in preparing few inorganic complexes					**K3**		
	CO4: To analysis of mixture of cations each consisting of two familiar metal cations and two less familiar metal cations					**K5**		
	CO5: To evaluate the estimation of metal ions colorimetry					**K6**		
Learning Resources								
Text Books	V. Ramanujam, Inorganic Semimicro Qualitative analysis, National Publishing Co., 1971.							
Reference Books	G. Svehla, Vogel's qualitative Inorganic analysis, Sixth Edition, Orient Longman, 1987.							
Website Link	1. https://youtu.be/bo7UMCTRNI4 2. https://youtu.be/8JuX8IJrcr8							

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M2PCHP02	INORGANIC CHEMISTRY - I	DSC PRACTICAL - II	II	3	0	0	3	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	M	S	S	S	S
CO2	S	M	M	S	S	S	M	S	S	S
CO3	M	S	S	M	S	M	S	S	M	S
CO4	S	M	S	S	S	S	M	M	S	S
CO5	S	S	M	S	M	S	S	S	S	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion
Teaching and Learning Methods	Demonstrate practical techniques
Assesment Methods	Class Practical, Observation, Record, Model & Semester Practical examinations

Designed By	Verified By	Approved By
Mrs. A. DHIVYA	Dr. P. SUMATHI	

A. Dhivya P. Sumathi

Curriculum Development Cell MCAS (Autonomous) Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHP03	PHYSICAL CHEMISTRY - I	DSC PRACTICAL - III	II	3	0	0	3	3
Objective	To Understand the principle of conductivity experiments, chemical kinectics and phase diagram.							
S.No.	**List of Experiments / Programmes**					**Knowledge Levels**		**Sessions**
1	Conductivity Experiments: 1. Determination of equivalent conductance of a strong electrolyte & the verification of DHO equation. 2. Verification of Ostwald's Dilution Law & Determination of pKa of a weak acid 3. Verification of Kohlrausch's Law for weak electrolytes. 4. Determination of solubility of a sparingly soluble salt. 5. Acid-base titration (strong acid and weak acid vs NaOH) 6. Precipitation titrations (mixture of halides only) 7. Determination of hydrolysis constant of aniline hydrochloride. 8. Saponification value of ethylacetate by conductivity measurements. 9. Comparison of the relative strength of chloroacetic acid and acetic acid by conductance method					K1,K2 & K3		10
2	Kinetics: 1. Study the kinetics of acid hydrolysis of an ester, determine the temperature coefficient and also the activation energy of the reaction 2. Study the kinetics of the reaction between acetone and iodine in acidic medium by half life method and determine the order with respect to iodine and acetone					K3,K4		10
3	Phase diagram: Construction of phase diagram for a simple binary system (naphthalene-phenanthrene or Benzophenone - diphenyl amine)					K4		5

4	Adsorption : Adsorption of oxalic acid on charcoal & determination of surface area (Freundlich isotherm only.	K5	5
Course Outcome	**CO1:** To study kinetics of simple reactions.	**K1**	
	CO2: Get an insight into applications of conductometric methods.	**K2**	
	CO3: To distinguish between strong acid and weak acid.	**K3**	
	CO4: Construct the phase diagram for a simple binary system.	**K4**	
	CO5: Apply the knowledge gained from Surface Chemistry.	**K5**	

Learning Resources

Text Books	B. Viswanathan, P.S. Raghavan, Practical Physical Chemistry, Third Edition.
Reference Books	A.J. Findlay, Kitchener, Practical Physical Chemistry, Ninth Edition.
Website Link	1. https://youtu.be/vMOa7wrP3w0 2. https://youtu.be/JS3ylTuks58 3. https://youtu.be/-GS6uoFf3qQ 4. https://youtu.be/VCuv8sIVVfU

L- Lecture T- Tutorial P- Practical C- Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHP03	PHYSICAL CHEMISTRY - I	DSC PRACTICAL - III	II	3	0	0	3	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	M	S	M	S	M	M	S
CO2	M	M	M	M	S	M	M	M	M	S
CO3	S	M	M	M	M	S	M	M	M	M
CO4	M	S	S	S	M	M	S	S	S	M
CO5	S	M	M	S	M	S	M	M	S	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion
Teaching and Learning Methods	Demonstrate practical techniques,Practical
Assesment Methods	Class Practical, Observation,Record, Model & Semester Practical examinations

Designed By	Verified By	Approved By
Mrs. P. AYYANAR	Dr. P. SUMATHI	

Curriculum Development Cell MCAS Autonomous Rasipuram

M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3PCHC06	ORGANIC CHEMISTRY - III	DSC THEORY - VI	III	5	4	1	0	5
Objective	To study and understand the addition reactions, organic synthesis, oxidation-reduction reactions and rearrangements and their applications in structural elucidation of steriods.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Oxidation and Reduction Reactions: Oxidation Reactions:** Dehydrogenation by quinones, selenium dioxides, ferricyanide, manganese dioxide, permanganate, mercuric acetate, lead tetra acetate, and OsO4 oxidation of saturated hydrocarbons, alkyl groups, alcohols, halides and amines **Reactions involving cleavage of C-C bonds: cleavage of double bonds**; oxidative decarboxylation, allylic oxidation, Oxidation by chromium trioxide - pyridine, Dimethyl sulphoxide – Di cyclohexyl carbodiimide (DMSO-DCC). **Reduction Reactions:** Replacement of oxygen by hydrogen - Wolff Kishner and Clemmenson and Rosenmund reductions with mechanism; Electrochemical and photochemical reduction, Trialkyl and triphenyl tin hydrides. McFadyen-Stevens reduction, Homogeneous hydrogenation, Reduction by metal hydrides and alkoxides with stereochemistry, Hydroboration with cyclic systems, Removal of Oxygen from substrate; Reduction with cleavage; MPV, Bouveault-Blanc reduction, reduction involving anionic attack.	K1, K2 & K3	12
II	**Reagents in Organic Synthesis:** Synthesis of simple organic molecules using standard reactions like acylation and alkylation of enamines and active methylene compounds. Sulphur ylides. Robinson annulations Protection and deprotection of functional groups (R-OH, R-CHO, RCOR, R- NH2 and R-COOH) Reagents and their uses: DCC, trimethyl silyl chloride, 1,3 – dithiane (umpolung), diisobutylaluminium hydride (DIBAL), 9BBN, Baker's yeast, Gilman's reagent Wilkinson's catalyst and Polyphosphoric acid.	K2, K3 & K4	12
III	**Addition to Carbon – Carbon and Carbon – Hetero atom multiple bonds:** Addition of halogen and nitrosyl chloride to olefins, hydration of olefins and acetylenes, hydroboration, hydroxylation – cis-hydroxylation (OsO4 & KMnO4), trans-hydroxylation (Prevost reaction and Woodward modification), epoxidation, Michael addition, 1,3-dipolar addition, carbenes and their additions, Diels - Alder reaction. Mechanism and applications of Mannich, Stobbe, Darzen Glycidic ester condensation. Benzoin condensation, Peterson olefination (Silyl Wittig reaction), Strecker synthesis, Wittig, Wittig - Horner, Perkin, Thorpe, Ritter and Prins reactions.	K3,K4	12

IV	**Molecular rearrangements:** Study of the following rearrangements with mechanism Wagner-Meerwin, Demjanov, Dienone-phenol, Favorski, Baeyer-Villiger, Wolff, Stevens, Von-Richter, Beckmann, Smiles, Neber and Hofmann – Martius rearrangements.	K3,K5	12
V	**Steroids and steroid hormones:** Structural elucidation of cholesterol, ergosterol and oestrone. Conversion of cholesterol into oestrone, testosterone and progesterone. Artificial hormones – synthesis and properties of stilboestrol and hexoestrol. .	K3,K5& K6	12
Course Outcome	CO1: Understand the mechanism of oxidation and reduction reactions.	**K1**	
	CO2: To interpret the mechanisms and applications of various reagents used in organic conversions	**K3**	
	CO3: Gain in depth knowledge in reactions involving addition to carbon-carbon and carbon-heteroatom multiple bonds	**K4**	
	CO4: Comprehend the mechanism in molecular rearrangements and its applications.	**K5**	
	CO5: To acquire depth knowledge about Steroids and steroid hormones and their structural elucidation	**K6**	

Learning Resources

Text Books	1. Jerry March, Advanced Organic Chemistry -Reactions, Mechanisms and Structure, Fourth Edition, John Wiley and Sons, 1992 2. Francis A. Carey, Organic Chemistry, Third Edition, The McGraw Hill Companies, Inc.,1996 3. P. S. Kalsi, Organic Reactions and Mechanisms, Second Edition, New Age International Publishers, 2002
Reference Books	1. S. H. Pine, J. B. Hendrickson, D. J. Cram and G. S. Hammond, Organic Chemistry, Fourth Edition., McGraw Hill Company, 1980 2. S. M. Mukherji and S. P.Singh, Reaction Mechanism in Organic Chemistry, Macmillan, 1984 3. Neil Issac, Physical Organic Chemistry, J. Wiley, NewYork, 1987
Website Link	1. https://nptel.ac.in/courses/104103023 2. https://nptel.ac.in/courses/104103111 3. https://nptel.ac.in/courses/104101127

L-Lecture T-Tutorial P-Practical C-Credit

M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3PCHC06	ORGANIC CHEMISTRY - III	DSC THEORY - VI	III	5	4	1	0	5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	S	S	S	S	M	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	M	M	S	S	S	M	S	S	S
CO4	S	S	S	M	S	S	S	S	M	S
CO5	M	S	M	S	L	M	S	M	S	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Unit-III-Naming reaction, Seminar& Group discussion
Teaching and Learning Methods	Chalk andTalk,Smart class & Demo class
Assesment Methods	Unit test, Internal test, Assignment ,Semester examination

Designed By	Verified By	Approved By
Dr.P.SUMATHI	Dr.P.SUMATHI	

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M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3PCHC07	INORGANIC CHEMISTRY - II	DSC THEORY - VII	III	5	4	1	0	5
Objective	To learn the various theories of coordination compounds and study the morphology of Molecules.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Solid State - I :** 1.1 Electrical properties of solids: Conductors and non - conductors, Conductivity in pure metals and alloys – superconductors – Occurrence of super conductivity - BCS theory – Type - I and Type - II and High temperature (HT) superconductors - Preparation of HT superconductors - critical temperature – persistent currents - Meissner effect. 1.2 Magnetic properties – dia, para, ferro, antiferro and ferrimagnetism; hysterisis; Optical properties – solid – state lasers and Inorganic phosphors. 1.3 Reactions in solid state and phase transitions – diffusion coefficient, diffusion mechanism, vacancy and interstitial diffusions, formation of spinels; solid solutions, order - disorder transformations and super structure.	K1,K2	12
II	**Solid State – II :** 2.1 Types of solids - close packing of atoms and ions - bcc, fcc and hcp, voids and their types - Goldschmidt radius ratio – derivation - its influence on structures. 2.2 Structures of NaCl, NiAs, CdI2, Pervoskite, rutile, fluorite and antifluorite - Zinc blende and Wurtzite. 2.3 Defects in solids - Point defects, line defects and surface defects; Dislocations - Non-stoichiometric compounds; Use of X-ray powder data in identifying inorganic crystalline solids.	K2,K4	12
III	**Theories of coordination compounds:** 3.1 VB theory – CFT - Splitting of d orbital in ligand field and different symmetries – CFSE -Factors affecting the magnitude of 10 Dq - Evidence for crystal field stabilization (Structural and thermodynamic effects) - Spectrochemical series – Site selection in spinels - tetragonal distortion from octahedral symmetry – John - Teller distortion - Nephelauxetic effect 3.1 MO theory –octahedral, tetrahedral and Square planar complexes – pi - bonding and molecular orbital theory - experimental evidence for pi - bonding.	K1,K2	12

IV	**Stability and Stereochemical Aspects** 4.1 Stability of complexes - thermodynamic aspects of complex formation, factors affecting stability, stability correlations, statistical and chelate effects; Determination of stability constants - polarographic, photometric and potentiometric methods. 4.2 Stereochemical aspects - stereoisomerism in inorganic complexes, isomerism arising out of ligand distribution and ligand conformation, chirality. 4.3 Macrocyclic ligand types - porphyrins, corrins, Schiff bases, crown ethers, cryptates and catenands (simple complexes).	K2,K4	12
V	**Reaction Mechanism of transition metal complexes :** 5.1 Energy profile of a reaction - reactivity of metal complexes - inert and labile complexes - kinetic application of valence bond and crystal field theories. 5.2 Kinetics of octahedral substitutions - acid hydrolysis - factors affecting acid hydrolysis - base hydrolysis - conjugate base mechanism - direct and indirect evidences in favour of conjugate mechanism - anation reactions - reactions without metal ligand bond cleavage. 5.3 Substitution reactions in square planar complexes - trans effect - mechanism of the substitution reactions. 5.4 Redox reactions - electron transfer reactions - mechanism of one electron transfer reactions - outer sphere type reactions - cross reactions and Marcus - Hush theory, inner sphere type reactions.	K5	12
Course Outcome	CO1: Remember the types of Ionic crystals and their characteristics	**K1**	
	CO2: Comprehend the splitting of d-orbitals and MO diagram of inorganic complexes	**K2**	
	CO3: Analyse the crystal defects	**K3**	
	CO4: Learn the stability of various complexes and determine the isomerism in various complexes	**K4**	
	CO5: Predict the kinetics and reaction mechanism of Inorganic complexes	**K5**	

Learning Resources

Text Books	1. L. V. Azaroff, Introduction to Solids, McGraw Hill, New York. 2. L. Smart, D. Moore and S. Thomas, Solid State Chemistry- An Introduction, Second Edition 3. D.M.Adams, Inorganic Solids, John Wiley Sons,1974
Reference Books	1. Mullor, Inorganic structural chemistry, Wiley, New York, 1993. 2. D. Bannerjea, Coordination Chemistry, Tata McGraw Hill, 1993. 3. M. L. Tobe, Inorganic Reaction Mechanism, Nelson, 1972.
Website Link	1. http://nptel.ac.in/courses/104108062 2. http://nptel.ac.in/courses/104105085 3. http://youtu.be/Ep7mkm-T0Po

L-Lecture T-Tutorial P-Practical C-Credit

M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3PCHC07	INORGANIC CHEMISTRY - II	DSC THEORY - VII	III	5	4	1	0	5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	L	S	M	S	S	M
CO2	S	S	L	S	S	S	S	M	S	M
CO3	S	M	M	M	S	S	M	M	S	S
CO4	S	S	S	S	M	S	S	S	M	S
CO5	S	S	M	M	S	S	S	M	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Unit - III - stereoisomerism in inorganic complexes-Seminar
Teaching and Learning Methods	Chalk and talk, Smart class & Ball and stick model
Assesment Methods	Unit test, Internal assesment, Semester examination

Designed By	Verified By	Approved By
Mrs. M.SARANYA	Dr. P. SUMATHI	A. L. Jamuna

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M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3PCHC08	PHYSICAL CHEMISTRY - III	DSC THEORY - VIII	III	5	5	0	0	5
Objective	To impart knowledge on theoretical electrochemistry, photochemistry, quantum chemistry and spectroscopy							

Unit	Course Content	Knowledge Levels	Sessions
I	**Electrochemistry – I :** 1.1 Ions in solutions – Debye – Huckel theory of strong electrolytes – Debye – Huckel – Onsager equation – verification and limitation – Debye – Huckel limiting law and its extension. 1.2 Electrode – Electrolyte interface - adsorption at electrified interface – electrokinetic phenomena – Tiselius method of separation of proteins – Membrane potential - Lippmann capillary equation – Electrical double layers – Helmholtz Perrin, Gouy - Chapman and Stern models.	K1, K2 & K3	12
II	**Electrochemistry – II :** 2.1 Polarisation and over voltage – Butler Volmer equation - diffusion current - exchange and equilibrium current density - Hydrogen and oxygen evolution reactions. 2.2 Corrosion and passivation of metals – Pourbaix and Evans diagrams – Prevention of corrosion. 2.3 Electrochemical energy systems – Primary and secondary batteries – (dry cells, lead acid storage batteries, silver - zinc cell, nickel - cadmium battery) 2.4 Fuel cells – Electrodeposition – principles and applications.	K3,K5	12
III	**Photochemistry :** 3.1 Absorption and emission of radiation - decay of electronically excited states – radiative and non- radiative processes – theory of fluorescence and phosphorescence – prompt and delayed fluorescence – quenching of fluorescence – static and dynamic quenching – Stern – Volmer equation – Excimers and exciplexes 3.2 Kinetics of photochemical reactions – Photosensitized reactions. 3.3 Photovoltaic and photogalvanic cells – photo electrochemical cells – solar cells - solar energy conversion.	K3,K4	12

IV	**Quantum Chemistry III** 4.1 Theory of chemical bonding – Born – Oppenheimer approximation – LCAO – MO approximation for hydrogen molecule ion and hydrogen molecule – Valence Bond theory of hydrogen molecule 4.2 Concept of hybridisation – sp, sp2 and sp3 hybridisation 4.3 Huckel Molecular orbital (HMO) theory for conjugated π - systems application to ethylene, butadiene and benzene 4.4 Self consistent field approximation – Hartree and Hartree – Fock self consistent field theory.	K4,K5	12
V	**Spectroscopy :** 5.1 Rotational spectroscopy – Rigid Rotor – Intensity of spectral lines – Effect of isotopic substitution on the rotation spectra. 5.2 Vibrational spectroscopy – harmonic oscillator – anharmonic oscillator – Hot bands – selection rules – Overtones and combination frequencies – Fermi Resonance. 5.3 Raman spectroscopy – Raman effect (quantum theory) - Rotational and Vibrational Raman Spectra – Mutual Exclusion Rule. 5.4 Electronic spectroscopy – Electronic spectra of diatomic molecules – vibrational coarse structure – Franck – Condon Principle.	K3	12
Course Outcome	CO1: An in depth study of fundamentals and theories involved in Electrochemistry.	K2	
	CO2: Have hands-on practical knowledge about batteries and fuel cells.	K3	
	CO3: Learn about the physical concepts of spectroscopy.	K3	
	CO4: Gain in depth knowledge on the various concepts of photochemistry.	K4	
	CO5: Analyze the formation of molecules using quantum theory	K5	

Learning Resources

Text Books	1. S. Glasstone, Introduction to Electro Chemistry, Affiliated East West Press, New Delhi,1960. 2. D. R. Craw, Principles and applications of Electro chemistry, Chapman and Hall, 1991. 3. J. Robbins, Ions in solution – An Introduction to Electro chemistry, Clarendon Press, Oxford,1972.
Reference Books	1. J. O. M. Bockris and A. K. N. Reddy, Electrochemistry, Vol I and II, Plenum, NewYork, 1977. 2. J. C. Calvert and J. N. Pitts, Photochemistry, wiley, London,1966 3. R. P. Wayne, Photochemistry, Butterworths, London,1970.
Website Link	1. https://youtu.be/Q3COPMv7-24 2. https://youtu.be/4BZYd59Uv_s 3. https://youtu.be/_IEWeanbfnQ

L-Lecture T-Tutorial P-Practical C-Credit

M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3PCHC08	PHYSICAL CHEMISTRY - III	DSC THEORY - VIII	III	5	5	0	0	5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	L	S	S	M	S	M
CO2	S	M	S	M	S	M	M	S	M	S
CO3	S	S	M	L	M	M	S	S	M	S
CO4	M	S	S	M	S	S	M	S	M	M
CO5	S	M	M	S	M	M	S	M	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Nil
Teaching and Learning Methods	Chalk and talk, Smart-Class & Google meet
Assesment Methods	Unit test, Internal examinations, Semester examinations

Designed By	Verified By	Approved By
Mr. P. AYYANAR	Dr. P. SUMATHI	A.L. Somu

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M.Sc-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3PCHE05	EXPERIMENTAL METHODS IN CHEMISTRY	DSE - III	III	5	3	2	0	4
Objective	To understand the key role of various physical techniques like SEM,TEM,AFM,STM and HPLC. Acquire the knowledge about X-ray analysis and electroanalytical Chromatographic techniques.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Surface Imaging:** 1.1 Basic concepts in surface imaging 1.2 Principle, Instrumentation and Applications – Scanning Electron Microscopy (SEM) 1.3 Principle, Instrumentation and Applications Scanning Tunneling Microscopy (STM) 1.4 Principle, Instrumentation and Applications Transmission Electron Microscopy (TEM) 1.5 Principle, Instrumentation and Applications Atomic Force Microscopy (AFM).	K1,K2 & K3	12
II	**X-ray Analysis:** 2.1 X-ray absorption – X-ray Photoelectron Spectroscopy – theory, instrumentation and applications. 2.2 Diffraction – theory – Bragg's law, instrumentation and applications – Single crystal and powder crystal XRD – EDAX. 2.3 UPES – theory, instrumentation and applications.	K2,K4	12

III	**Electroanalytical Techniques:** 3.1 Polarography – Theory, apparatus, DME, diffusion, kinetic and catalytic currents, current - voltage curves for reversible and irreversible systems, qualitative and quantitative applications to inorganic systems. 3.2 Amperometric titrations – Theory, apparatus, types of titration curves, successive titrations and two indicator electrodes, applications. 3.3 Complexometric titrations – chelating agents, types of EDTA titration – direct and back titrations, replacement titrations – masking and demasking reagents.	K1,K3 & K4	12
IV	Separation Methods – I: 4.1 Normal and Reversed - phase liquid chromatography – Theory and applications – HPLC – principle, instrumentation, apparatus and materials, column efficiency and selectivity, applications 4.2 GC chromatography – principle, instrumentation, retention volume, resolution and applications.	K3, K4	12
V	**Separation Methods – II :** 5.1 Gel chromatography or Gel Permeation Chromatography – Principle, Materials, Gel preparation, column Packing and Detectors – applications and advantages of gel chromatography. 5.2 Ion Exchange Chromatography – Definition, Principle, cation and anion exchangers – regeneration - column used in separations - Ion exchange capacity and techniques – Applications	K3, K5	12
Course Outcome	CO1: To know the instrumentation techniques involved in surface imaging.	K1	
	CO2: Impart knowledge about sources and Understand the instrumentation of X-ray analysis.	K2	
	CO3: An exposure about the Polarography and amperometric techniques and their applications.	K3	
	CO4: To interpret the principle applications of GC & HPLC.	K4	

	CO5: To recognize the principles involved in chromatographic techniques.	K5	

Learning Resources	
Text Books	1. Frank A. Settle, Handbook of instrumental techniques for analytical chemistry, Prince Hall, Newjersey,1997 2. Gurdeep R. Chatwal, Sham K. Anand, Instrumental methods of chemical analysis, Himalaya Publishing House, 2011 3. P. Atkins and J. de Paula Atkins, Physical Chemistry, Eighth Edition., Oxford university Press, 2008
Reference Books	1. R. Wiesendanger, scanning probe microscopy and spectroscopy, Cambridge university press, 1994 2. F. Scholz, Electroanalytical methods, Springer, Second Edition., 2010. 3. Chemistry Experiments for Instrumental methods – Donald T. Sawyer, William R. Heineman, Janice M. Beebe, John Wiley & Sons, 1984.
Website Link	1. http://youtu.be/oiOLG4nHxI8 2. http://youtu.be/FgywZoVtpPW 3. http://youtu.be/L-xIHihOGKs 4. https://nptel.ac.in/courses/113/104/113104082/

L-Lecture T-Tutorial P-Practical C-Credit

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3PCHE05	EXPERIMENTAL METHODS IN CHEMISTRY	DSE - III	III	5	3	2	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	L	S	S	S	S	S
CO2	M	S	S	M	S	M	S	S	S	S
CO3	S	M	M	S	S	S	S	M	S	S
CO4	S	S	S	M	M	S	M	S	M	M
CO5	S	S	M	S	S	S	S	M	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Unit - III DME- Seminar, Unit- V Gel preparation- Group discussion
Teaching and Learning Methods	Chalk and talk, smart-Class,Demo classes
Assesment Methods	Unit test, Internal test, Assignments and University examination.

Designed By	Verified By	Approved By
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M. Sc. - Chemistry LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3PCHIS1	INTERNSHIP TRAINING	INTERNSHIP	III	90	0	0	90	2
Objective	To Learn academic credit and develop new skills, work habits and attitudes necessary for job success. Internship must take place outside college viz., Research Institute, Chemical industries.							

Guidelines for internship training programme	**Knowledge Levels**	**Sessions**
I. The students are expected to have a practical training in any industry or Research institute to enable them to acquaint him / her with the procedure, practice and working of companies. II. Each student should undergo industrial training for a minimum period of two weeks at the end of the Second semester vacation. III. He / She shall undergo the above training in the institutions like other Institutes, R&D Lab, private limited and public limited companies, CLRI, CECRI,NIT,IIT, Molecular connexions, Milk, Water & soil testing labs, Microlabs, Biocon, Biosis, Golbal calcium & Sandmar. IV. Students may make their own arrangements in fixing the companies for candidates should submit a report in not less than 25 type written pages. V. Candidates should submit the attendance certificate from the institution for having attended the training for two weeks. VI. Industrial training reports shall be prepared by the students under the supervision of the faculty of the department. VII. Industrial training report must contain the following: Cover page Copy of training certificate Profile of the industry, Objectives, work diary, Acknowledgement, content, Aim & scope, Report about the work undertaken by them during the tenure of training Observation and conclusion about the concern Findings VIII. Internship viva – voce examination will be conducted with internal & external examiners at the end of the third semester and the credits will be awarded	**K3-K5**	

Course Outcome	**CO1:** Upgrade the learning in a professional environment	**K3**	
	CO2: Gaining experience with current science & technology	**K4**	
	CO3: Contributing to significant projects	**K4**	
	CO4: Building personal skills, Developing a resume that highlights desirable skills	**K4**	
	CO5: Networking with people working in the science community	**K5**	

Learning Resources : Hands on training

L – Lecture T – Theory P – Practical C - Credit

M. Sc. - Chemistry LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3PCHIS1	INTERNSHIP TRAINING	INTERNSHIP	III	90	0	0	90	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	M	S	M	S	S	S
CO2	M	S	M	S	M	S	S	M	S	S
CO3	S	S	S	S	S	S	M	S	S	S
CO4	S	M	S	S	S	S	S	S	M	M
CO5	S	S	S	S	S	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW			M-MEDIUM		S-STRONG				

Tutorial Schedule	Preparation of Work diary & Internship report preparation
Teaching and Learning Methods	Training in industries, PT Classes, Smart classroom
Assesment Methods	Attendance, Internal & external viva-voce exams

Designed By	Verified By	Approved By
Dr. N. Nithiya	Dr. N. Nithiya	

N. Nithiya N. Nithiya

Curriculum Development MCAS (Autonomous) Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PCHC09	INORGANIC CHEMISTRY - III	DSC THEORY - IX	IV	5	5	0	0	5
Objective	To learn the synthesis, properties, bonding and reactions of organometallic complexes, catalysis, electronic spectra of complexes, Supramolecular Chemistry and Photochemistry							
Unit	**Course Content**						**Knowledge Levels**	**Sessions**
I	**Bonding in Organometallic Complexes and metal carbonyls :** 1.1 Definition of organometallic compound - 18 electron rule - effective atomic number rule - classification of organometallic compounds - the metal carbon bond types - ionic bond - sigma covalent bond - electron deficient bond - delocalised bond - dative bond. 1.2 Metal carbonyl complexes - synthesis - structure and reactions of metal carbonyls - the nature of M-CO bonding - binding mode of CO and IR spectra of metal carbonyls - metal carbonyl anions - metal carbonyl hydrides - metal carbonyl halides - metal carbonyl clusters - Wade's rule and isolobal relationship.						K1, K2	12
II	**Organometallic and Organometallic Sandwich complexes:** 2.1 Alkene complexes - synthesis of alkene complexes - bonding of alkenes to transition metals - bonding in diene complexes - reactivity of alkene complexes - Alkyne complexes - synthesis, structure and reactions of alkyne complexes. 2.2 Arene complexes - synthesis - structure and reactivity of arene complexes - multidecker complexes. Cyclopentadienyl complexes - metallocenes - synthesis of metallocenes - bonding in metallocenes - reactions of metallocenes - Cp2Fe/Cp2Fe+ couples in biosensors - bent sandwich complexes - bonding in bent sandwich complexes.						K3	12

III	**Catalysis:** 3.1 Hydrogenation of olefins (Wilkinson's catalyst) - hydroformylation of olefins using Cobalt and Rhodium catalysts (oxo process) 3.2 Oxidation of olefins to aldehydes and ketones (Wacker process) 3.3 Polymerization (Zeigler - Natta catalyst) - Cyclooligomerization of acetylene using Nickel catalyst (Reppe's catalyst) - polymer bound catalysts - metallocene and stereospecific polymerisation of 1-alkenes.	K3	12
IV	**Supramolecular Chemistry and Photochemistry:** 4.1 Supramolecular chemistry - Introduction, supermolecules, supramolecules, supramolecular interactions (ion-ion, ion-dipole, H-bonding, cation-pi, anion-pi, pi-pi and Van der Waal's interactions), Ionophore and molecular receptors. 4.2 Structure and applications of crown ethers, beta-cyclodextrin, clays, zeolite and dentrimers. 4.3 Photochemistry- Photosubstitution, Photoredox and isomerisation processes, Photo chemistry of d3 and d6 complexes and Applications of metal complexes in solar energy conversion.	K4	12
V	**Electronic Spectra of Complexes:** 5.1 Spectroscopic Term symbols for dn ions - derivation of term symbols and ground state term symbol 5.2 Hund's rule; Selection rules - break down of selection rules, spin-orbit coupling, band intensities, weak and strong field limits 5.3 Correlation diagram - Energy level diagrams - Orgel and Tanabe - Sugano diagrams; effect of distortion and spin orbit coupling on spectra - Evaluation of Dq and B values for octahedral complexes of Nickel 5.4 Charge transfer spectra 5.5 Spectral properties of Lanthanides and Actinides.	K2,K4	12
Course Outcome	**CO1:** Understand the bonding in Organometallic complexes and metal carbonyls.	**K1**	
	CO2: Gain knowledge about Organometallics and Organometallic Sandwich complexes.	**K2**	
	CO3: Learn about the inorganic catalysis and its applications.	**K3**	

	CO4: Be exposed to Supramolecular Chemistry and Inorganic Photochemistry.	**K4**	
	CO5: Acquire knowledge about the electronic spectra of complexes and term symbols.	**K4**	
Learning Resources			
Text Books	1. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry - Principles of structure and reactivity, Fourth Edition, Pearson - Education, 2002. 2. F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, Wiley Eastern, Fifth Edition, 1988. 3. S. F. A. Kettle, Coordination compounds, ELBS, 1973.		
Reference Books	1. Organometallics 1, Complexes with Transition Metal-Carbon - Bonds, Bockmann, Oxford science publications, Oxford, 1996. 2. Organometallics 2, Complexes with Transition Metal-Carbon - Bonds, Bockmann, Oxford science publications, Oxford, 1996. 3. G. W. King, Spectroscopy and Molecular Structure, Holt Rienehart and Winston, 1964.		
Website Link	1. htpps://aptel.ac.in/courses/104/104/104104109/ 2. htpps://aptel.ac.in/courses/104/104/104104101/ 3. htpps://aptel.ac.in/courses/104/103/104103069/		

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PCHC09	INORGANIC CHEMISTRY - III	DSC THEORY - IX	IV	5	5	0	0	5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M	M	S	S	S	M
CO2	S	M	S	S	S	S	S	M	S	S
CO3	M	S	S	M	S	M	S	S	S	S
CO4	S	M	M	S	M	S	M	S	M	M
CO5	M	S	S	M	S	S	S	M	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion
Teaching and Learning Methods	Chalk and talk, smart-Class,Demo classes
Assesment Methods	Unit test, Internal and University examinations, Assignments

Designed By	Verified By	Approved By
Mrs. A. DHIVYA	Dr. P. SUMATHI	

A. Dhiya P. Sumathi

Curriculum Development Cell MCAS Autonomous Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PCHE07	MEDICINAL CHEMISTRY	DSE - IV	IV	5	3	2	0	4
Objective	The student will understand the mechanism of drug action and various phases of drug development and exposed to ideas about target-based drug design and clinical trial of drugs							

Unit	Course Content	Knowledge Levels	Sessions
I	**Basics of medicinal chemistry:** Brief history of medicinal chemistry - classification of drugs - brief description of biological, chemical, computer revolutions in drug design - pro drugs and soft drugs - design of prodrug system - multiple pro drug formation - soft drug principle and applications	K1, K3	15
II	**Drug targets and drug solubility:** Enzymes and enzyme inhibitors - competitive and non-competitive inhibitors - reversible and irreversible inhibitors - ligand-receptor theories - Clark's theory and Paton's rate theory - proteins, lipids, and nucleic acids as drug targets - effect of pH, pKa, and polarity on drug Solubility	K2,K3	15
III	**Pharmacokinetics and drug metabolism:** Natural resources of lead compounds - absorption, distribution, metabolism, and elimination- oxidation and hydrolysis - testing drugs in vitro - high-throughput screening - testing drugs in vivo - therapeutic index and therapeutic ratio	K3	15
IV	**Clinical testing and synthesis of drugs:** Various phases in preclinical testing and clinical trials - designing organic synthesis -convergent synthesis - patenting and manufacture - complexes and chelating agents - metal clusters - detoxification - drug action and metal chelation	K4	15

V	**Development of new drugs :** Five classic steps in the design of a new drug - procedures in drug design - isolation of bioactive compounds - accidental discovery - examination of metabolites - interference with fundamental life processes - exploitation of side effects of drugs - random screening - synthesis of drugs - molecular modification of lead compounds - factors affecting drug development	K4	15
Course Outcome	CO1: Get knowledge about basic terminology involved in Medicinal Chemistry	K1	
	CO2: Understand drug targeting molecule and their solubility	K2	
	CO3: An in-depth knowledge about drug pharmacokinetics and its metabolism	K3	
	CO4: Comprehend and understand the clinical testing of drugs	K4	
	CO5: Gain in knowledge about the new drugs to be synthesised and develop methodologies for drug design and preparation	K4	
Learning Resources			
Text Books	1. David A. Williams, William O. Foye, Thomas L. Lemke; Foye's Principles of Medicinal Chemistry, Fifth Edition; Lippincott Williams and Wilkins: Philadelphia, 2002. 2. Delgado and Remers, Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, Eleventh Edition; Lippincott Williams and Wilkins: Philadelphia, 2004		
Reference Books	1. D. J. Abraham, Ed., Burger's Medicinal Chemistry, Sixth Edition, Vol 1-6. 2. Daniel Lednicer and Lester A. Mitscher Organic Chemistry of Drug Synthesis, Vol.1- 6. 3. Joel G. Hardman and Lee L. Limbird, Edition; Goodman and Gilman's the Pharmacological Basis of Therapeutics, Tenth edition, Alfred Gilman, 200.		
Website Link	1. https://nptel.ac.in/courses/104/106/104106106/ 2. https://youtu.be/ewERE8gpqBU 3. https://youtu.be/K3ig3WKmVAM		

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4PCHE07	MEDICINAL CHEMISTRY	DSE - IV	IV	5	3	2	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	M	S	S	M	M	M
CO2	M	M	S	M	S	M	M	S	M	S
CO3	M	M	S	M	M	M	M	S	M	M
CO4	S	M	M	M	S	S	M	M	M	S
CO5	M	S	M	S	M	M	S	M	S	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion , Unit-IV- chelating agents
Teaching and Learning Methods	Chalk and talk, smart-Class,Demo classes
Assessment Methods	Unit test, Assignments, Internal and End semester examinations,

Designed By	Verified By	Approved By
Mrs. M. SATHYA	Dr. P. SUMATHI	

Curriculum Development Cell MCAS (Autonomous) Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PCHP04	ORGANIC CHEMISTRY - II	DSC PRACTICAL - IV	IV	4	0	0	4	3
Objective	1.To know about the estimation of phenol, methyl ketone, glucose, nitro and methoxy groups. 2. To acquire knowledge about the analysis of oils (RM value, iodine value, saponification value and acetyl value), extraction and estimation of active constituents like Citric acid from lemon, Lycopene from Tomato caffeine from tea. 3. To understand the preparation of organic compounds.							
S.No.	**List of Experiments / Programmes**						**Knowledge Levels**	**Sessions**
1	**I. Organic Estimations** 1. Phenol 2. Aniline 3. Methyl Ketone 4. Glucose 5. Iodine value of an oil 6. Saponification value of oil						K1,K2 & K3	10
2	**II. Organic Preparation, Involving Two stages** 1. Sym-tribromobenzene from aniline. 2. m- Nitrobenzoic acid from methyl benzoate. 3. para - Nitroaniline from acetanilide. 4. Benzanilide from benzophenone. 5. Aspirin from methyl salicylate 6. Anthraquinone from phthalic anhydride. 7. EDC coupling reaction- Synthesis of Amide. 8. Fischer-Indole synthesis						K4,K5	10
3	**III. Extraction of Natural Products:** 1. Caffeine from tea leaves. 2. Citric acid from lemon. 3. Lycopene from Tomato.						K4	5
4	**IV. Chromatographic Separations (Not for Examination)** 1. Column chromatography: separation of a mixture of ortho and para- Nitroanilines. 2. Thin layer Chromatography: separation of a mixture of ortho and para - Nitroanilines. 3. Paper chromatography - identification of natural alpha amino acids.						K4	5

Course Outcome	**CO1:** To know the protocol for the preparation of organic compounds by double stage	**K1**
	CO2: To understand the basic reaction conditions such as solubility hydrolysis, acetylation, bromination and nitration.	**K2**
	CO3: To execute the idea about recrystallisation.	**K3**
	CO4: Study the operation and performance liquid-liquid extractions column with different packings.	**K4**
	CO5: To apply the separation skills to extract various compounds from the natural source.	**K5**

Learning Resources	
Text Books	1.Vogel"s Text book of practical organic chemistry, 5th edition, Prentice Hall, 2008
Reference Books	1. B. S. Furniss, A. J. Hannaford, P. W. G. Smith and A. R. Tatchell, Vogel's Practical Organic Chemistry, Fifth edition. ELBS. 1989. 2. Raj K. Bansal, Laboratory manual of Organic Chemistry, Third Edition, New Age International (P) Ltd, 1996.
Website Link	1. https://youtu.be/5K1t4-1TDdo 2. https://youtu.be/qdmKGskCyh8 3. https://youtu.be/IU1m_4_49sE

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4PCHP04	ORGANIC CHEMISTRY - II	DSC PRACTICAL - IV	IV	4	0	0	4	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	M	S	M	S	M	M
CO2	M	S	M	M	S	M	S	M	M	S
CO3	S	M	M	S	S	S	M	M	S	S
CO4	M	S	S	M	M	M	S	S	M	M
CO5	M	M	S	M	M	M	M	S	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Viva-voce practical Questions Group discussion
Teaching and Learning Methods	Demonstrate practical techniques
Assesment Methods	Observation, Record, Class Praticals, Model practicals

Designed By	Verified By	Approved By
Ms .S. ESWARI	Dr. P. SUMATHI	

Curriculum Development Cell MCAS (Autonomous) Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PCHP05	INORGANIC CHEMISTRY PRACTICAL - II	DSC PRACTICAL - V	IV	4	0	0	4	3
Objective	To estimate ions present in a mixture, metals present in ores and alloys and prepare inorganic complexes							

S.No.	**List of Experiments / Programmes**	**Knowledge Levels**	**Sessions**
1	Part - I Quantitative analysis of complex materials A) Quantitative analysis of the following mixture 1. Iron and magnesium 2. Iron and nickel 3. Copper and nickel 4. Copper and Zinc B) Analysis of Ores (Not for examinations) 1. Determination of percentage of calcium and magnesium in dolomite. 2. Determination of percentage of MnO_2 in pyrolusite 3. Determination of percentage of lead in galena. C) Analysis of Alloys (Not for examinations) 1. Determination of tin and lead in solder 2. Determination of copper and zinc in brass. 3. Determination of Chromium and nickel in stainless steel.	K1, K2	15
2	Part II Preparations of the following 1. Sodium hexanitrocobaltate (III) 2. Sodium Trisoxalatoferrate (III) 3. Prussian blue $Fe_4[Fe(CN)_6]_3$ 4. Bis(acetylacetanato) Copper (II) 5. Hexamminecobalt (III) chloride 6. Hexamminenickel (II) chloride	K4, K5, K6	15
Course	**CO1:** Analyze the metal ions present in a	**K2**	

Outcome	mixture, alloys and ores	
	CO2: Prepare few inorganic complexes	**K3**
	CO3: Analyze the metal ions using volumetry and gravimetry	**K4**
	CO4: Understand the mechanism of metal complex preparation	**K4**
	CO5: Apply the principles of ion elimination present in the mixture, ores and alloys	**K5,K6**

Learning Resources	
Text Books	1. J. Basset, R. C. Denney, G. H. Jeffery and J. Mendham Vogel's Text book of quantitative inorganic analysis, Fourth Edition, ELBS, 1985 2. W. G. Palmer, Experimental Inorganic Chemistry, Van Nostrand Reinhold Co., London, 1972.
Reference Books	1. G. Svehla, Vogel's qualitative Inorganic analysis, Sixth Edition, Orient Longman, 1987, International (P) Ltd. 1996 2. D. N. Grindley, An advanced course in practical Inorganic Chemistry, Butter worths, 1964.
Website Link	1. https://www.youtube.com/watch?v=ZQQVlGCtEns 2. https://www.youtube.com/watch?v=lbP2dlvoupU 3. https://www.youtube.com/watch?v=SilzJBCEins

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4PCHP05	INORGANIC CHEMISTRY - II	DSC PRACTICAL - V	IV	4	0	0	4	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	S	M	S	M	L	S	M
CO2	S	M	M	M	M	S	M	M	M	M
CO3	M	M	M	M	M	M	M	M	M	M
CO4	S	M	M	M	M	S	M	M	M	M
CO5	M	M	M	M	M	M	M	M	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion
Teaching and Learning Methods	Demonstrate practical techniques,Practical
Assesment Methods	Class Practical, Observation,Record, Model & End Semester Practical examinations

Designed By	Verified By	Approved By
Dr. N. NITHIYA	Dr. P. SUMATHI	

N. Nithiya P. Sumathi

Curriculum Development Cell MCAS Autonomous Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PCHP06	PHYSICAL CHEMISTRY - II	DSC PRACTICAL - VI	IV	4	0	0	4	3
Objective	To perform Determination of thermodynamic quantities from EMF measurements Potentiometric titrations, buffer solution, kinectics of chemical reaction and solubility product.							
S.No.	**List of Expriments / Programmes**					**Knowledge Levels**		**Sessions**
1	**DETAILED LIST OF EXPERIMENTS** Typical list of possible experiments are given. Experiments of similar nature and other experiments may also be given. The list given is only a guideline. A minimum of 15 experiments have to be performed. 1. Determination of the activity coefficient of an electrolyte at different molalities by emf measurements. 2. Determination of the dissociation constant of acetic acid by titrating it with sodium hydroxide using quinhydrone as an indicator electrode and calomel as a reference electrode. 3. Determination of the strength of a given solution of KCl using differential potentiometric titration technique. 4. Determination of the pH of the given solutions with the help of the indicators using buffer solutions and by colorimetric method. 5. Determination of the pH of a given solution by emf method using hydrogen electrode and quinhydrone electrode. 6. Determination of the composition and instability constant of a complex by mole ratio method. Calculation of the thermodynamic parameters for the reaction Zn + H2SO4 à ZnSO4 + H2 by emf method. 7. Determination of the formation constant of silver ammonia complex and stoichiometry of the complex potentiometrically. 8. Solubility and solubility products by emf method. 9. Determination of the activity coefficient of Zinc ions in the solution of 0.002M Zinc sulphate using Debye - Huckel Limiting law.					K1,K3,K4		30

	10. Determination of solubility product of Silver bromide and calculate its solubility in water and 0.1 M and 0.01 M KBrO3 using Debye- Huckel limiting law. 11. Determination of the electrode potentials of Zn and Ag electrodes in 0.1 M and 0.001M solutions at 298 K and find the standard potentials for these electrodes and test the validity of Nernst equations. 12. Study the inversion of cane sugar in presence of acid using polarimeter.		
2	13. Determination of the rate constant and order of reaction between potassium persulphate and potassium iodide and determine the temperature coefficient and energy of activation of the reaction. 14. Study the primary salt effect on the kinetics of ionic reactions and test the Bronsted relationship (iodide ion is oxidized by persulphate ion.) 15. Determination of the viscosities of mixtures of different compositions of liquids and find the composition of a given mixture. 16. Determination of the partial molar volume of glycine/methanol/formic acid/sulphuric acid by graphical method and by determining the densities of the solutions of different compositions. 17. Study the surface tension - concentration relationship of solutions (Gibb's equation)	K2,K3 & K5	
Course Outcome	**CO1:** Will get an knowledge about kinetics experiments and hands-on experience	K1	
	CO2: Understand the usage and applications of potentiometry equipment.	K3	
	CO3: Analyse & determine the pH of the buffer solution by potentiometry methods.	K4	
	CO4: To Evaluate partial molar volume of viscoscity methods.	K5	
	CO5: Get knowledge about determination of rate constant,order of reaction and energy of activation.	K5	

Learning Resources	
Text Books	1. Khosla, Garg and Adarsh Khosla, Senior Practical Physical Chemistry 2.B. Viswanathan, P.S. Raghavan, Practical Physical Chemistry, Third Edition.
Reference Books	1. B. P. Levitt, Findlay's Practical Physical Chemistry, Ninth Edition., Longman, London, 1985. 2. A.G. Md. S. Oolvi, Practical Physical Chemistry. 3. Khosla, Garg and Adarsh Khosla, Senior Practical Physical Chemistry.

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PCHP06	PHYSICAL CHEMISTRY - II	DSC PRACTICAL - VI	IV	4	0	0	4	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	S	S	M	M	M	S
CO2	S	M	M	S	M	S	M	M	S	M
CO3	M	M	S	S	M	M	M	S	S	M
CO4	M	M	M	S	M	M	M	M	S	M
CO5	M	S	S	M	S	M	S	S	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion
Teaching and Learning Methods	Demonstrate practical techniques,Practical
Assesment Methods	Class Practical, Observation,Record, Model & Semester Practical examinations

Designed By	Verified By	Approved By
Mr. V. SANTHOSHKUMAR	Dr. P. SUMATHI	

Curriculum Development Cell MCAS (Autonomous) Rasipuram

Website Link	1.https://youtu.be/6CC9byzWszk 2. https://youtu.be/jN9JZ6liU7k 3.https://youtube.com/watch?v=ERlUhncF7jg&feature=share

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc., Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PCHPR1	PROJECT WORK	PROJECT WORK	IV	8	0	0	8	5
Objective	To Identify Problem related to their area of interest in Chemistry and Chemical industry and enhance problem solving skills and research knowledge.							

Details	**Course Content**	**Knowledge Levels**	**Sessions**
PROJECT PREPARATION FORMAT			
Cover Page & Title Page	**Cover Page & Title Page:** The fonts and locations of various items on this page should be exactly as shown in a specimen copy**.**		
Inside cover page	Inside cover page Same as cover page.		
Bonafide Certificate	**Bonafide Certificate**: The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14.		
Acknowledgement	**Acknowledgement:** This should not exceed one page. The candidate should convey his appreciation to all whom have played a role for completion of his M.Sc Project work.		
Abstract	**Abstract:** An abstract should provide a concise summary of your research project. It should include the principal objectives of the study, methods employed, a summary of the results and primary conclusions. It should contain approximately 250 words written in the past tense and should not include references.		
Contents	**Table of Contents:** The table of contents should list all headings, sub headings after the table of contents page, as well as any titles preceding it. The title page and Bonafide Certificate will not find a place among the items listed in the Table of Contents. One and a half spacing should be adopted for typing the matter under this head.		
Tables	**List of Tables**: The list should use exactly the same captions as they appear above the tables in the text. 1.5 spacing should be adopted for typing the matter under this head.		
Figures	**List of Figures**: The list should use exactly the same captions as they appear below the figures in the body of the text. One and a half spacing should be adopted for typing the matter under this head. All charts, graphs, maps, photographs and diagrams should be designated as figures. X and Y axes titles are mandatory for all the graphs.		

Symbols	**List of Symbols, Abbreviations and Nomenclature:** 1.5 spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations etc. should be used.		
Chapters	**Chapter I - Introduction:** Statement of the Problem, Significance, Need for the study, Objectives		
	Chapter II- Aim & Scope		
	Chapter III- Experimental methods: Procedures, Hypothesis.		
	Chapter IV- Results and Discussion: Tables and Figures, Statistical Presentations, Hypothesis Testing.		
	Chapter V- Conclusion		
	Chapter VI- References		
	References		
GUIDELINES FOR PROJECT PREPARATION			
Numbering	• Every page in the project report, except the project report title page, must be accounted for and numbered. • The page numbering, starting from acknowledgements and till the beginning of the introductory chapter, should be printed in small Roman numbers, i.e, i, ii, iii, iv..... • The page number of the first page of each chapter should not be printed (but must be accounted for). All page numbers from the second page of each chapter should be printed using Arabic numerals, i.e. 2,3,4,5... • All printed page numbers should be located at the right corner at the bottom of the page.	K4-K6	
Chapters	• Use only Arabic numerals. Chapter numbering should be centered on the top of the page using large bold print. <Size 14><Times New Roman>	K4-K6	
TEXT			
Regular Text	**Regular Text**: Times Roman 12 pts and normal print.	K4-K6	
Chapter Heading	**Chapter Heading -** Times Roman 14 pts. Bold and capital.	K4-K6	
Section Headings	**Section Headings -** Times roman 12 pts. Bold and capital.	K4-K6	
Subsection Headings	**Subsection Headings** - times roman 12 pts. bold print and Leading capitals i.e, only first letter in each word should be in capital.	K4-K6	
Special Text	**Special Text-** Italics/Superscript /Subscript/Special symbols, etc., as per necessity. Special text may include footnotes, endnotes, physical or chemical symbols, mathematical notations, etc.	K4-K6	
Sections	**Sections:** Use only Arabic numerals with decimals. Section numbering should be left justified using bold print. Example: 1.1, 1.2, 1.3, etc.	K4-K6	
Sub Sections	**Sub Sections:** Use only Arabic numerals with two decimals.	K4-	

	Subsection numbering should be left Justified using bold print. Example: 1.1.1, 1.1.2, 1.1.3, etc.	K6	
References	Use only Arabic numerals. Serial numbering should be carried out based on Alphabetical order of surname or last name of first author. The format is written like, author name followed by year followed by title of the work followed by details of the journal. Same font as regular text, serial number and all authors names to be in bold print. Title and Journal names should be in italic. 1. **Alvarez LH and Cervantes FJ**, 2011. "(Bio) nanotechnologies to enhance environmental quality and energy production". *J ChemTechnolBiot*86 (1354–1363). 2. **Banjong B, Rattanai B, Zongporn J, Naratip V**, 2010. "Grass blade-like microparticle $MnPO_4 \cdot H_2O$ prepared by a simple precipitation at room temperature".*Power Techno.* 203 (310 - 314).	K4-K6	
Typing Instructions	**Typing Instructions:** The impression on the typed copies should be black in color. One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style 'Times New Roman' and Font size 12. Use A4 (210 mm X 297 mm) bond un-ruled paper (80 gsm) for all copies submitted. Use one side of the paper for all printed/typed matter.	K4-K6	
Justification	**Justification:** The text should be fully justified	K4-K6	
Margins	**Margins:** The margins for the regular text are as follows LEFT - 1.5" RIGHT - 1" TOP - 1" BOTTOM - 1"	K4-K6	
Paragraph Spacing	Use 6 pts before & 6 pts after paragraphs. All paragraphs in the seminar/project report should be left justified completely, from the first line to the last line. Use 1.5 spacing between the regular text and quotations. Provide double spaces between: (a) From top of page to chapter title, (a) Chapter title and first sentence of a chapter, Use single spacing (a) In footnotes and endnotes for text. (b) In explanatory notes for tables and figures. (c) In text corresponding to bullets, listings, and quotations in the main body of seminar/project report. Use single space in references and double space between references.	K4-K6	
Tables	All tables should have sharp lines, drawn in black ink, to separate rows/columns as and when necessary.	K4-K6	

	Tables should follow immediately after they are referred to for the first time in the text. Splitting of paragraphs, for including tables on a page, should be avoided. Provide double spaces on the top and the bottom of all tables to separate them from the regular text, wherever applicable. The title of the table etc. should be placed on the top of the table. The title should be centered with respect to the table. The titles must be in the same font as the regular text and should be single spaced.		
Figures	All figures, drawings, and graphs should be drawn in black ink with sharp lines and adequate contrast between different plots if more than one plot is present in the same graph. The title of the figure etc. should be placed on the bottom of the figure. Figures should follow immediately after they are referred to for the first time in the text. Splitting of paragraphs, for including figures on a page, should be avoided. Provide double spaces on the top and the bottom of all figures to separate them from the regular text, wherever applicable. Figures should be centered with respect to the figure. The titles must be in the same font as the regular text and should be single spaced. The title format is given below: Fig. <blank><chapter number>.<serial number><left indent><figure	K4-K6	
Page Dimension & Binding Specifications	The project report should be prepared in A4 size. The dissertation shall be properly bound; The bound front cover should indicate in Silver and embossed letter.		
Course Outcome	**CO1:** Identification of research idea	K2	
	CO2: Analyze of problem solving skills	K4	
	CO3: Analyze sources for conduct of Research	K4	
	CO4: Evaluate the research report	K5	
	CO5: Create the research report	K6	

Learning Resources	
Text Books	1. Research Methodology: Methods and Techniques, by C.R. Kothari, New Age Publications, 2009.
Reference Books	1. Research Methodology: Methods and Techniques by C.R. Kothari, New Age Publications, 1985. 2. Essentials of Research Design and Methodology by: Geoffrey R. Marczyk, David DeMatteo, David Festinger, 2005.
Website Link	1. http://gen.lib.rus.ec/

M. Sc. - Chemistry LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4PCHPR1	PROJECT WORK	PROJECT WORK	IV	8	0	0	8	5

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	S	M	M	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	S	M	M
CO4	S	S	S	M	S	S	S	S	M	M
CO5	M	M	M	S	S	M	M	S	M	S
Level of Correlation between CO and PO	L-LOW			M-MEDIUM		S-STRONG				

Tutorial Schedule	-
Teaching and Learning Methods	-
Assessment Methods	**EA - 100%** 1. Project Report - 150 Marks 2. Viva-Voce - 50 Marks 3. Total - 200 Marks

Designed By	Verified By	Approved By
Dr. N. Nithiya	Dr. N. Nithiya	

N. Nithiya N. Nithiya

Curriculum Development Cell MCAS Autonomous Rasipuram

M. Sc., Chemistry – Chemistry for Competitive Examination Syllabus - LOCF - CBCS - Pattern with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PCHOE1	Chemistry for Competitive Examination	**Self study** Online -Competitive Examination	IV	-	-	4	0	2
Objective	To Identify Problem related to their area of interest in Chemistry and Chemical industry and enhance problem solving skills and research knowledge.							

Details	**Course Content**	**Knowledge Levels**	**Sessions**
	Assemblage of different topics related to Chemistry in particular, Organic, Inorganic, Physical, Pharmaceutical, Spectroscopy, Analytical, Forensic, Food Chemistry etc. Major emphasis has been put forth to include recent developments in the subjects. This course aims to give a holistic view of all the topics which comprised of some factual text points, multiple choice questions (MCQ), it is extremely suitable for students pursuing their higher degree in University/institute for their entrance exams, students preparing for various national and state level competitive entrance exams such as ICAR-JRF/SRF/NET/ARS, IARI/NDRIPh.D., SAUs; CSIR/UGC-NET/JRF/SRF; ICMR, DBT, GATE, BARC, IISc, JNU, BHU, etc. to get admission in Ph.D., in Chemistry. In addition, it is also useful for UPSC and states PSC. **Rules for creating MCQ pattern.** 1. Objective type online examination will be conducted at the end of 4^{th} semester. 2. Questions must be taken from all previous question papers of CSIR-NET, SET, NEET, UPSC, IBPS and Common Entrance Test for Ph.D. 3. **Test critical thinking**. Multiple choice questions to test the superficial knowledge. Learners to interpret facts, evaluate situations, explain cause and effect, make inferences, and predict results. 4. **Emphasize Higher-Level Thinking** Use memory-plus application oriented questions. These		

	questions require students to recall principles, rules or facts in a real life context. Eg.1 <u>Ability to Justify Methods and Procedures</u> In the synthesis of polydimethylsiloxane, the chain forming , branching and terminating agent respectively , are a. 20 , 28 , 50 and 126 b. 24 , 28 ,82 and 126 c. 20 , 50 , 80 and 184 d. 28 , 50 , 82 and 180 Eg.2 <u>Ability to Interpret Cause-and-Effect Relationships</u> The chemical potential (μ) of 2 molar Na_2SO_4 solution is expressed in terms of mean ionic activity co-efficient ($\gamma_{\pm}$) as a. $\mu_0 + 5\ RT\ ln2 + 3\ RT\ ln\ \gamma_{\pm}$ b. $\mu_0 + 3\ RT\ ln2 + 3\ RT\ ln\ \gamma_{\pm}$ c. $\mu_0 + 5\ RT\ ln\ \gamma_{\pm}$ d. $\mu_0 + 4\ RT\ ln\gamma_{\pm}$ 5. Mix up the order of the correct answers Keep correct answers in random positions and don't let them fall into a pattern that can be detected 6. **Use a Question Format** Multiple-choice items to be prepared as questions (rather than incomplete statements)		

	Incomplete Statement Format: The capital of California is in Direct Question Format------ Less effective. In which of the following cities is the capital of California? - This is Best format. 7. **Keep Option Lengths Similar** Avoid making your correct answer the long or short answer 8. **Avoid the "All the Above" and "None of the Above" Options** Students merely need to recognize two correct options to get the answer correct 9. HOD's instruct to the faculty to prepare minimum 500 questions booklet (cumulatively for each programme) with solutions and circulate among the students. 10. Each Department to prepare the Questions (MCQ pattern with four answers) and submit to ICT.		

Course Outcome	**CO1:** Identification of pattern of questions asked in competitive exams	K2	
	CO2: Analyze the topics that are repeated in competitive exams	K4	
	CO3: Able to categorize the topics and select the topics of their interest	K4	
	CO4: Ability to solve problems related to each topic	K5	
	CO5: Get confidence about appearing for competitive exams	K6	

Learning Resources	
Text Books	1. Trueman's UGC NET Chemical Sciences - 2023 Edition Paperback – 1, M. Gagan, January 2023
Reference Books	1. Csir-Ugc Net/Jrf/Set Chemical Sciences Paperback, Hemant Kulshrestha, Ajay Taneja, 2010.
Website Link	1. https://ifasonline.com/

M. Sc. - Chemistry LOCF - CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PCHOE1	Chemistry for Competitive Examination	**Self study** Online - Competitive Examination	IV	-	-	4	0	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	M	S	L	S	S	S
CO2	S	S	M	M	M	S	L	M	S	S
CO3	S	M	S	S	S	S	M	M	S	S
CO4	S	M	M	S	M	S	L	S	S	S
CO5	S	S	M	S	S	S	M	S	M	S
Level of Correlation between CO and PO	L-LOW			M-MEDIUM		S-STRONG				

Tutorial Schedule	NET / SET / GATE / CET / TRB / NEET Old question papers – solutions – online mock test
Teaching and Learning Methods	Self study, Group discussion, Chalk and Talk, Audio-Video Learning, learning through mock test
Assessment Methods	100 multiple choice questions through computer based online examinations passing minimum is 50%

Designed By	Verified By	Approved By
Mrs. M. Saranya	Dr. N. Nithiya	

N. Nithiya

Curriculum Development Cell MCAS (Autonomous) Rasipuram

List of Extra Disciplinary (GEC) Course
SYLLABUS - LOCF-CBCS PATTERN
EFFECTIVE FROM THE ACADEMIC YEAR 2021-2022 Onwards

S. No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	II	21M2PCHED1	INDUSTRIAL CHEMISTRY
2	II	21M2PCHED2	CHEMISTRY IN HEALTH SCIENCE
3	II	21M2PCHED3	CHEMISTRY IN DAY-TO-DAY LIFE

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHED1	INDUSTRIAL CHEMISTRY	GEC - EDC - I	II	4	4	0	0	4
Objective	To learn the fundamentals of Glass, Ceramics and Cement and its manufacturing technique and Dyes, Paints, Synthetic fibers, Plastics, Oils, Fats and Waxes and their applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Glass and Ceramics: Glass:** Introduction- Raw materials, manufacture and applications. Some special glasses - fused silica glass, optical glass, glass wool, photosensitive glass- composition and uses. Ceramics: Definition, Manufacture and applications.	K1,K2	9
II	**Cement:** Introduction, Types of cement - High alumina cement, Slag cement, Acid resisting cement, White cement, Types of Portland cement, Raw materials, Manufacture of cement, Setting of cement, factors affecting quality of cement, Cement industries in Tamilnadu.	K3	9
III	**Dyes and Paints:** Dyes: Classifications of dyes, application of dyes in other areas-medicine, chemical analysis, cosmetics, colouring agents, Food and beverages. Paints: Constituents of paints, Manufacture of paints, Setting of paints, requirement of a good paint.	K3	9
IV	**Synthetic fibres and Plastics:** Synthetic fibres: Difference between natural and synthetic fibres, Synthesis and applications of Rayon, Terylene, Nylon and Teflon. Plastics: Classification, properties and applications of plastics - demerits of plastics.	K4	9
V	**Oils, Fats and Waxes:** Classification of oils, fats and waxes, distinction between oils, fats and waxes, Uses of essential oils and fats. Soap and its manufacture - toilet and transparent soaps, cleansing action of soap. Detergent - classification and uses.	K4, K5	9

Course Outcome	**CO1:** To remember the manufactuing process of glass and ceramics.	**K1**
	CO2: To understand the types and manufacturing of cement.	**K2**
	CO3: Learn about dyes, paints and pigments and their applications.	**K3**
	CO4: Analyze the importance and preparations of synthetic fibres and plastics.	**K4**
	CO5: Ilustrate knowledge about oils, fats and waxes.	**K5**
Learning Resources		
Text Books	1.B. K. Sharma, Industrial Chemistry, Goel Publishing House Pvt Ltd.,1999 2. M. G. Arora and M. Sing, Industrial Chemistry. Anmol Publications, First Edition, 1994 3. G. N. Pandey, A Textbook of Chemical Technology. Vol. I and II, Vikas Publishing House Pvt Ltd., 1997	
Reference Books	1.B. K. Chakrabarty, Industrial Chemistry, Oxford and IBM Publishing Co. Pvt Ltd., 1991 2. V. Subrahmaniyan, S. Renganathan, K. Ganesan, S. Ganesh, Applied Chemistry, Scitcch Publications, 1998 3. J. E. KuriaCose and J. Rajaram, Chemistry in Engineering and Technology, Vol I and II, Tata McGraw Hill, 1984	
Website Link	1. https://www.youtube.com/watch?v=zdmEaXnB-5Q 2. https://www.britannica.com/science/band-theory	

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHED1	INDUSTRIAL CHEMISTRY	GEC - EDC - I	II	4	3	1	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	S	S	M	M	M	S
CO2	M	S	M	M	S	M	S	M	M	S
CO3	M	S	S	M	M	M	S	S	M	S
CO4	S	M	S	S	M	M	M	S	S	M
CO5	S	M	M	S	M	S	S	M	S	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion
Teaching and Learning Methods	Chalk and talk, smart-Class,Demo classes
Assesment Methods	Unit test, Internal and University examinations, Assignments

Designed By	Verified By	Approved By
Mr. S. RAMKUMAR	Dr. P. SUMATHI	

Curriculum Development Cell MCAS Autonomous Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHED2	CHEMISTRY IN HEALTH SCIENCE	GEC - EDC - II	II	4	4	0	0	4
Objective	To acquire knowledge about good physique fitness, skin care, hair care, clinical chemistry and diagnostic tools.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Health Maintenance:** Health maintenance - Height, Weight and Body Mass Index - causes and hazardness of obesity. Healthy bones - Role of enzymes and hormones in health. Chemistry of maintaining body structure and appearance - food habits and diets.	K1, K2	9
II	Skin protection - Structure and functions of skin - Skin care products - raw materials - its characterisation and formulation - SPF - toner, cleanser, moisturizer, face mask - Herbal extracts and essential oils in skin care.	K2,K3	9
III	Hair Care - Structure - Types and functions - characterization and formulation of shampoo and anti- dandruff shampoos - classification and formulation of hair colorants - herbal hair care products	K3	9
IV	**Clinical Chemistry:** Determination of sugar in serum and urine - detection of cholesterol - estimation of red cell count, Na, K, Ca, bicarbonates and phosphates in serum and their significance. Reason for abnormal value of sugar, cholesterol, urea, creatinine - control measures.	K4	9
V	**Diagnostic Tools:** Principle and uses of Microscopy, Endoscopy, Differential cell counter, X-Ray, ECG, Scanning, Ultrasound, Echo, CT and MRI.	K5	9
Course Outcome	**CO1:**Get an in-depth understanding about general health maintenance.	K1	
	CO2: Understand the basics of skin care and the various products used for maintenance.	K2	
	CO3: Apply the methods for hair care technology.	K3	
	CO4: Analyze practical knowledge about the tests involved in identification of essential elements in human body.	K4	
	CO5: Evaluate the various diagnostic tools involved to study human anatomy.	K5	
Learning Resources			

Text Books	1.B. M. Mithal and R. N. Saha, A handbook of cosmetics, Vallabh Prakashan publication, New Delhi, 2000. 2.John V. Simmons, Science of Cosmetics, Science and the beauty business, Vol-I Macmillan education, 1989. 3.G. L. David krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K. L. N. Reddy, C. Sudhakar, Drugs, University Press (India) Ltd, Orient Longman, First Edition, 2001.
Reference Books	1.Ramnik Sood, Medical Laboratory Technology: Methods and Interpretation, Third Edition, Jaypee Brothers medical publishers,1995. 2.Evelyn C Pearce, General Text Book of Nursing ECBS 1990. 3.Jayashree Ghosh, Applied Chemistry, First Edition, S. Chand and company pvt Ltd, 2016.
Website Link	1.http://www.hsc.edu.kw/vpo/cgo/resources/Chemistry%20%20for%20Health%20Scinces.pdf 2.https://pubs.acs.org/doi/10.1021/acs.jchemed.0c00887 3.https://www.nigms.nih.gov/education/Booklets/the-chemistry-of-health/Pages/Home.aspx

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHED2	CHEMISTRY IN HEALTH SCIENCE	GEC - EDC - II	II	4	4	0	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	S	S	S	M	M	S
CO2	M	M	S	M	S	M	M	S	M	S
CO3	M	S	M	S	S	M	S	M	S	S
CO4	S	M	M	M	S	S	M	M	M	S
CO5	S	M	S	S	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion
Teaching and Learning Methods	Chalk and talk, smart-Class,Demo classes
Assesment Methods	Unit test, Internal and University examinations, Assignments

Designed By	Verified By	Approved By
Mr. S. RAMKUMAR	Dr. P. SUMATHI	

Curriculum Development Cell MCAS Autonomous Rasipuram

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHED3	CHEMISTRY IN DAY TO DAY LIFE	GEC - EDC - III	II	4	4	0	0	4
Objective	To acquire knowledge about good physique fitness, skin care, hair care, clinical chemistry and diagnostic tools.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Essential Nutrients:** Carbohydrates - Proteins - Lipids - Nucleic acids and Vitamins - Definition, Sources, Classification, Applications and Diseases due to deficiency	K1,K2	9
II	**Soil Nutrients and Food Additives:** Fertilizers - Pesticides - Insecticides - Definition, Classification, Characteristics and Uses. Additives -Definition, Characteristics, Uses and Abuse of additives in foods and beverages	K2,K3	9
III	**Dyes, Paints and Pigments:** Dyes - Definition, Classification based on mode of application and structure, Applications. Paints - Definition, Ingredients, Characteristics, uses and drying process. Pigments -Varnishes - Definition, Characteristics, Types and Uses.	K3	9
IV	**Soaps, Detergents and Disinfectants:** Soaps and Detergents - Definition, Ingredients, Classification, Characteristics and Uses. Disinfectants - Definition, Characteristics and Uses. Characteristics, Raw materials used in soaps preparation	K4	9
V	**Miscellaneous products:** Toothpaste - mouth wash - perfumes and deodorants - mosquito repellents - talcum powder - face scrubber - sanitizers - room freshners - compositions and uses.	K5	9
Course Outcome	**CO1:**Gain insight into the essential micronutrients required by human beings.	**K1**	
	CO2: To understand the soil nutrients and food additives.	**K2**	
	CO3: Apply **the** synthectic applications of dyes, paints and pigments.	**K3**	
	CO4: Analyze the importance and preparations of soaps, detergents and disinfectants.	**K4**	
	CO5: Evaluate the applications of chemistry in day-to-day life.	**K5**	

Learning Resources	
Text Books	1.Dr. M Swaminathan, Advanced Text Book on Food and Nutrition - Vol I, 2018. 2.Mahendra Sharma, Textbook of soil Fertility and Nutrient Management, 2016. 3.Subramanian Senthilkannan Muthu, Sustainable Innovations in Textile Chemistry and Dyes (Textile Science and Clothing Technology), 2018.
Reference Books	1.K. Bagavathi Sundari, Applied Chemistry, MJP Publishers, 2006. 2.Singh. K, Chemistry in Daily Life: Third Edition, 2012. 3.Ley E. Manahan, Fundamentals of Environmental Chemistry, Third Edition, CRC Press, Taylor and Francis Group, 2009.
Website Link	1. https://www.worldofchemicals.com/455/chemistry-articles/chemistry-in-everyday-life.html 2.https://www.geeksforgeeks.org/importance-of-chemistry-in-everyday-life/ 3.https://ncert.nic.in/ncerts/l/lech207.pdf

L-Lecture T-Tutorial P-Practical C-Credit

M. Sc.,-Chemistry Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PCHED3	CHEMISTRY IN DAY TO DAY LIFE	GEC - EDC - III	II	4	4	0	0	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S	S	M	M	S	S
CO2	M	S	M	M	S	M	S	S	M	S
CO3	M	S	S	M	S	M	S	S	M	S
CO4	M	M	S	S	M	S	M	S	S	M
CO5	S	M	M	S	M	S	S	M	S	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	Group discussion
Teaching and Learning Methods	Chalk and talk, smart-Class,Demo classes
Assesment Methods	Unit test, Internal and semester examinations, Assignments

Designed By	Verified By	Approved By
Mr. S. RAMKUMAR	Dr. P. SUMATHI	

Curriculum Development Cell MCAS (Autonomous) Rasipuram