PG DEPARTMENT OF CHEMISTRY

SYLLABUS

2021-2023 Batch

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NGM COLLEGE (Autonomous)

Affiliated to Bharathiar University

Re-Accredited by NAAC & ISO 9001:2015 certified

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PREAMBLE

NALLAMUTHU GOUNDER MAHALINGAM COLLEGE, POLLACHI

Our dream is to make the college an institution of excellence at the national level by imparting quality education of global standards to make students academically superior, socially committed, ethically strong, spiritually evolved and culturally rich citizens to contribute to the holistic development of the self and society. Training students to become role models in academic arena by strengthening infrastructure, upgrading curriculum, developing faculty, augmenting extension services and imparting quality education through an enlightened management, committed faculty who ensure knowledge transfer, instill research aptitude and infuse ethical, cultural values to transform students into disciplined citizens in order to improve quality of life.

PG DEPARTMENT OF CHEMISTRY

Department of M.Sc., Chemistry was established in July, 2015 with following Vision and Mission. It offers a wide range of courses including Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Medicinal Chemistry, Green Chemistry, Nano chemistry and Analytical chemistry etc. Experts from Pure and Applied Chemistry domain will teach the courses and students will develop a thorough understanding of fundamentals and experimental concepts of Chemistry. There will be an opportunity for the students to participate in an extensive and varied seminar, workshop, conferences, association, research club activities, extension and internship programmes and gain experience in a large variety of projects. The outcome based education is established in the year 2019.

VISION

To establish a center of excellence for leading-edge chemistry education. The main goal will be to produce highly skilled graduates capable of working in the rapidly changing scenario in the field of chemical science and technology during their lifetime.

MISSION

To impart quality education through up-to-date knowledge and information in the field of chemistry related to science and technology and enable them to take up the challenge of the world to come.

CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC guidelines to be followed.

CORE COURSE

A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

ELECTIVE COURSE

Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

PROJECT WORK/DISSERTATION

It is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. Project/Dissertation work would be of 5 credits.

OUTCOME BASED EDUCATION (OBE)

It is the educational approach which focuses on student centric education in the context of development of personal, social, professional and knowledge (KSA) requirements in one's career and life. Outcome Based Education is an approach that focuses on outcomes such as the achievements of students that are measurable, proven and can be improved. It is simply the establishment of expected goals or outcomes for different levels of graduate, and a commitment to ensure that every student achieves at least those minimum proficiencies before being allowed to post graduate.

The authorities of Nallamuthu Gounder Mahalingam College, Pollachi in lieu of accreditation standards of National Assessment and Accreditation Council, decided to opt for Outcomes Based Education (OBE). As the part of the decision in Academic council meeting

was held at the campus. The detailed document is designed and the existing curriculum of the department is transformed in to the framework of OBE. This is the first step towards the implementation of OBE in the department. The document will serve all stakeholders in the effective implementation of the curriculum. The OBE is continuous process for quality enhancement and it will go a long way in order to enhance the competencies and employability of the Post-graduates of the department.

The M.Sc., Chemistry program aims that the graduates will become successful professional by demonstrating rational and analytical thinking abilities. The graduates will be mould to communicate efficiently and work in interdisciplinary research and demonstrate scientific leadership in academia and industries.

Programme Educational Outcomes

PEO1	To understand major concepts, theoretical principles, experimental findings and the ability to employ them for critical thinking and efficient problem solving skills in different areas of chemistry.
PEO2	To qualify State, National and International eligibility exams to carry out research in National/International institutes.
PEO3	To pursue successful professional careers in the chemical industry, government, academia, national and international research institutions as innovative scientists.
PEO4	To develop leaders, entrepreneurs and professional employees in contemporary and also global outlook.
PEO5	Graduates will contribute to the growth of the nation and society as ethical and responsible professionals.

Programme Outcomes

After completion of the M.Sc Chemistry Programme, the students able to

PO1	Firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries.
PO2	Design and carry out scientific experiments with modern instrumentation & classical techniques, analyze data and interpret results effectively in diverse teams and to adhere secure laboratory practices.

PO3	Qualify for higher studies, research and enter into the chemical, pharmaceutical, bio-pharmaceutical and materials industries and in academic institutions, business entities and governmental agencies.
PO4	Communicate scientific information concisely, both orally and in writing, and complement recent developments in the field of chemistry and related subjects.
PO5	Create, select, and apply appropriate techniques, resources, and modern IT tools and Chemical technologies to complex activities with an understanding of the limitations.
PO6	Continue to acquire relevant knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in the subject concerned.
PO7	Explain environmental pollution issues and the remedies thereof and to develop the sustainable and eco-friendly technology in Industrial Chemistry.
PO8	Acquire attitude and to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes

After completion of the M.Sc Chemistry Programme, the students able to

PSO – 01	Proficient in spectral, qualitative and quantitative phytochemical techniques in natural products isolations, nano synthesis, coordination complexes and also to develop interdisciplinary approach of the subject.
PSO – 02	Develop new innovations in chemical, pharmaceutical, food products, cosmetics and allied chemical industries and successfully implement them at an industrial scale.

SCHEME OF SYLLABUS & EXAMINATION

NALLAMUTHU GOUNDER MAHALINGAM COLLEGE, POLLACHI

(Autonomous, Affiliated to Bharathiar University)

Accredited by NAAC, An ISO 9001: 2015 institution

SEMESTER - I

Semester	Subject Code	Title of the Paper	Hrs / Week		Hrs / Sem.	Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P	T		Internal	External		
I	21PCY101	Inorganic Chemistry –I- Solid Stateand Nuclear Chemistry	5	--	75	3	50	50	100	4
	21PCY102	Organic Chemistry – I- Reactionsand Mechanisms	5	--	75	3	50	50	100	5
	21PCY103	Physical Chemistry –I- Group Theory and Chemical Kinetics	5	--	75	3	50	50	100	5
	21PCY207	Inorganic Chemistry Practical-I	--	5	75	--	--	--	--	--
	21PCY208	Organic Chemistry Practical-I	--	5	75	--	--	--	--	--
	21PCY209	Physical Chemistry Practical –I	--	5	75	--	--	--	--	--
Total			**15**	**15**	**450**	**9**	**150**	**150**	**300**	**14**

SEMESTER - II

Semester	Subject Code	Title of the Paper	Hrs / Week		Hrs / Sem.	Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P	T		Internal	External		
II	21PCY204	Inorganic Chemistry –II- Coordination and Organometallic Chemistry	5	--	75	3	50	50	100	4
	21PCY205	Organic Chemistry-II –Organic Reactions and Stereochemistry	5	--	75	3	50	50	100	5
	21PCY206	Physical Chemistry-II – Quantum and Electrochemistry	5	--	75	3	50	50	100	4
	21PCY2EA 21PCY2EB 21PCY2EC	*Major Elective –I – Green, Nanochemistry & Cyber Security *Food Science and Technology * Advanced Polymeric Materials	3	--	45	3	50	50	100	3
	21PCY2N	*Non Major Elective Chemistry in day to day life	2		30	3	50	50	100	2
	21PCY207	Inorganic Chemistry Practical -I	--	4	60	6	50	50	100	4
	21PCY208	Organic Chemistry Practical-I	--	3	45	6	50	50	100	4
	21PCY209	Physical Chemistry Practical -I	--	3	45	6	50	50	100	4
Total			**20**	**10**	**450**	**33**	**400**	**400**	**800**	**30**

SEMESTER - III

Semester	Subject Code	Title of the Paper	Hrs / Week		Hrs / Sem.	Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P	T		Internal	External		
III	21PCY310	Organic Chemistry –III– Natural Products and Organic Reagents	5		75	3	50	50	100	5
	21PCY311	Physical Chemistry –III –Classical and Statistical Thermodynamics	5		75	3	50	50	100	4
	21PCY312	Spectroscopic Techniques – Application in Organic Chemistry	5		75	3	50	50	100	5
	21PCY3EA 21PCY3EB 21PCY3EC	Major Elective -II – Applied Electrochemistry * Nanoscience and Nanotechnology *Dye chemistry	3		45	3	50	50	100	3
	20PCY415	Inorganic Chemistry Practical-II	--	4	60	--	--	--	--	--
	20PCY416	Organic Chemistry Practical–II	--	4	60	--	--	--	--	--
	20PCY417	Physical Chemistry Practical–II	--	4	60	--	--	--	--	--
Total			**18**	**12**	**450**	**12**	**200**	**200**	**400**	**17**

SEMESTER - IV

Semester	Subject Code	Title of the Paper	Hrs / Week		Hrs / Sem.	Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P	T		Internal	External		
IV	21PCY413	Inorganic Chemistry –III- Bioinorganic and Inorganic Photochemistry	5	--	75	3	50	50	100	5
	21PCY414	Analytical Techniques	5	--	75	3	50	50	100	4
	21PCY4EA 21PCY4EB 21PCY4EC	*Major Elective –III-Medicinal Chemistry *Computational Chemistry *Green Chemistry	3		45	3	50	50	100	3
	21PCY415	Inorganic Chemistry Practical-II	--	5	75	6	50	50	100	4
	21PCY416	Organic Chemistry Practical-II	--	5	75	6	50	50	100	4
	21PCY417	Physical Chemistry Practical –II	--	5	75	6	50	50	100	4
	21PCY418	Project Work & Viva Voce	--	-	-	6	50	50	100	5
		Library	2							
* Students can choose any one of the papers as electives										
Total			**15**	**15**	**420**	**33**	**350**	**350**	**700**	**29**
Grand Total (Total Marks + Total Credits)									**2200**	**90**

LIST OF ELECTIVES

SEMESTER	SUBJECT CODE & TITLE
II	**MAJOR ELECTIVE-I** 21PCY2EA - Green, Nanochemistry & Cyber Security 21PCY2EB - Food Science and Technology 21PCY2EC - Advanced Polymeric Materials
III	**MAJOR ELECTIVE-II** 21PCY3EA - Applied Electrochemistry 21PCY3EB - Nanoscience and Nanotechnology 21PCY3EC - Dye Chemistry
IV	**MAJOR ELECTIVE-III** 21PCY4EA - Medicinal Chemistry 21PCY4EB - Computational Chemistry 21PCY4EC - Green Chemistry

CO-SCHOLASTIC COURSES

ADVANCED LEARNERS (Optional)

S. No	Semester	Course	Hours/ Week	Total Hours	Internal Marks	External Marks	Total Marks	Credits
1	III	21PCY3AL - Advanced Functional Materials	-	-	50	50	100	Grade
		ONLINECOURSES						
2	I/II	Swayam, MOOC Course etc.,	-	-	-	-	-	2
		VALUE ADDED COURSES						
3	III	Value Added Course-I 21PCY3V01-Chemistry in Household Products	2	30	25	25	50	2
4	III	Value Added Course–II 21PCY3V02-Chemistry of Industrial Process: An Introduction	2	30	25	25	50	2
		CERTIFICATE COURSES (Optional)						
5	III	Certificate Course–I **2IPCYCFC01-Fundamentals of Pharmaceutical Chemistry**	2	40	50	50	100	2
6	IV	Certificate Course–II **21PCYCFC02-Phytochemical Techniques and Health Chemistry**	2	40	50	50	100	2
		The scholastic courses are only counted for the final grading and ranking. However, for the award of the degree, the completion of Co-scholastic one online courses is mandatory. All other Co-scholastic courses are optional only.						

Question Paper Pattern
(Based on Bloom's Taxonomy)

K1-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

1. Theory Examinations: 70 Marks

(i) Test- I & II, ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q 1 -10)	A (Q 1 – 5 MCQ) (Q 6–10 Define/Short Answer)	10 x 1 = 10	MCQ Define	70 **(Reduced to 50 for ESE)**
K3 (Q 11-15)	B (Either or pattern)	5 x 4 = 20	Short Answers	
K4 & K5 (Q 16 – 21)	C (Q -16 is Compulsory and Q 17 – 21 answer any 3)	4 x 10 = 40	Descriptive/ Detailed	

2. Practical Examinations: 100/50 Marks

Knowledge Level	Criterion	External/Internal Marks	Total
K3	Record work & Practical	50/50	100
K4			
K5			

***** In Theory ESE, Students will write Examination Maximum Marks as 70 and it will be reduced to 50 for Total Mark calculation.

Components of Continuous Assessment

THEORY

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Test 1	(70 / 4.67) = 15	15+15+10+05+05	50
Test 2 / Model	(70 / 4.67) = 15		
Assignment / Digital Assignment	10		
Seminar / Socratic Seminar	05		
Group Task : GD, Role Play, APS	05		

PRACTICAL

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Test / Model	30	30+5+15	50
Observation Note	5		
Record	15		

PROJECT

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Review I (Introduction)	10	10+10+10+20	50
Review II (Literature Survey)	10		
Review III (Results and Discussion)	10		
Report Submission	20		

PROJECT EXTERNAL

External **Total – 50 marks**

Project	**Total – 30 marks**
Relevance of the topic to the academic / society	05 Marks
Objectives	05 Marks
Experimental design	10 Marks
Expression of results and discussion	10 Marks
Viva Voce	**Total – 20 marks**
Presentation	10 Marks
Discussion	10 Marks

STUDENT SEMINAR EVALUATION RUBRIC

Grading Scale:

A	B	C	D
5	4	2 - 3	0 - 1

CRITERIA	A - Excellent	B – Good	C - Average	D - Inadequate
Organization of presentation	Information presented as interesting story in logical, easy to follow sequence	Information presented in logical sequence; easy to follow	Most of information presented in sequence	Hard to follow; sequence of information jumpy
Knowledge of subject & References	Demonstrated full knowledge; answered all questions with elaboration **&** Material sufficient for clear understanding **AND** exceptionally presented	At ease; answered all questions **but** failed to elaborate **&** Material sufficient for clear understanding **AND** effectively presented	At ease with information; answered most questions **&** Material sufficient for clear understanding **but** not clearly presented	Does not have grasp of information; answered only rudimentary Questions **&** Material not clearly related to topic **OR** background dominated seminar
Presentation Skills using ICT Tools	Uses graphics that explain and reinforce text and presentation	Uses graphics that explain text and presentation	Uses graphics that relate to text and presentation	Uses graphics that rarely support text and presentation
Eye Contact	Refers to slides to make points; engaged with audience	Refers to slides to make points; eye contact majority of time	Refers to slides to make points; occasional eye contact	Reads most slides; no or just occasional eye contact
Elocution – (Ability to speak English language)	Correct, precise pronunciation of all terms Voice is clear and steady; audience can hear well at all times	Incorrectly pronounces few terms Voice is clear with few fluctuations; audience can hear well most of the time	Incorrectly pronounces some terms Voice fluctuates from low to clear; difficult to hear at times	Mumbles and/or Incorrectly pronounces some terms Voice is low; difficult to hear

WRITTEN ASSIGNMENT GRADING RUBRIC

Grading Scale:

A	B	C	D	F
09 - 10	07- 08	05 - 06	03 - 04	01 - 02

CRITERION	A – Excellent	B - Good	C - Average	D - Below Average	F - Inadequate
Content & Focus	Hits on almost all content exceptionally clear	Hits on most key points and writing is interesting	Hits in basic content and writing is understandable	Hits on a portion of content and/or digressions and errors	Completely off track or did not submit
Sentence Structure & Style	* Word choice is rich and varies * Writing style is consistently strong * Students own formal language	* Word choice is clear and reasonably precise * Writing language is appropriate to topic * Words convey intended message	* Word choice is basic * Most writing language is appropriate to topic * Informal language	* Word choice is vague * Writing language is not appropriate to topic * Message is unclear	* Not adequate
Sources	Sources are cited and are used critically	Sources are cited and some are used critically	Some sources are missing	Sources are not cited	Sources are not at all cited
Neatness	Typed; Clean; Neatly bound in a report cover; illustrations provided	Legible writing, well-formed characters; Clean and neatly bound in a report cover	Legible writing, some ill-formed letters, print too small or too large; papers stapled together	Illegible writing; loose pages	Same as below standard
Timeliness	Report on time	Report one class period late	Report two class periods late	Report more than one week late	Report more than 10 days late

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY101			Inorganic Chemistry –I- Solid state and Nuclear Chemistry		**Batch:**	2021 - 2023
						Semester:	I
Lecture Hrs./Week	5	**Tutorial**	-	**Total Hrs/ Sem**	75	**Credits:**	4

Course Objectives

* To gain knowledge about structure and bonding in inorganic rings, cages, chains and metal clusters.
* To understand the concepts of acid-bases and non-aqueous solvents.
* To learn about inorganic crystals and structural determination methods.
* Ability to know the principle of nuclear model, application of radioactive counting techniques and radioactive isotopes.

Course Outcomes

On the completion of the course the student will be able to

#	**Course Outcomes (CO)**	**Knowledge Level**
CO1	Identify the applications of inorganic compounds as rings and clusters.	K2, K3
CO2	Remember the modern acid-base concepts.	K2
CO3	Distinguish the types of solids and their defects.	K4
CO4	Apply the nuclear chemistry principles and its application in various fields.	K4
CO5	Evaluate n/p ratio, binding energy and Q-value of nuclear reactions.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	**Content**	**Hrs**
Unit I	**Rings** - borazines - phosphonitrilic compounds- sulphur - nitrogen ring compounds (S_4N_4). **Cages** –Structure and bonding of phosphorous compounds, boranes, carboranes and metallocene carboranes. **Chains** – catenation, heterocatenation, isopolyanions, heteropolyanions (explanation with examples). **Metal clusters** - Structure and bonding of dinuclear, trinuclear, tetra nuclear and hexa nuclear clusters - polyatomic zintl anions and cations - chevral phases. **Self-study: fullerenes and their applications.**	15

Unit II	**Modern concepts of Acids and bases** A generalized acid base concepts – steric effects and solvation effects – Measures of Acid-Base strength –Factors affecting the strength of acids and bases- Common ion effect and Henderson's equation- Solvent system concept- Lux-flood concept - Cady-Elsey concept - Usanovich concept - HSAB principle - Pearson concept – Theories of Hardness and Softness – Acid and base strength of HSAB, limitations and applications of HSAB. **Non aqueous solvents** – Levelling effect of the solvent - classification of solvents, characteristic properties of ionizing solvents – chemical reactions in liquid ammonia, liquid HF, liquid N_2O_4, liquid SO_2 and oxyhalide solvents. **Self-study: levelling solvents**	15
Unit III	**Solid state** Introduction of solids - Close packing of spheres - packing efficiency - hexagonal close packed (hcp) and cubic close packed (ccp) structures - coordination number - tetrahedral and octahedral holes - limiting radius ratio rule. Study of structures of rutile, fluorite, antifluorite, zinc blende, wurtzite, perovskite, ilmenite and spinels. Metallic state - free electron theory and band theory, Electrical properties of solids - insulators - intrinsic semiconductors - impurity semiconductors (n and P type) - super conductivity - Meissner effect - BCS (cooper pair) theory. **Self-study: point defects in solids - Schottky and Frenkel defects – dislocations**	15
Unit IV	**Nuclear Chemistry –I** Nucleus: nuclear structure - stability of nuclei - packing fraction - even - odd nature of nucleons - n/p ratio - nuclear potential - binding energy and exchange forces - shell model and liquid drop model. Decay of radio nuclei: rate of decay - determination of half-life period - secular equilibrium and decay series. Particle acceleration and counting techniques: linear accelerator - cyclotron and synchrotron - betatron - G. M. counter - proportional and scintillation counters. **Self-study: Radioactive isotopes**	15
Unit V	**Nuclear Chemistry – II** Modes of decay: alpha, beta, gamma and orbital electron capture - nuclear isomerism - internal conversions - Q value - nuclear cross section - threshold energy and excitation functions. Type of nuclear reactions with natural and accelerated particles - transmutation - stripping and pick-up - spallation - fragmentation, etc. - fission - characteristics of fission reaction - product distribution and theories of fission - fissile and fertile isotopes - U235, U238, Th232 and Pu239 - atom bomb - nuclear fusion - stellar energy - synthesis of new elements - principles underlying the usage of radioisotopes in analysis - agriculture -	15

	industry and medicine - mechanism of chemical reactions - uses of radioisotopes in analytical chemistry - isotopic dilution analysis - neutron activation analysis and dating methods. Hot-atom chemistry-Safety measures. **Self-study: Disposal of Nuclear Waste**.	
	Total contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

21PCY101

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Puri. B. R, Sharma. L. R and Madan S. Pathania	Principles of Inorganic Chemistry	Vishal Publishing Co, 41st edition	2006
2	Gurdeep Raj	Advanced Inorganic Chemistry, Vol-I	Geol Publishing House, 12th Edition	2014
3	Madan. R.D	Advanced Inorganic Chemistry, Vol-I	S. Chand & company, New Delhi, 3rd Edition	2012
4	Arnikar, H.J	Essentials of Nuclear Chemistry	New Age International, 4th Edition	2000
5	James E. Huheey Ellen A. Keiter	Inorganic chemistry	Pearson India Limited. 4th Edition	2006

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Albert Cotton. F and Geoffrey Wilkinson	Advanced Inorganic Chemistry	Wiley & Sons, 6th edition	2014
2	Anthony R. West	Solid State Chemistry and its Application	Wiley India	2011
3	Lee. J.D	Concise Inorganic Chemistry	Wiley India	2010 Reprint
4	Keith F. Purcell and John, C. Kotz	Inorganic chemistry	Holt- Saunders International Editions,	1980

5	Bodie E. Douglas, Darl H. McDaniel John J. Alexander.	Concepts and Models of Inorganic Chemistry	Wiley & Sons, 3rd edition	1970
6	Gary L. Miessler and Tarr,D. A	Inorganic Chemistry	Pearson Publication, 3rd edition	2004

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=O377ShVgLi0&list=PLFW6lRTa1g82yuaxHUfC72ZPBViN95TD&index=1
https://www.youtube.com/watch?v=Xs7SFulW4oE&list=PLXLBkCN7a8rn9Em3D5CRAOANhjwvC4CUK&index=1
https://youtu.be/FFAKGyBNc04
https://nptel.ac.in/courses/104/103/104103069/
https://nptel.ac.in/courses/104/104/104104101/
https://nptel.ac.in/courses/112/103/112103243/

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5		PO6	PO7	PO8	PSO1	PSO2
CO1	M	H	H	H	M		L	M	M	H	M
CO2	M	H	M	H	M		-	L	M	H	H
CO3	H	M	H	M	H		M	H	H	H	M
CO4	H	M	H	H	M		-	M	H	M	M
CO5	H	H	M	M	M		-	M	M	H	-

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs.R.Mini Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY102			Organic Chemistry –I- Reactions and Mechanisms		**Batch:**	2021 – 2023
						Semester:	I
Lecture Hrs./Week	5	**Tutorial**	-	**Total Hrs/Sem**	75	**Credits:**	5

Course Objectives

* To understand the aromaticity of organic molecules and reaction mechanisms.
* To provide knowledge about electrophilic, nucleophilic substitution and Elimination reactions.
* To learn about the basic concept about organic reaction intermediates.

Course Outcomes

On the completion of the course the student will be able to

#	**Course Outcomes (CO)**	**Knowledge Level**
CO1	Understand the aromaticity of compounds and develop skills for identifying the kinetics of reactions.	K2
CO2	Explain the mechanism of different types of substitution, addition and elimination reactions for synthesizing organic compounds.	K3
CO3	Apply the mechanisms in solving chemical reactions.	K3
CO4	Inspect the different types of reactions involved in chemical synthesis and various naming reactions.	K4& K5
CO5	Evaluate the various types of reaction intermediates.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	**Content**	**Hrs**
Unit I	**Aromaticity** Aromatic character – Huckel's Molecular orbital theory for aromaticity (HMO), concept of aromaticity and anti aromaticity – Critereia for aromaticity, Non-benzenoid aromatic compounds-Monocyclic and bicyclic non-benzenoid neutral compounds (Annulenes and azulenes).Antiaromatic and Homoaromatic compounds- Alternant and non-alternant hydrocarbons, fulvene, tropolone, and sydnone. **Kinetic and Non-kinetic Methods of Determination of Reaction Mechanisms** Guidelines for proposing reasonable mechanism – Energetics and energy profile diagrams Reaction Mechanism: **Non kinetic methods-** Product analysis, intermediate criteria (isolation, trapping and detection) - Isotopic labeling and cross over	15

	experiments- Stereochemical evidence. **Kinetic methods-** Primary and secondary kinetic isotopic effects**.** Mechanistic implications of rate law- Isotope effects. Kinetic and thermodynamic control of reactions - Hammonds postulates, linear free energy relationship- Hammett and Taft equations. **Self-study: Tautomerism –keto –enol, amido –imido and nitro –acinitro systems**.	
Unit II	**Electrophilic substitution reactions** **Aromatic electrophilic substitution reactions** Arenium ion mechanism - orientation and reactivity in mono substituted benzene rings – steric effects and ortho/para ratios - ipso attack, orientation in di-substituted benzene rings. Typical reactions - Friedel Crafts alkylation & acylation, Vilsmeier-Haack reaction, Gattermann-Koch reaction, Hofmann-Martius, Jacobsons reaction, Houben-Hoesch reaction, Diazonium coupling, Stork enamine reactions and Bischler-Napieralski reaction. **Aliphatic electrophilic substitution reactions – Mechanism** SE1, SE2, and SEi mechanism. -Factors affecting reactivity in SE reactions - Typical reactions –hydrogen exchange and migration of double bond, halogenation of carbonyl compounds. **Self-study: cyclic mechanism andBradsher reaction.**	15
Unit III	**Nucleophilic substitution reactions** **Nucleophilic substitution reactions Aliphatic nucleophilic substitution** SN1, SN2 and SNi reactions and mechanisms - factors affecting nucleophilic substitution reaction - ambident nucleophiles and ambident substrates. Substitution at vinyl carbon and allylic carbon - hydrolysis of esters (AAc1, AAc2 and BAc2 only). Neighbouring group participation by σ and π bonds. Typical reactions - Wurtz reaction - Claisen and Dieckmann condensation - Williamson reactions**.** **Aromatic nucleophilic substitution:** SNAr - benzyne mechanism - Zeigler alkylation - Chichibabin reaction - Vonbraun reaction - Cine substitution**.** **Self-study:, Anchimeric assistance, Rosendmund Reactions, Von Richter Rearrangement**	15
Unit IV	**Addition and elimination reactions** Addition to C-C and C-O multiple bonds - electrophilic, nucleophilic and free-radical additions - additions to conjucated systems - orientation - Birch reduction - hydroboration - Michael condensation- Mannich reaction - 1,3 dipolar additions,- Sharpless asymmetric epoxidation - Diels-Alder reactions - carbene addition to double bonds – hydration and hydroxylation of olefines. **Elimination reactions**-E1, E2, E1cB - stereochemistry of elimination, Hofmann and Saytzeff's rules - elimination versus substitution - pyrolytic cis elimination - Chugaev reaction – dehydration of alcohols, dehydro halogenation of vicinal dihalides, Hofmann degradation, Cope elimination, Wittig – Thorpe. **Self-study: - Darsen - Wittig - Thorpe and benzoin condensations.**	15
Unit V	**Reactive Intermediates** Classical and non-classical carbocations, carbanions, radical- anions, radical-cations, carbenes, arynes and nitrenes. General methods of generation**,** detection and reactivity of these intermediates.	15

	Types of free radical reactions, Mechanism of free radical reaction, mechanism at an aromatic substrate, Reactivity in aliphatic substrate, alkenes and at bridgehead. Effect of solvent on reactivity - Sandmeyar, Gomberg, Ullman, Pschorr and Hunsdiecker reactions.	
	Total Contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

21PCY102

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Mukherjee, S.M and Singh, S.P.	Reaction Mechanism in Organic Chemistry	New Age International Publishers,10thEdition,	2004
2	Agarwal, O.P.	Reactions and Reagents in Organic Chemistry	Goel publishing house. 49th Edition.	2014
3.	Ahluwalia, V.K. Rakesh K. Parashar	Organic Reaction Mechanisms	Narosa Publsihing House. 4th Edition.	2010
4.	Tewari, Vishnoi, K.S	Text book of Organic Chemistry	Vikas Publishing House, 3rd Edition	2006
5.	Jagadamba Singh and Yadav, L.D.S	Advanced Organic Chemistry	Pragati prakasham publishers. 20th Edition.	2014

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Finar, I.L.	Fundamental principles	Pearson education Ltd. Volume I, Sixth edition.	2014
2	Jerry March	Advanced Organic Chemistry	Wiley Publications Ltd. 4th Edition	2008
3	Morrison, R.T, Boyd, R.N	Organic Chemistry	Pearson India Ltd. 7th Edition.	2013
4	Skyes, P	Guide Book to Mechanism in Organic Chemistry	Pearson Education, 6th edition	2014

5	Ahluwalia.V.K	Organic Chemistry Fundamental concepts,	Narosa Publishing House	2013

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=T1ePwEQ4Fa0
https://www.youtube.com/watch?v=QkQUJhJYPA0
https://www.youtube.com/watch?v=hsBn-BxuN0M
https://www.youtube.com/watch?v=RtV_JxzZoss
https://www.youtube.com/watch?v=-D8tYR3LTsI
https://nptel.ac.in/courses/104/101/104101115/
https://nptel.ac.in/courses/104/103/104103110/
https://nptel.ac.in/courses/104/101/104101005/

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	-	H	H	H	-	H	H	M	M
CO2	H	H	M	H	H	H	H	H	H	H
CO3	M	H	H	H	M	H	H	M	H	H
CO4	H	H	M	H	H	M	H	H	M	H
CO5	H	-	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY103			Physical Chemistry –I – Group Theory and Chemical Kinetics		**Batch:**	2021 - 2023
						Semester:	I
Lecture Hrs./Week	5	**Tutorial**	-	**Total Hrs/Sem**	75	**Credits:**	5

Course Objective

* To gain knowledge on basic and applications of group theory.
* To learn about rate and order of the various reactions.
* To understand the concepts of catalysis, adsorption and its mechanisms.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	Course Outcomes (CO)	Knowledge Level
CO1	Summarize the fundamentals of group theory and the fundamental concepts on kinetics and reaction rate.	K2
CO2	Develop knowledge on applications of group theory and various theories of chemical kinetics.	K3
CO3	Predict the IR and Raman active vibration modes for molecules and type of hybridization in nonlinear molecules based on group theory.	K3
CO4	Analyze the use of the kinetics and theories of surface chemistry.	K4
CO5	Examine hybridization scheme for orbital in simple molecules.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Group theory-I**: Symmetry elements and symmetry operations - identity element - centre of symmetry- reflections symmetry planes - proper and improper rotation axes of symmetry. Group definition, properties-order of group- types of groups-sub group, isomorphic group - similarity transformation and classes. Point group classification-identification of point groups of simple molecules - group multiplication table (C2v and C3v point group) – Definition of matrix, square, diagonal, null, unit, row, column, symmetric matrices -	15

	Matrix multiplication (Commutative and non-Commutative) determination of inverse of a matrix, block multiplication of matrices – Addition Matrix representation of symmetry operations and subtraction of matrices – Matrix notations for symmetry operations of C2v and C3v point groups (use of vectors) construction of character tables for C2v and C3v point groups. **Self-study: Abelian group, Non - abelian group.**	
Unit II	**Group theory-II** Reducible and Irreducible representations – The Great Orthogonality Theorem and its consequences (statement only, proof not needed)- Determination of the characters for irreducible representation of C2v and C3v point groups – using the orthogonality theorem- direct product representation - wave function as bases for irreducible representation - spectral transition probabilities - projection operators - Huckel approximation -concept of hybridization - secular determinant - symmetry factoring of secular equations. Symmetry selection rule for IR, Raman spectra and rotational spectroscopy - infrared spectral activity of vibrational modes in NH_3 and H_2O molecules - classification of vibrational modes - application of group theory to bonding: hybridization scheme for orbital in simple molecules - AB_4 (T_d, CH_4), AB_5 (D_{3h} $Fe(CO)_5$) and AB_6 (O_h $[Co(NH_3)_6]^{3+}$). **Self-study: Mutual Exclusion Principle.**	15
Unit III	**Chemical Kinetics-I** Simultaneous reactions - opposing, parallel and consecutive reactions - theories of reaction rates - Arrhenius theory - collision theory - classical collision theory- modified collision theory - causes of weaknesses of the collision theory - absolute reaction rate or transition state theory - Statistical mechanical derivation of the rate equation - thermodynamical formulation of reaction rate, Lindeman's theory of unimolecular reactions. Kinetics in liquid solution - Salt effect - primary salt effect and secondary salt effect - significance of salt effect - effect of pressure on rates of reactions in solutions. **Self-study: The Steady State Approximation.**	15
Unit IV	**Chemical Kinetics-II** Experimental methods of fast reactions - shock tubes and pulse radiolysis techniques - kinetics of decomposition of N_2O_5, H_2-Cl_2. Photochemical reactions and H_2-Br_2 thermal reaction - non-stationary chain reaction - H_2-O_2 reaction and explosion limits. Effect of temperature, relative permittivity, ionic strength and solvent	15

	(Grunwald-Winstein equation) on reaction rates. **Self-study: Chain Reactions - general characteristics.**	
Unit V	**Surface Chemistry** Physisorption and Chemisorption – adsorption isotherm – derivation of Langmuir and Freundlich, derivation of B.E.T equation of multilayer adsorption – application of BET equation to surface area determination, derivation of Gibbs adsorption isotherm. Heterogeneous catalysis and their kinetics – chemical reactions on solid surfaces - Mechanism & Kinetics of unimolecular and bimolecular surface reactions – Langmuir –Hinshelwood, Langmuir –Ridel mechanism, ARRT of surface reactions. **Self-study: Basic concepts of Micelles and Reverse Micelles.**	15
	Total Contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

21PCY103

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Raman, K.V.	Group Theory and its applications to chemistry	Tata McGraw Hill publishing company Ltd, 3rd reprint.	2000
2	Bhattacharya, P.K.	Group theory and its chemical applications, second edition.	Himalaya Publishing House, 2nd edition	2020
3	Gopinathan, M. S. and Ramakrishnan, V	Group Theory in Chemistry	Vishal Publishers, 2nd edition	2013
4	Gurudeep Raj	Chemical Kinetics	Krishna Educational Publishers.	2014
5	Bajpai, D.N.	Advanced Physical Chemistry	S. Chand Publishing Limited, revised edition	2001

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Cotton, F.A	Chemical applications of group theory	A Wiley Interscience Publication, 3rd Edition.	2008
2	Laidler. K. J	Chemical Kinetics	Pearson Education India, 3rd Edition.	2003
3	Adamson A.M.	Physical Chemistry of Surfaces	John Willey, UK, 5th Edition	2002

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=-we7yTR7exI
https://www.youtube.com/watch?v=SmZ7CSvETNo
https://www.youtube.com/watch?v=Av9f25sqLG0
https://www.youtube.com/watch?v=5m8ubFNFJUU
https://nptel.ac.in/courses/104/104/104104080/
https://onlinecourses.nptel.ac.in/noc21_cy16/preview
https://onlinecourses.nptel.ac.in/noc20_cy13/preview
https://onlinecourses.nptel.ac.in/noc21_cy17/preview
https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-cy17/

Mapping

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CO1	H	M	-	-	-	-	H	H	-	-
CO2	H	H	M	M	M	-	-	-	M	L
CO3	H	H	H	H	H	M	L	M	M	L
CO4	H	H	M	M	H	L	M	M	H	M
CO5	H	H	M	M	M	L	M	L	M	-

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs. K.Vimaladevi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme code:	M.Sc.			**Programme Title :**		Master of Chemistry	
Course Code:	21PCY204			Inorganic Chemistry - II Coordination and Organometallic Chemistry		**Batch :**	2021-2023
						Semester	II
Lecture Hrs./Week	5	Tutorial	-	**Total Hrs/ Sem**	75	**Credits:**	4

Course Objectives

* To acquire knowledge about theories of bonding and applications, substitution reactions, electron transfer mechanism of coordination complexes.
* To apply the knowledge of coordination chemistry to research and analyze the term symbols.
* Realize the importance of organometallic complexes in biomedical and other applications.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	**Course Outcomes (CO)**	**Knowledge Level**
CO1	Explain the bonding coordination compounds in terms of Crystal Field Theory and Molecular Orbital Theory.	K3
CO2	Examine the spectra of complexes using TS and Orgel diagrams.	K2
CO3	Formulate mechanisms for reactions of transition metal complexes.	K4
CO4	Appraise the preparation, properties and uses of metal carbonyls.	K4
CO5	Prepare Important organometallic compounds coordination complexes as catalyst for reactions.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate

Units	**Content**	**Hrs**
Unit I	**Coordination Chemistry –I** Nomenclature of coordination complexes, Theories of coordination compounds – VBT, CFT, LFT- splitting of d orbitals in different symmetries - crystal field stabilization energy - factors affecting the magnitude of 10 Dq - evidence for crystal field stabilization – Spectro chemical series - applications of CFSE- tetragonal distortion from octahedral symmetry - Jahn-Teller distortion. Molecular orbital theory -octahedral complexes - pi bonding theory - experimental evidence for pi bonding.	15

	Stability of complex ions-factors affecting the stability of complex ions- Irving-William series-relation between stepwise formation constant and overall formation constant, their determination-Jobs‟ continuous variation method-Chelate effect. **Self-study: Magnetic properties- spin-orbit contribution-Para, Dia, ferro magnetism and antiferro magnetism- Determination of magnetic properties.**	
Unit II	**Coordination Chemistry –II** Quantum number of multi electron atoms- R-S coupling and micro states- ground state terms of d^1 to d^{10}- Hund's rule in determination of low energy states - derivation of terms for $p^2$and d^2 ions. Electronic spectra of coordination compounds - selection rules - band intensities and band widths - Nephelauxetic effect, Orgel and Tanabe - Sugano - spectra of Ti3+, V3+, Ni2+, Cr3+, Co2+, Cr2+ and Fe^{2+} - calculation of 10Dq and B for V3+ (oct) and Ni2+ (oct) complexes. **Self-study: Charge transfer spectra- effect of Jahn-Teller distortion and spin orbit coupling on Spectra.**	15
Unit III	**Coordination Chemistry –III** Labile and inert complexes - Substitution reactions in square planar complexes - the rate law for nucleophilic substitution in a square planar complex - the trans effect - theories of trans effect - uses of trans effect. Ligand substitution reactions in octahedral complexes - types and mechanism of substitution reactions S_N1 and S_N2 type - acid hydrolysis reaction- catalysed aquation type, base hydrolysis reaction - S_N2 and S_N1CB mechanism - anation reactions. Mechanisms of redox reactions - outer sphere mechanisms - excited state outer sphere electron transfer reactions - inner sphere mechanisms. **Self-study: Complementary and Non-complementary reactions.**	15
Unit IV	**Organometallic Chemistry – I** Classification of organometallic compound, concept of hapticity, Stability of organo metallic compounds- β hydrogen elimination- the sixteen and eighteen electron rule. Synthesis – structure and bonding in metal carbonyls – isoelectronic and isolobal analogy- use of IR in the structural elucidation of carbonyl compounds– metal carbonyls- metal carbonyl anions - metal carbonyl hydrides - metal carbonyl halides - metal carbonyl clusters – Wade's rule and isolobal relationship - metal nitrosyls - dinitrogen complexes - dioxygen complexes- fluxional behavior. **Self-study: Sytx number.**	15

Unit V	**Organometallic Chemistry – II** Synthesis, reactions, bonding and structure in metal alkene, alkyne, allyl,dienyls and Cyclobutadiene complexes, cyclopentadienyl *complexes (Ferrocene)*, arene complexes (Di benzene chromium), cyclo hepta trienyl complexes. **Self-study: π donors-Carboxylic ligands and complexes.**	15
	Total Contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity, Case study and flip class

21PCY204

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Atkins, P.W., Overton T.L., Rourke, J.P., Weller,M.T.,	Inorganic Chemistry	Oxford University Press, 5th Edition.	2010
2	Malik, U.K., Tuli, G.D., and Madan, R.D	Selected Topics in Inorganic Chemistry	S. Chand Publication	2010
3	Gopalan, R., Ramalingam, V	Concise Coordination Chemistry	Vikas Publishing house pvt Ltd, 3rd edition.	2001

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Cotton. F. A And Wilkinson.G	Advanced Inorganic Chemistry	Wiley Inter science 6th edition	1999
2	Lee. J.D	Concise Inorganic Chemistry	Wiley India, 4th edition	2010
3	James E. Huheey,Ellen A. Keiter	Inorganic Chemistry	Pearson Copyright, 4th Edition	2006
4	Basolo, F. and Pearson. R.G.	Mechanisms of Inorganic Reactions: Study of Metal Complexes in Solution	Wiley Eastern Limited, 2nd edition	1967

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=rlz3_1ofdQs&list=PL8TbBPqune7T-MwkLf-2FTAtE1WjjgCQr
https://www.youtube.com/watch?v=mlI1hnJZleo&list=PL8TbBPqune7T-MwkLf-2FTAtE1WjjgCQr&index=2
https://www.youtube.com/watch?v=HvwswG8FmqE
https://www.youtube.com/watch?v=M38GJOTjwr0
https://www.youtube.com/watch?v=SqxcALnh4zg
https://nptel.ac.in/courses/104/101/104101121/
https://nptel.ac.in/courses/104/101/104101090/
https://nptel.ac.in/courses/104/106/104106064/
https://www.youtube.com/watch?v=86rNPVAtj0Y
https://www.youtube.com/watch?v=vPdEtYNAyp0
https://www.youtube.com/watch?v=yjNpuBHlSVc
https://www.youtube.com/watch?v=CPTu1YswO1w

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
CO1	H	-	H	H	H	-	H	H	M	M
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CO3	M	H	H	H	M	H	H	M	H	H
CO4	H	H	M	H	H	M	H	H	M	H
CO5	H	-	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY205			Organic Chemistry –II – Organic Reactions and Stereochemistry		**Batch:**	2021 - 2023
						Semester:	II
Lecture Hrs./Week	5	**Tutorial**	-	**Total Hrs/Sem**	75	**Credits:**	5

Course Objective

* To give a thorough introduction to the study of Oxidation, Reduction and alkaloids.
* To know the concept of Organic Photochemistry.
* To enable a comprehensive knowledge on conformational Stereochemistry and Pericyclic reactions.

Course Outcomes

On the successful completion of the course, students will be able to

#	CO Statement	Knowledge Level
CO1	Comprehend the basic of oxidation and reduction reactions and photochemistry.	K2
CO2	Outline the importance of pericyclic reactions, to figure out isomerism and conformational analysis of stereochemistry and to understand the structural elucidation of alkaloids.	K2
CO3	Implement the basic values and analyze the functions of the natural product such as alkaloids.	K3
CO4	Analyze the reagents in chemical reactions, to execute photochemical and pericyclic reactions.	K4
CO5	Evaluate the stereo chemical isomerization, configuration and conformations of molecules.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Oxidation** Chromyl chloride, ozone, DDQ, dioxiranes, lead tetraacetate, selenium dioxide, DMSO with either Ac_2O or oxalyl chloride, Dess-Martin reagent. Synthesis involving phase transfer catalysis (PTC), use of crown ethers, Merrifield resin, baker's yeast, Oppanauer oxidation, Jones oxidation. Allylic oxidation - oxidation of alcohols, glycols, halides and amines to aldehydes and ketones. **Reduction** Catalytic hydrogenation - Wilkinson catalyst, dehydrogenation, reduction with $LiAlH_4$, $NaBH_4$, tertiary butoxy aluminum hydride, $NaCNBH_3$, tributyl tin hydride, alkali metals for reduction, reductions involving hydrazines, Clemmensen and Wolff kishner reduction. DIBAL and hydroboration. **Self-study: Birch reduction.**	15

Unit II	**Organic photochemistry** Laws of photochemistry - Beer-Lambert, Grothus-Draper law, Stark-Einstein law – Electronic excitation - energy transfer - quantum efficiency,Jablonski diagram - chemical actinometry - photosensitization - quenching. Photochemistry of carbonyl compounds - photoreduction - Norrish type I and type II reactions, Photoadditions - – Barton reaction - Patterno-Buchi reaction. Photochemistry of olefins - cis and trans isomerization - dimerization reactions - cycloaddition reactions - 1, 2 cycloadditions - photooxidation. Excimer formation - chemiluminescence and bioluminescence. Experimental technique: Actinometry. **Self-study: Photo substitution reactions of benzene derivatives.**	15
Unit III	**Pericyclic reactions** Conservation of molecular orbital symmetry - symmetry properties of molecular orbitals. Electrocyclic reactions - 1,3-diene and 1,3,5-triene systems, correlation diagram and FMO method, Woodward-Hoffman selection rule for electroyclic reactions -con rotatory and dis rotatory motions 4nπ and (4n+ 2)π systems. Cycloadditions reactions - correlation diagram and FMO approach, p2s + p2s, p2s + p4s (Diels-Alder reaction) systems. Woodward-Hoffman selection rule for cycloaddition reactions. Sigmatropic rearrangements - analysis of sigmatropic rearrangements by FMO method - 1,3& 1,5 sigmatropic rearrangements, other sigmatropic shifts - Cope and Claisen rearrangements, Dibyemethyl rearrangement, ene reaction. **Self-study: Simple problems in pericyclic reaction.**	15
Unit IV	**Stereochemistry** Optical isomerism – concept of chirality- concept of prochirality – axial chirality – (optical isomerism of biphenyls, allenes and spiranes) –planar chirality (optical isomerism of ansa compounds and cyclophanes) – helicity (optical isomerism of over – crowded molecules) - R, S – nomenclature of compounds having one and more than one chiral centres - enantiotopic and diastereotopic ligands & faces - stereo selective and stereo specific reactions – stereochemistry of sulfur and nitrogen compounds. Asymmetric synthesis: Cram's rule and Prelog's rule. **Geometrical Isomerism** E,Z –notation – Determination of configuration of geometrical isomers. Stereoismerism of cyclic compounds (up to six membered ring)– aldoximes & ketoximes. **Conformational Analysis** Configuration and conformation – Conformation of acyclic compounds –ethane, butane, cyclohexane, decalins. Quantitative correlation between conformation and reactivity, Winstein - Eliel equation. **Self-study:stability and reactivity in relation to conformation – perhydro phenanthrenes**.	15
Unit V	**Alkaloids** General methods for determination of structure of alkaloids - Structural elucidation and synthesis of morphine, reserpine, quinine, atropine, lysergic acid and nicotine. **Self-study: papaverine.**	15
	Total Contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity, Case study and flip class.

21PCY205

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS\ EDITION	YEAR OF PUBLICATION
1	Mukerjee S.M. & Singh, S.P.	Reaction mechanism in organic chemistry	McMillan India Ltd, 3rd Edition	2013
2	Ahluwalia, V.K. Rakesh K. Parashar	Organic Reaction Mechanisms	Narosa Publsihing House, 4th Edition.	2010
3	Kalsi. P.S	Stereochemistry, Conformation and Mechanism	John Wiley sons, 3rd edition.	1995
4	Nasipuri, M	Stereochemistry of Organic Compounds	New Age International, New Delhi, 3rd Edition.	2007
5	Agarwal O. P	Natural product Chemistry	Goel Publishing house, 20th Edition	2001
6	Jagadambal Singh	Advanced Organic Chemistry	Pragati prakasham publishers,20thEdition.	2014
7	Eliel, E.L	Stereochemistry of Carbon Compounds	McGraw Hill, New Delhi, 1st Edition.	2013
8	Viswanathan, B. & Aulice Scibioh, M	Photoelectrochemistry – Principles and Practices	Narosa Publishing House, New Delhi	2014

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Depuy, C.H. & Chapman. O.S	Molecular reactions and photochemistry	Prentice Hall	1972
2	Eliel. E.L, Wilen. S.H	Stereochemistry of Organic Compounds	Wiley International	1994
3	Potapov, V.M. Beknazarov. A	Stereochemistry	Mir Publications, Russia	1980
4	Jerry March	Advanced organic chemistry	A Wiley-Interscience, 4th Edition.	2007
5	Finar. I.L	Organic Chemistry, Volume I, The fundamental principles	Pearson education Ltd, 6th edition.	2014

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https://www.youtube.com/watch?v=uwia3_Her8s
https://www.youtube.com/watch?v=qB9V2uMaxA8
https://www.youtube.com/watch?v=Pp0LeL0SkRg
https://www.youtube.com/watch?v=J_b1Y4QhhZc
https://www.youtube.com/watch?v=BBljnB-6420
https://www.youtube.com/watch?v=JROZc-9DayM
https://www.youtube.com/watch?v=wNyijTBpOrI

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CO3	H	H	H	H	H	M	M	H	H	M
CO4	M	H	H	H	H	H	H	H	M	H
CO5	H	H	H	M	H	M	M	H	M	M

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.V.Prabhu Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY206			Physical Chemistry –II - Quantum and Electrochemistry		**Batch:**	2021 - 2023
						Semester:	II
Lecture Hrs./Week	5	**Tutorial**	-	**Total Hrs/Sem**	75	**Credits:**	4

Course Objective

* To motivate the students to comprehend a knowledge on quantum mechanics.
* To apply the quantum mechanical concept to simple molecules and experiment approximation methods.
* To appraise the practical applications of electro chemical techniques.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	CO Statement	Knowledge Level
CO1	Understand the failure of classical mechanics and formulation of quantum mechanics.	K2
CO2	Solve the Schrödinger wave equation for simple systems	K4
CO3	Comprehend the approximate methods in quantum mechanics and apply it to simple molecules	K5
CO4	Estimate the Current- Voltage relationship and Theories of Electro kinetics	K3
CO5	Realize the practical applications of conductometric and potentiometric applications	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Quantum Chemistry-I** Success of quantum theory and the failure of classical mechanics - black body radiation, photo electric effect and Compton effect. The need for quantum mechanics- time dependent and time independent Schrodinger equation - operator concept as applied to quantum mechanics (basic ideas) – Energy and angular momentum operator-ladder operators -eigen functions and eigen values - postulates of quantum mechanics - application of Schrodinger equation to the particle in a box (1-D& 3-D Boxes) - particle in a ring & particle in spherical orientation. **Self-study: Requirement of an acceptable wave function**	15

Unit II	**Quantum Chemistry-II** Harmonic oscillator and rigid rotator - central force problem - H-atom - method of separation of variables - final solution - the energy and wave function for the problem. Approximation Methods: Approximate methods in quantum mechanics - need for the approximation methods - perturbation and variation methods applicable to H atom in ground state - He atom in the ground state. Shapes of the wave functions **Self-study: Quantum numbers.**	15
Unit III	**Quantum Chemistry-III** Slater determinant - HMO treatment of simple and conjugated π- electron systems - ethylene, allyl, butadiene and benzene systems - charge distributions and bond orders from the coefficients of HMO. Delocalization energy- construction and use of hybrid orbitals. **Self-study: Determination of bond order**	15
Unit IV	**Electrochemistry – I** Mean ion activity and activity coefficient of electrolytes in solution -ion association -ionic strength -Debye-Hückel theory and Debye-Hückel limiting law –its validity and limitations -strong and weak electrolytes -Debye theory of electrolytic conductance -Debye-Hückel-Onsager equation -verification and limitations -electrochemical cells. **Self-study: Conductance – Applications of standard redox potentials**	15
Unit V	**Electrochemistry-II** The electrical double layer -polarizable and non-polarizable interfaces -structure of electrical double layer -double layer models -Helmholtz, Guoy-Chapman and Stern models. Kinetics of electrode processes -current-potential curve -Butler-Volmer relation and its approximations -symmetry factor and transfer coefficient -Tafel equation -charge transfer resistance -Nernst equation from Butler-Volmer equation -primary and secondary batteries -fuel cells -corrosion and its prevention methods **Self-study: Corrosion control**	15
	Total Contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity, flip class and Case study.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Prasad, R. K	Quantum Chemistry	New age international(P) limited Publishers, New Delhi, 4th Edition	2010
2	Chandra, A.K.	Introductory Quantum Chemistry	Tata-McGraw Hill Publication Co. Ltd., New Delhi, 4th Edition	2012
3	Ira N. Levine.	Quantum Chemistry	PHI learning Pvt. Ltd, 7th Edition	2014
4	Puri, B.R & Sharma. L. R.	Advanced Physical Chemistry	Milestone Publishers & Distributors, 2nd Edition	2009
5	Atkins, P. and De Paula, J.	Physical Chemistry	Oxford University Press, New Delhi, 9th Edition	2012
6	Viswanathan, B, Venkatraman, R, Rengarajan, K. Sundaram, S and Ragavan, P.S.,	Electrochemistry	S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai, 1st Edition	2007
7	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications, 5th Edn	2011

Reference Books

21PCY206

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Melvin W. Hanna.	Quantum Mechanics in Chemistry	Addison Wesley Longman, 2nd Edition.	1969
2	Mc Quarrie. D.A	Quantum Chemistry	University Science Books, 2nd Edition	2008
3	Thomas Engel	Quantum Chemistry & Spectroscopy	Pearson Education, 2nd Edition	2006
4	Atkins. P.W and Friedman. R.S	Molecular Quantum Mechanics	Oxford University Press/4th Edition	2005
5	Mc Quarrie, D.A. and Simon, J.D.	Physical Chemistry- A Molecular Approach	Viva Books Pvt. Ltd., New Delhi/ 1st South Asian Edition	2015
6	Glasstone. S	Introduction to Electrochemistry,	East West Press Private Ltd. 10th Printing	2011
7	Antropov L.I.	Theoretical electrochemistry	MIR publishers, Moscow, 1stEdition	1972
8	Jain P C and Monika Jain	Engineering Chemistry	Dhanpat Rai Publishing Co, 16th Edition	2015

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=LnmCsNQsR68
https://www.youtube.com/watch?v=uPvWlwOhCTo
https://www.youtube.com/watch?v=p82enyv3XA0
https://www.youtube.com/watch?v=gLesbQ8MPlU
https://www.youtube.com/watch?v=ASPuNKrCzDE
https://onlinecourses.nptel.ac.in/noc20_cy27/preview
https://onlinecourses.swayam2.ac.in/arp19_ap51/preview
https://onlinecourses.nptel.ac.in/noc21_cy20/preview
https://onlinecourses.nptel.ac.in/noc20_ch02/preview
https://www.coursef.com/online-electrochemistry-course?amp
https://www.youtube.com/watch?v=gLesbQ8MPlU

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	H	M	-	M	M	H	H
CO2	H	H	H	L	H	-	L	M	L	H
CO3	H	H	H	H	M	M	H	H	H	M
CO4	H	H	H	M	H	-	H	M	-	-
CO5	H	H	H	M	H	M	H	H	H	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs.M.Anusuya Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY2EA			Major Elective –I: Green, Nano Chemistry and Cyber Security		**Batch:**	2021 - 2023
						Semester:	III
Lecture Hrs./Week	3	**Tutorial**	-	**Total Hrs/Sem**	45	**Credits:**	3

Course Objective

* To stimulate students to have in-depth knowledge in green chemistry.
* To acquire a clear idea about various synthesis of Nanomaterials and techniques.
* To gain knowledge about the significance of research and scientific writing.
* To apply the principles of Cyber Security and its attack.

Course Outcomes

On the completion of the course the student will be able to

#	**CO Statement**	**Knowledge Level**
CO1	Recollect the hazardous effect of chemicals and solvents used in laboratory.	K2, K3
CO2	Get the idea about cyber security.	K3
CO3	Ability to write a good research report.	K5
CO4	Analyze the nano materials using various techniques.	K4
CO5	Apply the ideas of legal and ethical issues for cybercrime and plagiarism.	K3
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate		

Units	**Content**	**Hrs**
Unit I	**Green Chemistry Principles & Greener Reactions** Definition, twelve basic principles of green chemistry - planning a green synthesis in a chemical laboratory - Atom efficient processes and atom efficiency, atom economy (with specific reaction). Water as greener solvent- reactions in ionic-liquid, solvent free reaction - solid supported organic synthesis, phase transfer catalyst (PTC), use of microwaves and sonication (any four specific reactions with mechanism). **Self-study: need of green chemistry.**	9

Unit II	**Preparation of Nano Structured Materials** Introduction- definition – types, properties of nano materials, Bottom up and Top down approaches - methods of preparation of nano materials - plasma arching, chemical vapour deposition, electrodeposition, sol-gel synthesis. **Experimental Techniques** Instrumentation, principle and applications of scanning electron microscopy (SEM), transmission electron microscopy (TEM), atomic force microscopy (AFM), scanning tunnelling microscopy (STM) and ESCA, Applications of Nanomaterials - Catalysis, environmental and biomedical (drug delivery) applications. **Self-study:Nanomaterials - environmental hazards.**	9
Unit III	**Research Methodology** **Concepts of Research** - Importance of research in science, Criteria of good research, Sources of a research problem. Types of research - Basic, applied, action, experimental, diagnostic and exploratory. Primary and secondary sources-N-list-journals, plagiarism, Intellectual property rights, patent, trade, Copyrights, Plagiarism. Web of science, Scopus, Science citation index. **Scientific Writing** Nature and purpose, the components of dissertation and Research paper**,** Writing techniques. Types of scientific publications-magazines, journals, reviews, news, letters, Structure of Scientific paper. Various reference styles. **Self-study: H – Index, I-10 Index and citations.**	13
Unit IV	**Over view of cyber security** Confidentiality, integrity and availability **Threats:** Malicious software (viruses, Trojans, root kits, worms, and botnets), Memory exploits (buffer overflow, heap overflow, integer overflow, format string). **Self-study: Cryptography- Authentication, password system- windows security.**	**7**
Unit V	**Network security:** Network intrusion detection and prevention system, firewalls. **Software security:** Vulnerability auditing, penetration testing, sandboxing, control flow integrity – **web security**: user authentication- Legal and ethical issues: trade secret, hacking and intrusion, privacy, identity theft. **Self-study: Legal and ethical issues and Cybercrime**	**7**
	Total Contact Hrs	**45**

Pedagogy and Assessment Methods

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

Text Book

21PCY2EA

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ahluwalia. V.K,	Green Chemistry (Environmental benign Reactions)	Ane Books Pvt. Ltd	2006
2	Pradeep.T	Text Book of Nano science and Nanotechnology	McGraw Hill Education (India) Pvt.Ltd	2012
3	Kothari. C.R	Research Methodology	New Age International (P) Limited.	2011
4	Biju Dharmapalan	Scientific Research Methodology.	Narosa Publications ,New Delhi	2012
5	Hans F. Ebel, Claus Bliefert	The Art of Scientific Writing	Wiley Publishing, 2nd Edition	2005
6	Arthur. W.M. Conklin Greg White	Principles of Computer Security	McGraw-Hill Education; 4th edition	2016

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Poole C.P & Owns F.J.	Introduction to Nanotechnology	John Wiley & Sons.	2003
2	Singh, Y.K, Nath, R	Research Methodology	APH Publishing Corporation, 1st Edition	2005
3	Chwan-Hwa(John) Wu, J.David Irwin	Computer Networks & Cyber security	CRC Press	2016
4	Mike O'Leary	Cyber O	A press Publications	2016
5	Jeff Kramer, Nicolas Burrus,Florian Editler, Matt Parker	Hacking the Kinect	Technology in cation Publications	2016

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://youtu.be/ooJSgsB5fIE
https://youtu.be/iy_h0tr_CMc
https://youtu.be/E03gh1huvW4
https://www.youtube.com/watch?v=Yzfl3rtF0SM
https://youtu.be/_zq4qTc9Jmg
https://www.youtube.com/watch?v=C2pN3l2BGc4
https://www.youtube.com/watch?v=-emrdVazBN8
https://www.youtube.com/watch?v=ooJSgsB5fIE
https://nptel.ac.in/courses/118/102/118102003/
https://nptel.ac.in/courses/121/106/121106007/

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	M	H	H	H	M	H	M	M	H	M
CO2	M	H	M	H	M	H	M	M	H	H
CO3	H	M	H	M	H	H	H	H	H	M
CO4	H	M	H	H	M	H	M	H	M	M
CO5	H	H	M	M	M	H	M	M	H	M

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Mrs.K.Vimaladevi Dr.V.Prabhu Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY2EB			*Major Elective –I Food Science and Technology		**Batch:**	2021 - 2023
						Semester:	II
Lecture Hrs./Week	3	**Tutorial**	-	**Total Hrs/Sem**	45	**Credits:**	3

Course Objective

* To enable the students understand the effect of various methods of food processing.
* To knowledge about the structure and composition of food materials.
* To identify different cooking methods and common adulterants in foods.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	Course Outcomes (CO)	Knowledge Level
CO1	Understand the outlines of cereal and pulse processing technology.	K2
CO2	Identify food additives and sweeteners.	K3
CO3	Comprehend the nutritive value of fleshy foods.	K3
CO4	Recognize the composition of sugar, spices, nuts and oilseeds.	K4
CO5	Detect the food adulterants and control process.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Physico-chemical properties of foods:** Moisture in Foods, Hydrogen Bonding, Bound Water, Water Activity in Foods, Determination of Moisture Content in Foods, True Solutions, Dispersions, Sols, Gels, and Foams. **Cereals and millets:** Structure, nutritive value, processing outlines of some common cereals (rice, wheat).Pulses: structure and composition of pulses, toxic constituents in pulses, processing of pulses-soaking, germination, Malting. **Self-study: Colloids and Emulsions**	9
Unit II	**Vegetables, Fruits and Milk:** Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments. Milk and milk products, composition, nutritive value, properties. **Self-study: Processing of milk**	9

Unit III	**Fleshy Foods:** Egg: structure, composition, nutritive value, measures of quality. Meat: Structure, composition, classification, nutritive value, tenderization and curing of meat; Poultry: composition, classification, nutritive value and processing. **Self-study: Fish: composition, classification, nutritive value**	9
Unit IV	**Sugar, Fats and Oil Seeds:** Sugar - composition, nutritive value, stages of sugar boiling. Nuts and oilseeds: classification, composition, nutritive value, uses of nuts and oilseeds. **Self-study: Spices and condiments: types, functions and uses.**	9
Unit V	**Food Additives:** Introduction, need of food additives in food processing and preservation.Characteristicsand classification of food additives. **Antimicrobial agents** - Nitrites, sulphides, sulphurdioxide, sodium chloride,hydrogen peroxide. **Antioxidants** - Introduction, mechanism of action, natural and synthetic antioxidants, technological aspect of antioxidants. **Sweeteners**- Introduction, importance, classification- natural and artificial, chemistry-technology and toxicology, consideration for choosing sweetening agents. Colors- Introduction, importance, classification- natural, artificial, and natural. **Self-study: Control of common food adulterants.**	9
	Total Contact Hrs	**45**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and Case study.

21PCY2EB

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Shakuntala Manay, Shadaksharaswamy. M	Foods, Facts and Principles	New Age International Pvt Ltd Publishers, 2nd Edition	2017
2	Chandrasekhar, U.	Food Science and applications in Indian Cookery,	Phoenix Publishing House, New Delhi	2002
3	Swaminathan, M.	Food Science Chemistry and Experimental Foods	Bappco Publishers, Bangalore.	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Srilakshmi,B.	Food Science	New age International P. Ltd, New Delhi.	2015
2	Williams, Mc.	Food Fundamentals	John Willey and sons, New York.	2007
3	Mahindru, S.N.	Food Science and Technology	Hardbound P.Ltd, New Delhi.	2009
4	Norman N. Potter	Food Science	Springer link, Newyork/ 5th Edition	2009

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=roF_CakF4Ew
https://www.youtube.com/watch?v=QVvEue4gMLs
https://www.youtube.com/watch?v=bfEf7YYNCdY
https://www.youtube.com/watch?v=3a_CPQnSh8o
https://www.youtube.com/watch?v=d24YJrnhw2E
https://www.youtube.com/watch?v=2D1FkfnX7q8

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	H	H	H	L	H	H	M	H
CO2	H	H	H	H	H	M	H	H	M	H
CO3	M	H	H	H	H	M	H	H	H	H
CO4	H	H	H	H	H	M	H	H	H	H
CO5	H	H	H	M	H	M	H	M	M	L

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Mrs. R. Mini Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY2EC			Major Elective I – Advanced Polymeric Materials		**Batch:**	2021 – 2023
						Semester:	II
Lecture Hrs./Week	3	**Tutorial**	-	**Total Hrs/Sem**	45	**Credits:**	3

Course Objectives

* To choose any research work related to the advanced polymeric materials.
* To gain Knowledge about polymeric composites.
* To learn the conducting and biomedical polymers and its applications.

Course Outcomes

On the successful completion of the course, students will be able to

#	CO Statement	Knowledge Level
CO1	Acquire the knowledge about dendrimers, hyper-branched polymers and polymer nanocomposites.	K4
CO2	Recognize the importance of synthetic biomedical polymers for drug delivery and conducting polymers.	K5
CO3	Understand the synthetic route, structure, properties and uses of engineering plastics.	K2
CO4	Analyze the properties of new polymeric materials.	K4
CO5	Synthesize the new conducting and biomedical polymers	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** –

Units	Content	Hrs
Unit I	**Dendrimers and hyper branched polymers:** Dendrimers and hyper branched polymers Properties of Dendrimers and Hyper branched Polymers and their Blends: Dendrimers and their structure, synthesis of Dendrimers, Hyper branched Polymers and their structure. Synthesis of hyper branched polymers, branching and poly dispersity, conformation, general concepts of polymer blends. Blends of Dendritic polymers with thermoplastics.	9
Unit II	**Polymer nano composites:** Polymer nano composites, Polyamide/clay nano composites - Synthesis, characterization and properties of Nylon6 – clay hybrid. Polystyrene/clay nano composites– Surface initiated polymerization, syndiotactic polystyrene/ clay nanocomposites, properties. Poly butylene sterephthalate (PBT) based nanocomposites, Epoxy nanocomposites on layered silicates. Polypropyelene layered silicate nano composites.	9

Unit III	**Biomedical polymers:** Synthesis Biomedical polymers for drug delivery Polymers as biomaterials, biomedical applications of synthetic polymers, synthetic polymers for biomedical applications, poly(α-hydroxyesters), poly(lacticacid), poly(anhydrides), poly(phosphazenes), controlled drug delivery, methods of drug delivery.	9
Unit IV	**Conducting polymers:** Conducting polymers, Correlation of chemical structure and electrical conductivity. Structure of conducting polymers, Poly(acetylene), poly(pyrrole)s, poly(thiophene)s, polyanilines, poly(p- phenylenesulphide), poly(p-phenylenevinylene)s. Different methods of synthesis of polyaniline: solution polymerization, interfacial polymerization, electrochemical synthesis, enzyme synthesis and photo induced polymerization of aniline. Applications of conducting polymers: Membranes and ion exchanger, corrosion protection, gas sensors, biosensors, electrocatalysis.	9
Unit V	**Engineering plastics:** Engineering plastics, Acrylonitrile, butadiene, styrene(ABS), Polycarbonates(PC), Polyamides(PA), Polybutylene terephthalate (PBT), Polyethylene terephthalate (PET), Polyphenylene oxide (PPO), Polysulphone (PSU), Polyether ether ketone (PEEK). Polyimides, Poly phenylene Sulphide (PPS), Synthetic route, structure, properties and uses.	9
	Total Contact Hrs	**45**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and Case study.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Gabriel O. Shonaike & Suresh G. Advani	Advance polymeric materials	CRC press	2003

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	F. Scholz	Monographs in electrochemistry Conducting polymers – a new era in electrochemistry	Springer – Verlag, Germany	2012
2	Y-W Mai	Polymer nano composites	Wood head Publishing Ltd	2006
3	S Bhadra	Progress in preparation, processing and applications of polyaniline	Progress in polymer Science, 34 ,783 – 810	2009

Related Online Contents [MOOC, SWAYAM, NPTEL, and Websites]

https://nptel.ac.in/courses/104/105/104105124/
https://www.youtube.com/watch?v=UjMbwS0LOkU
https://www.youtube.com/watch?v=Sqz_QLAo7-c

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	H	H	M	H	M	H	H
CO2	H	M	H	H	H	H	M	H	H	H
CO3	M	H	H	H	H	H	H	H	H	H
CO4	H	M	H	H	-	H	H	-	M	L
CO5	H	H	H	H	H	M	H	H	L	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Mrs. R. Mini Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY2N			*Non Major Elective Chemistry in Day to Day Life		**Batch:**	2021 - 2023
						Semester:	II
Lecture Hrs./Week	2	**Tutorial**	-	**Total Hrs/Sem**	30	**Credits:**	2

Course Objective

* To understood industrial preparations and materials of application in day today life.
* To get an awareness about eco-friendly products to lead sustainable life.
* To enable the student to understand about the manufacture of commercial products.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	Course Outcomes (CO)	Knowledge Level
CO1	Remember fundamental concepts of applied chemistry	K1
CO2	Understand the drugs used in day to day life.	K2
CO3	Test the various forms of drugs, cosmetics and milk products in day to day life.	K3
CO4	Predict the knowledge about the paints and cleansing agents.	K4
CO5	Analyze the composition of fertilizers, pesticides and milk products.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Food and Medicines:** Medicines - Antacid - Tranquilizers (Psychotherapeutic Drugs) – Analgesics – Antipyretics – Antimicrobials – Antibiotics – Antiseptics – Disinfectants. Chemistry in Food and Cosmetics - Artificial Sweetening Agents - Food Preservatives **Self-study: Analysis of pesticides and heavy metals, other adulterant**	7
Unit II	**Fertilizer and Pesticides:** Fertilizer type- need for fertilizers- essential requirements-NPK ratio-sources of fertilizers. Effect of nitrogen, potassium and phosphorous on plant growth. Pesticides -classification of insecticides, fungicides, herbicides as organic and inorganic - general methods of application and toxicity, Identification of pesticides in food. **Self-study: Safety measures when using pesticides**	8

Unit III	**Paints** Paints, varnish and lacquers- ingredients, characteristics and their uses. Chemistry in Colouring Matter - Classification of Dyes on the Basis of Constitution. **Self-study: Classification of Dyes on the Basis of Application**	5
Unit IV	**Cleansing agents:** Cleansing agents - Soaps - classification, manufacture, dry cleaning-properties. **Self-study: Cleansing agents- importance of cleansing**	5
Unit V	**Milk and Milk products:** Milk and Milk products-composition of Milk; Flavour and aroma of Milk; Physical properties of Milk; milk products; Cream; butter; ice Cream; milk powder. **Self-study: Effect of heat on Milk; pasteurization; Homogenization**	5
	Total Contact Hrs	**30**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and Case study.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Jayashree Ghosh. S	Fundamental Concepts of Applied Chemistry	Chand, Publications.	2005
2	Sharma, B.K.	Instrumental methods of Chemical analysis, 18th Edition.	Krishna Prakashan Media p Ltd	2011

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ronald Bailey, Herbert Clark, James Ferris, Sonja Krause, Robert Strong	Chemistry of the environment	Elsevier publications, 2nd Edition	2001
2	Jain and Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company, 15th edition	2013

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=kyjYsKfEz88
https://www.youtube.com/watch?v=2sHlLNzTpUU
https://www.youtube.com/watch?v=vppFkXW7Dt8
https://www.youtube.com/watch?v=e8X6RNFcMVc

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	-	-	H	H	-	H
CO2	H	H	M	M	M	-	-	-	M	H
CO3	H	H	H	M	H	M	H	M	M	H
CO4	H	M	H	-	H	M	H	M	-	H
CO5	H	M	H	-	H	M	H	M	-	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs.K.Vimaladevi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

<table>
<tr><td colspan="2">Programme Code:</td><td colspan="2">M. Sc</td><td colspan="3">Programme Title:</td><td colspan="2">Master of Chemistry</td></tr>
<tr><td colspan="2">Course Code:</td><td colspan="2">21PCY207</td><td colspan="3">Inorganic Chemistry Practical –I</td><td>Batch:</td><td>2021 – 2023</td></tr>
<tr><td colspan="5"></td><td>Semester:</td><td>I & II</td></tr>
<tr><td rowspan="2">Lecture Hrs/Week</td><td>I Sem</td><td>5</td><td rowspan="2">Tutorial</td><td rowspan="2">-</td><td rowspan="2">Total Hrs/Sem</td><td>I</td><td>75</td><td rowspan="2">Credits:</td><td rowspan="2">4</td></tr>
<tr><td>II Sem</td><td>4</td><td>II</td><td>60</td></tr>
<tr><td colspan="10">Course Objectives</td></tr>
<tr><td colspan="10">* To equip the students with analytical skills by analyzing the given inorganic salt mixture containing two common cations and two rare cations.</td></tr>
<tr><td colspan="10">* To perform systematic qualitative analysis with the strong theoretical back ground.</td></tr>
<tr><td colspan="10">* To enable the students to prepare simple complexes by using published reactions.</td></tr>
</table>

Course Outcomes

On the completion of the course the student will be able to

#	CO Statement	Knowledge Level
CO1	Separate common and rare cations.	K3
CO2	Analyze and report cations in a mixture.	K4
CO3	Analysis of synthesized compounds by UV Spectroscopy.	K4
CO4	Prepare and report coordination compounds.	K5
CO5	Develop skills in the synthesis of inorganic complexes.	K6

	Content	Hrs
A	**Semi micro Qualitative Analysis:** Qualitative Analysis employing semi micro methods & spot tests of mixtures of common cations & ions of the following less familiar elements. **Less Familiar Cations:** Molybdenum, Uranium, Thorium, Tungsten, Selenium, Cerium, Titanium, Zirconium, Vanadium & Lithium. **Familiar Cations:** Lead, Copper, Bismuth, Cadmium, Nickel, Manganese, Zinc, Barium, Strontium, Calcium, Ammonium, Magnesium	
B	**Preparation of Inorganic Complexes** **Any Six preparations selected from the following list:** Hydroxylamine hydrochloride, Chrome alum Copper(I)Chloride, Trithio urea copper(I), Potassium trioxalatochromate(III),	

	Potassiumtrioxalatoferrate(III), Hexaminecobalt(III)chloride, Chloropentamminechromium(III)chloride, Tetrammine copper(II) Sulphate, Ammonium hexachloro stannate (IV).	
C	**Demonstration (NOT FOR ESE EXAMINATION)** * UV Spectroscopic analysis of Synthesized compounds.	
	Total Contact Hrs	**75 +60Hrs**

Pedagogy: Demonstration and hands on practicals

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ramanajum V.V	Semimicro Qualitative Inorganic Analysis.	National Publishing Company	1985
2	VenkateswaranV, Veeraswamy R and Kulandaivelu A.R,	Principles of Practical Chemistry	Sultan Chand & Sons. 2nd Edition	1997
3	Arthur I.Vogel	Macro & Semimicro Qualitative Inorganic Analysis	Orient Long man's Ltd, 1st Edition	1968

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	H	H	H	H	H	H	M
CO2	H	H	M	H	H	M	H	H	H	M
CO3	H	H	M	H	H	H	H	H	H	H
CO4	H	H	M	H	H	M	H	H	H	M
CO5	H	H	M	H	H	-	H	H	H	M

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs.R. Mini Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:		M.Sc			**Programme Title:**			Master of Chemistry	
Course Code:		21PCY208			Organic Chemistry Practical –I			**Batch:**	2021 – 2023
								Semester:	I & II
Lecture Hrs./Week	**I Sem**	5	**Tutorial**	-	**Total Hrs/Sem**	**I**	75	**Credits:**	4
	II Sem	3				**II**	45		

Course Objective

* To enable the students to separate two components in an organic mixture.
* To identify the separated components by qualitative tests.
* To prepare organic compounds and identify the organic compounds from the given spectral data.
* Handle UV-Vis. spectrophotometer effectively.
* Apply different chromatographic techniques for separating organic compounds.

Course Outcomes

On the successful completion of the course, students will be able to

#	CO Statement	Knowledge Level
CO1	Remember the analysis of organic compounds and aromatic substitution reactions.	K1
CO2	Separate organic mixtures by solvent extraction and chromatographic techniques.	K4
CO3	Analyze organic compounds by IR, NMR and UV visible spectra.	K4
CO4	Develop skills in the synthesis of organic compounds.	K6
CO5	Determine boiling point /melting point.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

	Content	Hrs
A	**Analysis of two component organic mixtures.** (Separation and characterization of individual compounds) Note: Each student has to complete the analysis of minimum of FIVE Mixtures during the course.	
B	**Single stage Preparations and Recrystallization (Any Five)** 1. **Hydrolysis:** Preparation of Benzoic acid from Benzamide.	

	2. Acetylation: Preparation of Acetanilide from Aniline. **3. Bromination:** Preparation of p-Bromoacetanilide from Acetanilide. **4. Nitration:** Preparation of m-dinitrobenzene from Nitrobenzene. **5. Benzoylation:** Preparation of Benzanilide from Aniline. **6. Oxidation:** Preparation of Benzoic acid from Benzaldehyde. 7. Preparation of Glucose penta acetate.	
C	**Demonstration only** General methods of separation and purification of organic compounds such as: 1. Solvent extraction 2. Soxhlet extraction 3. Fractional crystallization 4. TLC and Column Chromatography 5. Melting point of synthesize compounds	
D	**Class work only** 1. Drawing the structures of organic molecules and reaction schemes byChemDraw, Symyx Draw. 2. Chemsketch. Draw the structures and generate the IR and NMR spectra ofthe substrates and products of synthesized compounds. 3. Identification of structural pattern of organic compounds (Flavone, Isoflavone and Quinone) by taking UV spectrum (class work only).	
	Total Contact Hrs	**75 +45 Hrs**

Pedagogy: Demonstration and hands on practical

Reference Book

21PCY208

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Gnanaprakasam and Ramamurthy	Organic Chemistry Laboratory Manual	Ananda Book Depot,Chennai.	1998
2	Vishnoi N.K	Advanced Practical Organic Chemistry	Vikas Publishing House	2001
3	Jagmohan. R	Advanced Practical Organic Chemistry, Vol. I &II.		2002

4	Ahluwalia, V.K., and Dhingra, S	Comprehensive Practical Organic Chemistry (Qualitative Analysis)	University Press, First Edition, Hyderabad	2012
5	Dey, B.B. and Sitharaman, M.V	Laboratory Manual of Organic Chemistry	Fourth Edition, Allied Publishers, New Delhi	1992
6	Silverstein, R.M., Bassler, G.C. and Morrill, T.C	Spectroscopic Identification of Organic Compounds	Sixth Edition, Wiley India Ltd., New Delhi	2006
7	Willard, H.H., Jr. Merritt, L.L., Dean. J.A. and Jr. Settle, F.A	Instrumental Methods of Analysis	Seventh Edition, CBS Publishers & Distributors, New Delhi	2008
8	Mann. F.G, Saunders. B.C	Practical Organic Chemistry	4th Edn., Pearson Education India	2009

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	H	M	M	H	H	H
CO2	H	H	H	M	H	M	M	H	H	H
CO3	H	H	H	M	H	M	M	H	H	H
CO4	H	H	H	M	H	M	M	H	H	H
CO5	H	H	H	M	H	M	M	H	H	H

H –High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. V. Prabhu Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:		M. Sc			**Programme Title:**			Master of Chemistry	
Course Code:		21PCY209			Physical Chemistry Practical –I			**Batch:**	2021 – 2023
								Semester:	I & II
Lecture Hrs./Week	**I Sem**	5	**Tutorial**	-	**Total Hrs/Sem**	**I**	75	**Credits:**	4
	II Sem	3				**II**	45		

Course Objective

* To make the students to understand the principle and to carry out the potentiometric titrations.
* To determine the pH and P^{Ka} values of buffers and acids.
* To determine the molecular weight of solutes.
* To construct the Phase diagram of two components systems.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	Course Outcomes (CO)	Knowledge Level
CO1	Recollect the concept of potentiometric titration.	K3
CO2	Understand the simple eutectic system, molecular weight determination by Rast method, partition coefficient and estimation of metal ions using colorimetry.	K4
CO3	Examine the strength of the solutions and Ka values by potentiometry.	K4
CO4	Calculate the molecular weight of chemical compounds from K_f values by Rast micro method.	K4
CO5	Estimate the metal ions using colorimetry.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

	Content	Hrs
A	**<u>Non Electrical Experiments</u>** **1. Properties of Matter** Simple Eutectic System- determination of unknown compositions. **2. Molecular weight determination** Determination of Molecular weight by Rast's micro method. **3. Partition coefficient** Determination of Equilibrium constant for the reaction. $KI + I_2 \leftrightarrow KI_3$	
B	**<u>Electrical Experiments</u> -Potentiometric Titrations:** **Acid-Base titrations** (using quinhydrone electrode) 4. Titration of Strong acid against Strong base 5. Titration of Weak acid against Strong base 6. Titration of mixture of (strong & weak) acids against Strong base 7. Determination of P^H (acidic solutions) 8. Determination of P^{Ka} of weak acid 9. P^H, P^{Ka} for Phosporic acid	

C	**Redox titrations** 10. Titration of Potassium Iodide against Potassium Permanganate 11. Titration of Ferrous Ammonium Sulphate against Potassium dichromate	
D	**Precipitation titrations** (using silver electrode) 12. Titration of Potassium chloride against Silver nitrate 13. Titration of mixture of halides (chloride and iodide) against silver nitrate	
E	**Colorimetric Estimations** (using photoelectric colorimeter) –**(Not for ESE)** Estimation of Copper, Iron, Nickel, Manganese and Chromium	
	Total Contact Hrs	**75+45 Hrs**

Pedagogy: Demonstration and hands on practicals.

21PCY209

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Palit S. R and De S.K	Practical Physical Chemistry	Science Book Agency, Calcutta.	2003
2	Sharma. P.C and Agarwal	Practical Chemistry	Goel Publishing House, Meerut.	1996
3	Venkateswaran.V and Kulaindaivelu. A. R	Practical Physical Chemistry	S.Chand & Co.	1987

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	H	H	H	H	-	-
CO2	H	H	M	M	M	H	H	H	M	-
CO3	H	H	H	H	H	M	H	H	M	-
CO4	H	H	H	H	H	M	M	H	H	-
CO5	H	H	M	H	M	M	M	H	M	-

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs.K.Vimaladevi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R. Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY310			Organic Chemistry –III – Natural Products and Organic Reagents		**Batch:**	2021 – 2023
						Semester:	III
Lecture Hrs./Week	5	**Tutorial**	-	**Total Hrs/Sem**	75	**Credits:**	5

Course Objective

* To promote an awareness in the student about natural products and their synthesis.
* To introduce new reagents available in organic synthesis.
* To synthesize eco-friendly reagents and chemical pathways for the development of green chemistry.

Course Outcomes

On the successful completion of the course, students will be able to

#	CO Statement	Knowledge Level
CO1	Comprehend the classes of natural products and the fundamental of condensation and molecular rearrangement reactions.	K2
CO2	Understand isolation, classification and structural elucidation of terpenoids, steroids and naming reactions which includes condensation, molecular rearrangements.	K2
CO3	Implement the biosynthetic idea of proteins and polypeptides.	K3
CO4	Apply the reagents inorganic synthesis.	K3
CO5	Predict the reagents involved inorganic synthesis and evaluate the structure and synthesis of heterocyclic compounds.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Terpenoids** Introduction –isolation and classification of terpenoids – isoprene rule, gem-dialkyl rule. Structural elucidation and synthesis of zingiberene, eudesmol, abeitic acid and caryophyllene, α-santonin, Linalool. Biosynthesis of mono and di terpenoids. **Self-study: α-pinene.**	15
Unit II	**Steroids** Introduction-steroids- Structural elucidation of cholesterol (synthesis not required), ergosterol, Vitamin-D, Bile acid,testosteroneand progesterone, Estrogen. **Self-study: Structural elucidation of equilenin (synthesis not expected).**	15

Unit III	**Retrosynthetic analysis, protection and deprotection** An introduction to retrosynthesis – synthon – synthetic equivalent – target molecule, functional group interconversion. Retro synthetic analysis and Synthesis of simple organic molecules such as 1,2, 1,3, 1,4 and 1,5 – dicarbonyl compounds both acylic and cyclic. Formation of 3,4,5 and 6 membered cyclic compounds. Use of standard reactions, like Grignard reactions, Robinson annulations etc., Protection and deprotection of functional groups – R-OH, RCHO, R-CO-R, R-NH2 and R-COOH. **Self-study: Grignard reactions, Robinson annulations.**	15
Unit IV	**Molecular rearrangements** Introduction- Wagner Meerwein rearrangements, dienonephenol, Wolf, Favorski, Neber rearrangement, Baeyer- Villigerrearrangement, Stevens, Chapman, Benzidine, Fries, Ardnt Eister synthesis, Lossen and Wallac rearrangements, Curtius, Hoffmann-Lofller- Freytag, Demjanov, Von-Richter rearrangement, Sommelet-Hauser rearrangement, Smiles rearrangement. **Self-study: Condensation reactions.**	15
Unit V	**Reagents in organic synthesis** Gilmans reagent, lithium di-methyl cuprate, lithium diisopropyl amide (LDA), trimethyl silyl iodide, Peterson's synthesis, Vilsmeier reaction. Preparations and synthetic applications of DBU(1,5-diazabicyclo[5.4.0] undecene-5), DCC (dicyclohexylcarbodiimide) , NBS, PCC, PDC, Wilkinson'scatalyst, Tri-n-butyltin hydride. **Heterocyclic compounds:** Structure, synthesis and reactions of flavones, isoflavones, purines (adenine and guanine) and anthocyanins (cyanin and pelargonin). Structural elucidation of caffeine. **Self-study: Uracil, Cytosine and thymine.**	15
	Total Contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class and Case study.

Text Book

21PCY310

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Finar. I. L	Organic Chemistry Vol. II	Longman Publishing Group	1998
2	Agarwal O. P	Natural product Chemistry	Goel Publishing house,20th Edition.	2001

3	Gurdeep Chatwal	Organic Chemistry of Natural Products Vol I& II	Himalaya Publishing House.	2001
4	Ahluwalia. V.K. Rakesh K. Parashar	Organic Reaction Mechanisms	Narosa Publsihing House, 4th Edition	2010
5	Stuart Warren	Designing Organic Syntheses	John Wiley and sons,1st Edition.	1994
6	Bansal, R.K	Organic Reaction mechanism	Tata McGraw-Hill, 11th Edition.	2006
7	Bansal, K	Heterocyclic Chemistry	New Age International, New Delhi, 5th Edition.	2012
8	Joule, J.A. and Mills, K	Heterocyclic Chemistry	Blackwell Publishing Company, New York, 4thEdition.	2004
9	Carruthers. W	Some Modern Methods in Organic Synthesis	Cambridge University Press, New York, 3rd Edition.	2009
10	Khan, M.A	Chemistry of Natural products	Omega Publications, NewDelhi,1st Edition.	2011
11	Mackie, R.K., Smith, M.M., and Aitken, R.A.	Guide Book to Organic Synthesis	Longman Scientific and Technical, Singapore, 2nd Edition.	1990

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Jerry March	Advanced organic chemistry	4th Edition, A Wiley-Inter science	2007
2	Newman, A. A	Chemistry of Terpenes and Terpenoids	Academic press publishers	1972

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://youtu.be/sdN9LgeKLAo
https://youtu.be/diksW7rHXms
https://youtu.be/baAaUzf_psy
https://youtu.be/nm0rkDiobvc
https://youtu.be/AYB_E9gdzx0
https://youtu.be/2DyeKE5q8Go
https://youtu.be/pel8P2atSEg

Mapping

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CO2	M	M	H	M	L	L	L	M	H	H
CO3	M	H	H	H	H	M	M	M	H	M
CO4	H	H	H	H	H	M	H	M	M	H
CO5	H	H	H	M	H	M	M	M	M	M

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.V.Prabhu Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY311			Physical Chemistry –III - Classical and Statistical Thermodynamics		**Batch:**	2021 – 2023
						Semester:	III
Lecture Hrs./Week	5	**Tutorial**	-	**Total Hrs/Sem**	75	**Credits:**	4

Course Objective

* To understand and apply the concept of fugacity, activity and chemical potential.
* To acquire knowledge on third law of thermodynamics and probability and ensembles.
* To gain knowledge about the distribution laws (classical and statistical) and their applications.

Course Outcome

On the successful completion of the course, students will be able to

#	CO Statement	Knowledge Level
CO1	Interpret the physical significance of chemical potential.	K2
CO2	Apply probability to molecular energy levels.	K3
CO3	Apply thermodynamic concepts to evaluate the relationship between thermodynamic properties.	K3
CO4	Comprehend the quantum statistics and partition function.	K4
CO5	Evaluate statistical thermodynamics to the properties of identical indistinguishable particles like electrons.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Themodynamics and Non-ideal systems** Chemical potential – Fugacity- determination of fugacity of gases by graphical method, from equation of state, approximate calculation method and generalized method- variation of fugacity with temperature and pressure. Fugacity and the standard state for non-ideal gases - Fugacity coefficient, fugacity of mixture of non- ideal gases – Lewis Randal rule. Definition of activity - Standard states - activity coefficient of a gas - relation between fugacity and activity coefficient of gas - variation of activity of a gas with temperature and pressure. Activity and activity coefficient of solutions-mean activity and mean activity coefficient. **Self-Study: Laws of thermodynamics.**	15

Unit II	**Third Law of Thermodynamics** Probability and third law - Nernst heat theorem, thermodynamic quantities at absolute zero - entropy of gases - entropy at absolute zero - entropy and probability (Boltzmann Expression) - Boltzmann - Planck equation - significance of thermodynamic probability - Entropy of expansion of ideal gas. **Probability and Ensembles** Theorems of permutations, combinations and probability. Thermodynamic probability to molecular systems- States of maximum thermodynamic probability of systems involving energy levels. Distinguishable and indistinguishable particles. Microstates and macro states. Ensembles – definition- micro canonical, canonical and grand canonical ensembles. **Self-study: Need for third law.**	15
Unit III	**Statistical Thermodynamics** Maxwell - Boltzmann statistics – Fermi-Dirac statistics-Bose-Einstein statistics-thermodynamic probability- Boltzmann expression for entropy - Stirling's approximation - States of maximum thermodynamics probability - Legrangian multipliers - Maxwell - Boltzmann distribution law - Evaluation of alpha and beta in M.B. distribution law. Experimental verification of Maxwell's distribution of molecular velocities by Stern method. Limitations of Maxwell Boltzmann distribution law. **Self-study: Thermodynamic probabilities of systems in equilibrium.**	15
Unit IV	**Partition function** Partition function – Relation between molecular partition function and canonical function - Evaluation of translational, rotational, vibrational and electronic partition function – Evaluation of E, Cv and entropy from the partition functions - The relation between partition function and thermodynamic function (E, H, S, A, G, Cv and Cp) - Effect of molecular symmetry on rotational partition function – Ortho and para hydrogen. **Self-study: Study of monoatomic and diatomic ideal gas molecule on the basis of partition functions.**	15
Unit V	**Quantum Statistic**s Bose Einstein distribution law- derivation – entropy of boson applications. Derivation of Planck's black body radiation law. Bose Einstein condensation. Helium at low temperature Fermi – Dirac distribution law- derivation, entropy of fermions, Applications - electron gas, fermi energy of free electrons at absolute zero. Heat capacity of free electrons in metals, comparison of Maxwell Boltzmann, Bose Einstein, Fermi - Dirac statistics. **Self-study: Heat capacity – Einstein theory and Debye theory, Debye T-cube law.**	15
	Total Contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

Text Book

21PCY311

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Puri B.R & Sharma. L R	Advanced Physical Chemistry	Milestone Publishers & Distributors, 2nd Edition	2009
2	Bajpai, D.N.	Advanced Physical Chemistry	S. Chand Publishing Limited., 1st Edition Reprint	2015
3	Gupta, M.C.	Statistical thermodynamics	Wiley Eastern Limited, 1st Edition	1990
4	Rajaram Kuriacose	Statistical thermodynamics	Shoban lal & Co, 4th edition	2006
5	Samuel Glasstone	Thermodynamics for chemists	East West Press, 2ndEdition	Reprint 2002

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Aktins. P. W	Physical Chemistry	Oxford University, 1stEdition	1978, Reprint 2005
2	Klotz, L. M, Rosenberg R.M. Benjamin, W.A	Chemical thermodynamics	Pearson publications, 3rd Edition	1974
3	Frederick.T. Wall	Chemical thermodynamics	W.H. Freeman & Company, 3rd Edition	1974
4	Nash, L.K.	Chemical Thermodynamics	Addision Wesley Publishing, 2nd Edition	1976

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=NrtZAJtEH3c&list=PLdBDmcnzLC_ZfA9evETglI7NX6N_45M77
https://www.youtube.com/watch?v=ogw0iojLBEQ
https://www.youtube.com/watch?v=UIVJ4JkqjaI
https://www.youtube.com/watch?v=1yf2LBUb39g
https://www.youtube.com/watch?time_continue=506&v=Lz0xqu3HvD0
https://nptel.ac.in/courses/115/103/115103113/
https://nptel.ac.in/courses/104/103/104103112/

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	H	M	M	M	M	M	M	M
CO2	M	H	M	H	M	M	M	M	M	M
CO3	H	M	H	M	H	H	H	H	M	-
CO4	H	M	H	H	M	H	H	H	H	M
CO5	M	H	M	H	M	H	M	M	H	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs .R. Mini Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY312			Spectroscopic Techniques - Application in Organic Chemistry		**Batch:**	2021 – 2023
						Semester:	III
Lecture Hrs./Week	5	**Tutorial**	-	**Total Hrs/Sem**	75	**Credits:**	5

Course Objective

* To enable the students to understand the principles and instrumentation of various spectroscopic techniques.
* To acquire knowledge in the structural determination of unknown compounds using various spectroscopic methods.
* To apply the spectral techniques in research and practical situations.

Course Outcome

On the successful completion of the course, students will be able to

#	CO Statement	Knowledge Level
CO1	Apply and evaluate the UV/Vis spectroscopy as a qualitative and quantitative method.	K3,K5
CO2	Analyze the vibrations of molecules and identify the functional group present in it.	K4
CO3	Predict the structure of compound using 1D and 2D NMR techniques.	K5
CO4	Assess the mass to charge ratio for the sample under test and to propose the fragmentation pattern.	K5
CO5	Able to identify an unknown organic compound using the spectroscopic principles.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**UV Visible Spectroscopy** Introduction to spectroscopy - Properties of electromagnetic radiation. Electronic excitation, Origin of different bands - Intensity of bands - Selection rules, Instrumentation, Correlation of electronic absorption with molecular structure, Simple chromophoric groups- auxochromes - effects of conjugation - Woodward - Fischer rules - aromatic system and systems with extended conjugation $-\lambda_{max}$ calculation of butadiene and carbonyl compounds- applications to organic compounds. **Self-study: Electromagnetic spectrum.**	15

Unit II	**IR Spectroscopy and Raman spectra** The vibrating diatomic molecules - the simple harmonic oscillator- the diatomic rotator - vibrations of polyatomic molecules - the influence of rotation on the spectrum of polyatomic molecules - factors influencing vibrational frequencies - characteristic group absorptions of organic molecules- finger print region -identification of functional groups - applications to simple organic molecules -medical diagnosis (cancer)- instrumentation- FT- IR,NIR. Raman spectra – introduction – characteristic properties of Raman lines – differences between Raman spectra and IR spectra – mechanism of Raman Effect – Intensity of Raman lines. **Self-study: Applications of Raman spectroscopy.**	15
Unit III	**Mass Spectrometry** Theory - instrumentation - isotopic abundance - determination of molecular weights and formula, ionisation techniques (CI, FD, FAB & ESI, APCI) - nitrogen rule -metastable ions and peaks - ion fragmentation mechanisms - Retro Diels-Alder rearrangement - Mclafferty rearrangement -elimination due to ortho groups. Fragmentation associated with functional groups - benzyl alcohol, phenol, methyl phenyl ether, benzaldehyde, 2-hexanone, benzoic acid, n-propyl ethanoate, and benzamide. **Self-study: LC-MS and GC-MS.**	15
Unit IV	**Nuclear Magnetic Resonance Spectroscopy -^{1}H NMR** Magnetic properties of nuclei - theory of nuclear resonance - chemical shift and its measurement - factors influencing chemical shift - chemical equivalence and magnetic equivalence - solvents and NMR spectra - spin-spin coupling, spin-spin splitting systems - proton exchange reactions – hetero nuclear coupling - deuterium exchange - double resonances - chemical shift reagents - applications to organic compounds - FT NMR. **Self-study: Instrumentation - CW NMR.**	15
Unit V	**^{13}C NMR and 2D NMR Techniques** Magnetic moment and natural abundance- broad band decoupling - Off-resonance decoupling - deuterium coupling - NOE effect- - peak assignments using DEPT spectrum - structural applications of simple organic molecules. **2D NMR Techniques**: Theory - ^{1}H-^{1}H COSY, ^{1}H-^{13}C COSY: HETCOR, Proton detected HETCOR: HMQC, HMBC, NOESY. Solving problems using IR, UV, NMR and mass spectra for simple molecules. **Self-study: Magnetic moment and natural abundance**	15
	Total Contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity, flip class and Case study.

21PCY312

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Sharma. Y. R	Elementary Organic Spectroscopy	S. Chand Publications, 4th Edition	2012
2	Kemp, W.	Organic Spectroscopy	Replica Press Pvt. Ltd., New Delhi, 3rd Edition	2008
3	Kalsi. P.S	Spectroscopy of Organic Compounds	New Age International (P) Ltd, 6th Edition	2014
4	Jag Mohan	Organic Spectroscopy	Narosa Publishing House	2013
5	Silverstein, R.M., Bassler, G.C. and Morrill, T.C.	Spectrometric Identification of Organic Compounds	John Wiley Publications, 6th Edition	2009

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Thomas Engel	Quantum Chemistry & Spectroscopy	Pearson Education	2006
2	Pavia. D. L. Lampman. G.M. Kriz. G.S. and James R. Vyvyan	Spectroscopy	Brooks/Cole Publications, 5th Edition	2011
3	Yadav. M. S	Molecular Spectroscopy	Arise Publishers & Distributors, 1st Edition	2011
4	Kaur. H	Spectroscopy	Pragati Prakashan Publications, 10th Edition	2015
5	Banwell. C.N.	Fundamentals of molecular spectroscopy	Tata McGraw Hill Publishing Company Ltd, 3rd Edition	2004

RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/results?search_query=https%3A%2F%2Fwww.khanacademy.org%2Fscience%2Forganic-chemistry%2Fspectroscopy-jay
https://www.youtube.com/watch?time_continue=1153&v=bEzlTtaEfDU
https://onlinecourses.nptel.ac.in/noc20_cy08/preview
https://onlinecourses.nptel.ac.in/noc19_cy29/preview
https://onlinecourses.swayam2.ac.in/cec20_ma16/preview

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	H	-	-	M	H	H
CO2	M	H	H	H	H	L	M	-	H	H
CO3	H	H	H	H	H	-	-	M	H	H
CO4	H	H	H	H	M	-	-	L	M	H
CO5	H	H	H	H	H	L	L	H	H	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs.M.Anusuya Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY3EA			*Major Elective –II - Applied Electrochemistry		**Batch:**	2021 - 2023
						Semester:	III
Lecture Hrs./Week	3	**Tutorial**	-	**Total Hrs/Sem**	45	**Credits:**	3

Course Objective

* To learn about Current - Voltage relationship, Electrochemical cells, Electroplating.
* To acquire the fundamental concepts and theories of electrochemistry.
* To gain knowledge about batteries and its commercial applications.
* To understand principles of corrosion, corrosion monitoring and corrosion inhibition.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	Course Outcomes (CO)	Knowledge Level
CO1	Understand the theory, basic instrumentation and applications of various electro analytical techniques used in corrosion.	K2
CO2	Examine and predict the kinetics of electrode reaction.	K4,K2
CO3	Make use of the applications of electrochemistry.	K3
CO4	Analyze current and voltage using various techniques.	K4
CO5	Discuss the types of batteries, fuel cells, theories of corrosion & its mechanism.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Potential Sweep methods** Current-voltage relationships -Voltametry – Polarography - mass transfer - diffusion limited currents - kinetic currents - adsorption currents - amperometry, coulometry, cyclic voltametry, rotating disc electrodes, chronoamperometry, chronopotentiometry, chronocoulometry (basic principles and applications only in all the above methods). **Self-study: Conductometric and potentiometric titrations.**	9

Unit II	**Electrochemical Cells** Electromotive force - measurement of EMF - the potentiometer - the electrochemical potential - the cell EMF and the cell reaction - reversible cells - types of half cells - classification of cells - the standard EMF of a cell - standard electrode potentials - calculation of the EMF of a cell - Nernst equation and its limitations - calculation of solubility products - standard free energies and entropies of aqueous ions - electrode concentration cells - electrolyte concentration cells - cells with liquid junctions - oxidation - reduction reactions. **Self-study: Components of electrochemical cells.**	9
Unit III	**Batteries** Thermodynamics of batteries and fuel cells - half cell reactions in batteries - characteristic requirements of a battery system - porous electrodes - separators - evolution of batteries - charge - discharge characteristics - primary batteries, lead acid batteries - Leclanche cells - lithium cells - Ni-Cd cells - High temperature batteries - sodium-sulphur system – H_2-O_2 fuel cell. **Self-study: Components of batteries.**	9
Unit IV	**Electrometallurgy and Electroplating** Electrowinning and electro refining of Cu and Ni, production of aluminium - Hall-Heroult process - Electrolytic production of magnesium and sodium - Electroplating operations - preplating operations - precious metal plating - anodizing of Al. **Self-study: Electroplating of nickel and chromium.**	9
Unit V	**Corrosion and Corrosion Control** Thermodynamics of corrosion – Pourbaix diagrams – kinetics of corrosion – evans diagram – corrosion current and corrosion potential – Metal oxidation – atmospheric corrosion – crevice corrosion – bimetallic corrosion – stress corrosion – cracking – corrosion control and corrosion inhibitors –cathodic protection – protection by sacrificial anodes. **Self-study: Painting for corrosion control.**	9
	Total Contact Hrs	**45**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity, flip class and Case study.

Text Book

21PCY3EA

S.NO	AUTHOR	TITLE OF THE	PUBLISH	YEAR OF
1	Glasstone. S	Introduction to Electrochemistry	East West Press PrivateLtd.	2011

2	Bard and Faulkner	Electrochemical Methods.	John Wiley and sons. 2nd	2001
3	Bockris and Reddy.	Modern Electrochemistry, (Vol.II).	Kluwer academic publishers. 2nd edition	2002
4	Jain and Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company. 15th edition	2013

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \	YEAR OF
1	Pletcher	Industrial Electrochemistry.	Chapmann and Hall. 2nd edition	2012
2	Banerjee.	Introduction to the Science of Corrosion and its Inhibition.	Oxonian Press.	1985
3	Raj Narayanan	An Introduction to Metallic Corrosion & its Prevention	Oxford & IBH Publishing Co., Pvt	1998

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=Y5JcWEd4Mws
https://www.youtube.com/watch?v=lrdeauk2QUI&t=233s
https://www.youtube.com/watch?v=1EWiEENa4Gs
https://www.youtube.com/watch?v=hKVXo4rgLIc
https://www.youtube.com/watch?v=0G_aqTI9Oos
https://www.youtube.com/watch?v=0P61i7jBitE
https://www.youtube.com/watch?v=A_rI9rNVgR8
https://www.youtube.com/watch?v=HHgPBMMZ26w
https://www.youtube.com/watch?v=YDeqYSNB_eU
https://nptel.ac.in/courses/103/108/103108162/
https://nptel.ac.in/courses/113/108/113108051/

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	H	M	H	H	H	-
CO2	H	H	H	M	M	M	H	L	H	M
CO3	H	H	H	H	H	M	H	H	M	-
CO4	H	H	H	H	H	L	H	H	H	-
CO5	H	H	H	H	M	M	M	M	M	-

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs.K.Vimaladevi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme code:	M.Sc.			**Programme Title :**		Master of Chemistry	
Course Code:	21PCY3EB			*Major Elective –II –Nanoscience and Nanotechnology		**Batch :**	2021-2023
						Semester:	III
Lecture Hrs./Week	3	**Tutorial Hrs./Sem.**	-	**Total Hrs./Sem**	45	**Credits:**	3
Course Objective							
* Origin and the basics of nanoscience and technology with relevance to biology and medicine.							
* The various methods available for preparation of nanostructured materials and their applications							
* The role of nanomaterials and their properties in advancing different areas of biology and medicine							

Course Outcomes

On the successful completion of the course, student will be able to:

#	Course Outcomes (CO)	Knowledge Level
CO1	Demonstrate the various nanoparticles process methods.	K2
CO2	Understand the role of various methods of preparation of Nanomaterials.	K2
CO3	Appreciate the plasmonic properties of nanomaterials	K3
CO4	Interpret the magnetic properties of nanomaterials	K4
CO5	Predict the major properties of nano objects such as nanotubes, quantum dots and nanoparticles.	K5
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate		

Units	Content	Hrs
Unit I	**Introduction to Nanoscience and Nanotechnology** Background to Nanotechnology scientific revolution, Types of Nanostructures, Definition of a Nano system, Types of Nanocrystals - one Dimensional (1D), two Dimensional (2D), three Dimensional (3D) Nanostructured materials, Quantum dots, Quantum wire - Core/Shell structures, Nanomaterials and properties - Carbon Nanotubes (CNT), Applications of Nanomaterials	9

Unit II	**Top-down and bottom-up techniques** Ball Milling – Lithography - Arc Discharge - Laser Pyrolysis. Supramolecular chemistry and self-assembly. Sol-gel method – electrochemical method - Hydrothermal-Solvothermal Synthesis – Co-precipitation. Allotropes of carbon, Introduction to fullerenes, CNT, and graphene – their unusual properties – luminescent carbon dots – present and future applications in medicine..	9
Unit III	**Oxide and ferrite nanomaterials; Magnetism and applications** Iron oxide – structure and types – ferrites (MFe_2O_4) and perovskites – magnetism and its change at the nanosize scale – preparation of magnetite and ferrite by sol-gel, combustion, co-precipitation, and hydrothermal methods – applications in medicine (elementary treatment).	9
Unit IV	**Gold and silver nanomaterials; Plasmonics** Common synthesis methods of gold nanoparticles – Common synthesis methods of silver nanoparticles – mechanism of growth – relationship between color, optical property and size – surface plasmon resonance – observation in UV-visible spectroscopy – application in self-assembled monolayers – application in photothermal therapy – application in imaging.	9
Unit V	**Quantum dots; polymers; Optical properties and luminescence** Cadmium selenide, cadmium sulfide, tungsten sulfide – common preparation methods – properties – concept of quantum confinement – optical and luminescence properties – applications in biology and medicine – a brief discussion on surfactants and polymers – ethical challenges in nanotechnology – nanotechnology products in the market related to biology and medicine – visions of nanotechnology**.**	9
	Total Contact Hrs	**45**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity, flip class and Case study.

Text Book

21PCY3EB

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Cao.G	Nanostructures and Nanomaterials: Synthesis, Properties and Applications,	Imperical College Press	2004
2	Pradeep.T	Nano: The Essentials in Understanding Nanoscience and Nanotechnology	Tata McGraw Hill, New York, 1st Edition	2007

3	Köhler, M. Fritzsche, W	Nanotechnology: An Introduction to Nanostructuring Techniques	WILEY-VCH Verlag GmbH & Co.,	2004
4	Bhagyaraj, S.M. Oluwafemi, O.S. Kalarikkal,N Thomas,S	Synthesis of Inorganic Nanomaterials: Advances and Key Technologies	Woodhead Publishers, Elsevier	2018

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ozin.G and Arsenaut.A	Nanochemistry: A Chemical Approach to Nanomaterials	Royal Society of Chemistry, London,	2005
2	Rao. C.N.R, Muller. A and Cheetham, A.K.	The Chemistry of Nanomaterials	Wiley VCH, Germany	2004
3	Niemeyer.C.M. and Mirkin. C.A.	Nano biotechnology, Concepts, Applications and Perspectives	WILEY-VCH, Verlag Gmb H&Co	2004
4	Foster, L.E.	Nanotechnology: Science, Innovation, and Opportunity,	Prentice Hall,	2005
5	Ratner, M. D. Ratner,D	Nanotechnology: A Gentle Introduction to the Next Big Idea	Prentice Hall	2002

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=I-m-FZy1oAA
https://www.youtube.com/watch?v=O9nUNkIHqT8
https://www.youtube.com/watch?v=t-m-NwJa4lY
https://www.youtube.com/watch?v=7ozWJbbFuV8
https://www.youtube.com/watch?v=xnOqahYA6NU
https://www.youtube.com/watch?v=FQzUrbKTLVU
https://www.youtube.com/watch?v=_UMmjgxKcOQ
https://www.youtube.com/watch?v=xAS4NS9RuI4
https://nptel.ac.in/courses/118/104/118104008/
https://nptel.ac.in/courses/118/107/118107015/
https://nptel.ac.in/courses/118/102/118102003/

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	H	M	H	H	H	H
CO2	H	H	H	M	M	M	H	M	H	H
CO3	H	H	H	H	H	M	H	H	M	H
CO4	H	H	M	H	H	M	H	H	H	H
CO5	H	H	M	H	M	M	M	M	M	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs.K.Vimaladevi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY3EC			Major Elective –II: Dye Chemistry		**Batch:**	2021 – 2023
						Semester:	III
Lecture Hrs./Week	3	**Tutorial Hrs./**	-	**Total Hrs/Sem**	45	**Credits:**	3
Course Objective							
* To understand the chemistry of dyes.							
* To interpret the various types of dyes, synthesis, reactions and applications.							
* To recognize the pigments, cosmetics and coloring agents.							

Course Outcomes

On the completion of the course the student will be able to

#	**CO Statement**	**Knowledge Level**
CO1	Learnt the chemistry of dyes.	K3
CO2	Studied the organic intermediate in the dye chemistry.	K4
CO3	Interpret the various types of dyes, synthesis, reactions and applications.	K5
CO4	Expertise in the pigments, cosmetics and colouring agents.	K5
CO5	Synthesize new variety of Dyes.	K5
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate		

Units	**Content**	**Hrs**
Unit I	Colour and Constitution: Relationship of colour observed to wavelength of light absorbed – Terms used in colour chemistry – chromophores, Auxochromes, Bathochromic shift, Hypsochrmic shift. Quinonoid theory and modern theories: Valence bond theory, molecular orbital theory.	9
Unit II	Chemistry of organic intermediates used in dye manufacture. Benzene, Naphathalene and Anthroqucnone intermediates. Nitro dyes, Nitrosodyes, Azo dyes – principles governing azo coupling– mechanism of diazotization coupling	9

	with amines, coupling with phenols. Classification according tothe number of azo groups and application – Tautomerism in azo dyes.	
Unit III	Synthesis of specifics dyes and uses Orange IV, Diamond Block F, Metanil yellow, Tartrazines Direct Deep Black, Eriochrome Black T, Eriochrome Red B, Cellition Scarlet B, Congo Red, Malachite green, methylene blue, Safranine – T, Acid Magenta, Cyanin Green G, Alizarine, Benzanthrone, Indigo, Copper phthalo cyanine, Sulphur black – T.	9
Unit IV	Synthesis, reactions and applications of xanthene dyes, _Cyanine dyes, acridine dyes, Sulphur dyes, Anthranquinone dyes: Anthraquinone mordant dyes, Anthroquinone acid dyes and Anthraquinone disperse dyes.	9
Unit V	Pigments – Introduction - Requirements of organic pigments Types of Pigments – Applications. Fluorsecent. Brightening agents – application of dyes in other areas – Leather, paper, medicine, chemical analysis, cosmetics, colouring agents Food and Beverages	9
	Total Contact Hrs	**45**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity, flip class and Case study.

21PCY3EC

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Finar. I. L	Organic chemistry volume – I	Pearson Education India; 6th edition	2002
2	Venkataraman. K	The chemistry of synthetic dyes volume I, III, III+IV	Elsiver	1971

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Gurdeep R.Chatwal	Synthetic Dyes	Himalaya Publishing House	2009
2	Chawathe.Shah. Ra	An Introduction to synthetic drugs and dyes	Himalaya Publishing House, 14th edition	2019
3	Sharma, B.K.	Instrumental methods of Chemical analysis, 18th Edition.	Krishna Prakashan Media p Ltd	2011

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://nptel.ac.in/courses/116/104/116104044//
https://www.youtube.com/watch?v=2sHlLNzTpUU
https://www.youtube.com/watch?v=71VHFKU36Jw

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
CO1	H	H	M	H	H	M	H	M	H	H
CO2	H	M	H	H	H	H	M	H	H	H
CO3	M	H	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	M	H	H	H
CO5	H	H	H	M	H	M	H	H	H	H

H-High, M-Medium, L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY3AL			Advanced Functional Materials (Optional)		**Batch:**	2021 – 2023
						Semester:	III
Lecture Hrs./Week	-	**Tutorial**	-	**Total Hrs/Sem**	-	**Credits:**	Grade

Course Objective

* To provide a comprehensive introduction of molecular level devices, machines.
* To know the structural and biological properties of PAMAM.
* To remember the principles of high temperature superconductors.
* To understand the importance of biodegradable polymers.

Course Outcomes

On the completion of the course the student will be able to

#	CO Statement	Knowledge Level
CO1	Remember the molecular-level devices and machines.	K1
CO2	Familiarize the molecular devices based on various supramolecular interactions.	K4
CO3	Propose the synthesis, characterization and application of PAMAM dendrimers.	K4
CO4	Interpret the principles underlying the high temperature superconductors and applications of oxide materials.	K5
CO5	Analyze the structure and importance of various biodegradable polymers, supramolecular polymers and self-healing polymers.	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content
Unit I	**Molecular-Level Devices and Machines Molecular machines** Pseudorotaxanes, rotaxanes and catenanes – Systems featuring charge-transfer interactions – systems featuring hydrogen bonding interactions. Devices based on Electronic and Nuclear motion: Plug/socket and related systems – electrochemically controlled systems.
Unit II	**Dendrimers** Structure and biological properties – Synthesis and characterization, PAMAM dendrimers as a vehicle for molecular delivery into cells – PAMAM dendrimers as MRI contrast agents.

Unit III	**Advanced functional oxide materials and their applications High temperature superconductors** Cuprate Materials, Electrical and Magnetic properties - Magnetic oxide materials: Ferromagnetic oxide materials, Ferrites materials - Multiferroic Materials: Origin of magnetic ordering in the oxide materials.
Unit IV	**Biodegradable Polymers** Biodegradable polymers - polyε-caprolactone- modified poly ε-caprolactone copolymer with ester, amide and urethane linkages, polyglycolate, polymandelic acid - biodegradable polyamides – polyester urea – polyamide urethane.
Unit V	**Smart polymers** Supramolecular polymers - Main chain supramolecular polymers, side-chain supramolecular polymers, examples of stimuli responsive supramolecular polymers, self-healing polymers.

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

21PCY3AL

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Fritz Vögtle. J, Fraser Stoddart and Masakatsu Shibasaki,	Molecular-Level Devices and Machines, In Stimulating Concepts in Chemistry	Wiley-VCH Verlag GmbH, Weinheim, (pp 255-266)	2000
2	Chad A. Mirkin and Christof M. Niemeyer	Poly(amidoamine) Dendrimer-Based Multifunctional Nanoparticles, In Nanobiotechnology II	Wiley-VCH Verlag GmbH &Co. KGaA, Weinheim	2007
3	Lynn. J. W,	High Temperature Superconductivity	Springer- Verlag	1990

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Guillet. J,	Polymers and Ecological problems,	Plenum Press, New York	1973
2	Schnabel. W	Polymer Degradation – Principles and Practical Applications	Hanser International.	1981

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://youtu.be/3xP-uMTX1GU
https://youtu.be/5HK9BD5lfIA
https://youtu.be/Q7nuEPnjgXY
https://youtu.be/ANHhZJguz3U

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H	H	H
CO2	H	H	M	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H
CO4	H	H	M	H	M	H	H	H	H	H
CO5	H	H	H	M	M	H	H	H	H	M

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY413			Inorganic Chemistry –III: Bioinorganic and Inorganic Photochemistry		**Batch:**	2021 - 2023
						Semester:	IV
Lecture Hrs./Week	5	**Tutorial**	-	**Total Hrs/ Sem**	75	**Credits:**	5

Course Objective

* To understand the key role of various elements in the living systems.
* To acquire knowledge in the nature, preparation and properties metal carbonyl complexes, photochemistry of metal complexes.
* To gain insight into the small molecules binding and transport mechanism involving metalloenzymes.
* To know about the mechanism of binding interactions of metal complexes with bio-molecules and metal based drug action.

Course Outcomes

On the completion of the course the student will be able to

#	**CO Statement**	**Knowledge Level**
CO1	Analyze the various biological roles such as metal ion transport and storage, electron.	K4
CO2	Knowledge about the medically- metal in medicine, interaction of metal ions with biomolecules.	K2
CO3	Analyze the mechanism involved by using homogeneous catalyst in organometallic compounds.	K4
CO4	Apply the inorganic metal complexes in photochemistry.	K3
CO5	Interpretation of bioinorganic chemistry to crack the competitive examinations.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate

Units	**Content**	**Hrs**
	Bioinorganic Chemistry: I Essential and trace elements in biological systems. Metal ion deficiency and disease: Fe, Cu and Zn. Metal ion toxicity: Classes of toxic metal compounds – Cr, Mn, Co, Ni, Se, Mo, Cu, Cd, Fe, Pb, and Hg toxicity – detoxification. Molecular mechanism of ion transport across the membrane – active transport theory – passive transport theory – Na+/K+ and Ca2+ pumps. Biochemistry of Calcium-Storage and transport of Calcium- Calmodulin - Muscle constaction and blood clotting.	

Unit I	Structure and functions of carboxypeptidase A. Carbonic anhydrase – inhibition and poisoning – corin ring system – vitamin B12 and B12 coenzymes – in-vivo and in-vitro nitrogen fixation.	15
Unit II	**Bioinorganic chemistry:II** **Metals in medicine** Binding of metal ions and complexes to biomolecules, Types of binding - Nucleic acid structures - Fundamental interactions with nucleic acids - Binding interactions of tris-phenanthroline metal complexes with DNA - Techniques to monitor binding (Electronic absorption, Fluorescence and Circular dichroic spectral techniques, electrochemical behaviour, viscosity measurement and ploarimetry). Chemotherapy - Radio diagnostic agents - MRI scanning - Chelating Agents (with special reference to EDTA) and therapy based on in vivo chelation of radio nucleotides - Dosage and toxicity. Au in rheumatic arthritis – Pt, Au and metallocenes in anticancer drugs (Cis-platin). **Self-study: Lithium in psychopharmacological drugs.**	15
Unit III	**Bioinorganic chemistry:III** Porphyrin ring system – metalloporphyrins – haemoglobin and myoglobin – structures and work functions – synthetic oxygen carriers – cytochromes – structure and work functions in respiration – chlorophyll – structure – photosynthetic sequence – iron-sulphur proteins (non-heme iron protein). Copper containing proteins: Classification – blue copper proteins – structure of blue copper electron transferases – copper proteins as oxidases – cytochrome c oxidase – mechanistic studies of cytochrome c oxidase – Haemocyanin - Haemoerythrin. **Self-study: Cytochrome-P-450.**	15
Unit IV	**Homogeneous catalyst by organometallics** Types of reactions in Homogeneous catalyst - olefin hydrogenation, olefin dimerization and metathesis, Monsanto acetic acid synthesis, olefin isomerization, Wacker oxidation of alkenes, hydroformylation, water gas shift reaction, template synthesis, alkene hydrosilation, acetic acid from ethylene. Heterogeneous catalysis - Zieglar- Natta Catalysis. **Self-study: Types of reactions in Homogeneous catalyst- Zeise's salt, Vaska complexes.**	15
Unit V	**Inorganic Photochemistry** Introduction, $[Ru(bipy)_3]^{2+}$ complexes in solar energy, Photochemical reactions of metal carbonyls, Photolysis of water. Photochemistry of metal beta diketonates. **Insertion reaction-** Introduction - CO insertion and SO_2 insertion reactions - insertion involving alkenes. **Oxidative addition and reductive elimination-** Introduction, one-electron oxidative addition-addition of oxygen-mechanism, 5-coordinate 18-electron reactants, 4-coordinate 16-electron reactants, 4-coordinate 18-electron reactants. **Self-study: concerted Vs free radical mechanism, reductive elimination.**	15
	Total Contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

Text Book

21PCY413

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Gurdeep Raj	Advanced Inorganic Chemistry	Geol Publishing House, 12th Edition	2014
2	Madan. R.D	Advanced Inorganic Chemistry	S. Chand & company, New Delhi, 3rd Edition	2011
3	Asim K. Das	Bio-inorganic chemistry	Books and Allied Pvt. Ltd	2015
4	Wolfgang Kaim, Brigitte schwederski, Axel klein	Bioinorganic chemistry: Inorganic Elements in the chemistry of life	Wiley, 2nd edition	2013

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Keith F. Purcell, John. C. Kotz	Inorganic chemistry	Holt-Saunders International Editions.	1997
2	James E. Huheey	Inorganic chemistry	Pearson India Limited, 4th Edition	Copyright 2006
3	Basolo, F. & Pearson. R.G.	Mechanisms of Inorganic Reactions: Study of Metal Complexes in Solution	Wiley Eastern Limited	1967
4	Ivano Bertini, Harry B. Gray, Stephen J.Lippard,	Bio-inorganic chemistry	VIVA books private Ltd	1998

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=6fRxAjMdMvE&list=PLRlh4Ip2fLusw2XTKlgOS9c5sGHCDlqW
https://www.youtube.com/watch?v=OgqPPFg4t6s
https://www.youtube.com/watch?v=k7Bf9p4-Kzo
https://www.youtube.com/watch?v=vnVMS_Dp0dU
https://www.youtube.com/watch?v=HkgsP0Jlc_o
https://www.youtube.com/watch?v=darVtuigUJA
https://www.youtube.com/watch?v=xzyR8Nsxloc
https://www.youtube.com/watch?v=plhLipR8yYQ
https://nptel.ac.in/courses/104/105/104105031/
https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cy26/

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	H	H	M	H	M	M	H	L
CO2	M	H	M	H	M	-	L	M	M	-
CO3	H	M	H	H	H	M	H	H	L	-
CO4	H	M	H	H	M	-	M	H	H	H
CO5	M	H	M	H	M	-	M	M	H	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs. R. Mini Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY414			Analytical Techniques		**Batch:**	2021 - 2023
						Semester:	IV
Lecture Hrs./Week	5	**Tutorial**	-	**Total Hrs/ Sem**	75	**Credits:**	4

Course Objective

*	To study the various types of errors and their correlations.
*	To enable the students to attain knowledge on various chromatographic techniques and thermo analytical methods.
*	To gain knowledge in ESR, Mossbauer spectroscopy and AAS, AES, Polarimetry and Photo Electron Spectrometry.
*	To acquire knowledge about the configuration and confirmation of organic molecules by ORD and CD.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	Course Outcomes (CO)	Knowledge Level
CO1	Classify thermo analytical techniques and to assess the thermal stability of a chemical compound.	K2
CO2	Comprehend the basic principle, instrumentation and applications of various chromatographic techniques, thermal analysis.	K2
CO3	Apply data analysis, various chromatographic techniques to separate the compounds, electron spin resonance and Mossbauer spectroscopy in the field of research.	K3
CO4	Evaluate the basic principle, instrumentation and applications of photoelectron spectroscopy, AAS, FES and Polarimetry.	K5
CO5	Interpret the data in chemical analysis.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate

Units	Content	Hrs
Unit I	Classification of errors – accuracy and precision – minimization of errors – significant figures- significant figures in computation. Statistical treatment of data: Mean, median, standard deviations, variance, relative standard deviation - spread, errors- standard deviation of computed results - reliability of results – Q test, Tn test	15

	– confidence limit – comparison of results – Student's t-test – F-test – comparison of the means of two samples. Correlation and regression: linear regression (least square analysis). **Self-study: Errors and classification in chemical analysis.**	
Unit II	**Chromatographic methods** Solvent extraction - Methods of extraction and applications of solvent extraction. Solid phase extraction - methods and applications - chromatography - HPLC - outline study of instrument modules. UPLC, UHPLC and HPLC-Mass spectroscopy, ion exchange chromatography and LC-MS. Gas chromatography - basic instrumental set up - carriers, columns, detectors and comparative study of TCD, FID, ECD and NPD. **Self-study: Thin layer chromatography and size exclusion chromatography.**	15
Unit III	**Thermal analysis** Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) and Thermometric titrations - basic principles, Instrumentation and application. Atomic absorption spectroscopy and Flame emission spectroscopy- Basic principles - Instrumentation and applications. **Photoelectron Spectroscopy** ESCA (XPS): principle, chemical shifts - description of ESCA spectrometer, X-ray sources, samples, analysis, detectors and recording devices, applications. Auger electron spectroscopy (AES) and UV photo electron spectroscopy (UPS) - principles, applications and instrumentation.	15
Unit IV	**Electron spin resonance** Theory - derivative curves -'g' values, Kramer's degeneracy - zero field splitting - hyperfine splitting - isotropic and anisotropic systems - identification of free radicals (CH_3 and C_6H_5 radicals, Copper - Iron complex) - applications. **Mossbauer spectroscopy** Principle and theory- Doppler Effect, Isomer shift - quadruple interactions - magnetic interactions. **NQR spectroscopy** Theory and Principle of NQR spectroscopy-Nature of electric field gradient, Energy levels and selection rules, Interaction of electric quadrupole with	15

	electromagnetic radiation, nuclear orientations, the asymmetry parameter, quadrupole transitions in spherical, axially symmetric fields and not axially symmetric fields. Applications of NQR spectra. **Self-study:Mossbauer spectroscopy – applications.**	
Unit V	**Polarimetry** Circular Dichroism and Optical rotatory dispersion -Basic principles of ORD and CD - Cotton effects - Octant rule - axial halo ketone rules - applications of ORD and CD. **Molecular fluorescence and phosphorescence** Principles and Applications of Fluorometers -Phosphorometers. **Self-study: Fluorescence and phosphorescence–applications.**	15
	Total Contact Hrs	**75**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

21PCY414

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Gurdeep R. Chatwal, Anand, S.K.	Instrumental Methods of Chemical Analysis	Himalaya Publishing House.	2003
2	Sharma, B.K.	Instrumental methods of Chemical analysis.	Krishna Prakashan Media P.Ltd, 18th Edition	2011
3	Ghosh	Introduction to Photoelectron Spectroscopy	NY, John Wiley & Sons	1983

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Skoog. D.A West. D.M & James Holler. F	Analytical Chemistry – An Introduction	Saunders College publishing	2000

2	Willard, H.H, Merrit L.L & Dean, J.A	Instrumental method of analysis	CBS Publishers & Distributors. 7th Edition	2002
3	Drago, R.S	Physical methods in Inorganic chemistry	W. B. Saunders Company. 1st Edition	1992
4	S.M. Khopkar	Basic Concepts of Analytical Chemistry	New Age International Publishers, 3rdEdn	2008

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=OypCNBPmGBY
https://www.youtube.com/watch?v=a3F0OSOchlo
https://www.youtube.com/watch?v=XMtmSz_9umk
https://www.youtube.com/watch?v=ryo8Kd2Wgks
https://www.youtube.com/watch?v=5FczhvJrYNE
https://www.youtube.com/watch?v=DgA3-UnpSuI
https://www.youtube.com/watch?v=9zimhww51WI
https://www.youtube.com/watch?v=s7zsL9yFOsg
https://www.youtube.com/watch?v=a81cDH26f7A
https://www.youtube.com/watch?v=r55anTcoWvE
https://www.youtube.com/watch?v=X3AHbeZhKhU

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	M	M	H	H	-
CO2	H	H	H	M	H	M	-	H	H	-
CO3	H	H	H	H	H	M	L	H	H	-
CO4	H	H	M	M	H	L	M	H	H	-
CO5	H	H	H	H	M	M	H	H	H	-

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs. K. Vimaladevi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc.,			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY4EA			***Major Elective –III Medicinal Chemistry**		**Batch:**	2021 – 2023
						Semester:	IV
Lecture Hrs./Week	3	**Tutorial Hrs./Sem.**	-	**Total Hrs/ Sem**	**45**	**Credits:**	3

Course Objective

* The course is to enable students to understand drug actions.
* To learn chemistry of various types of drugs such as antibiotics, analgesics, antidiabetics, cardiovascular, anti-cancer.
* Formulation and Synthesis of selected drugs.

Course Outcomes

On the successful completion of the course, students will be able to

#	CO Statement	Knowledge Level
CO1	Understand the nature, sources and biological classification of drugs.	K2
CO2	Explain the drugs metabolism and biotransformation.	K5
CO3	Synthesize and study of novel cardiovascular and anticancer drugs.	K5
CO4	Formulate the synthesis of few important drugs such as analgesics, cardiovascular, anti-cancer drugs, ant diabetic and antibiotics.	K4
CO5	Evaluate the application of Antibiotics, cardiovascular and anti-diabetics drugs.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Drug discovery, design and development:** Synthesis of the representative drugs of the following classes: analgesic, antipyretic and anti-inflammatory agents (Aspirin, paracetamol and lbuprofen); antibiotics (Chloramphenicol); antibacterial agents (Sulphonamides), antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital and Diazepam).	**9**

Unit II	**Insilco Drug Design and Computer Assisted New Lead Design:** Introduction, historical perspective, drug compounds, preparation and organization for drug seeking, common stages in the drug seeking campaign, sources of hits, leads and candidate drugs, natural products: higher plant and animal products, combinational libraries, lead optimization. Introduction, basic concepts, molecular recognition by receptor and ligand design, active conformation, approaches to discover new functions, approaches to the cases with known and unknown receptor structure and molecular docking study.	**10**
Unit III	**Cardiovascular drugs and cancer drugs** Anti-cancer drugs: Structure, uses and adverse effects of chlorambucil, methotrexate and fluorouracil. Cardiovascular drugs: Structure, uses and adverse effects of digoxin, quinidine, alpha-methy lDOPA, nitroglycerin and tolazoline hydrochloride. Anti-diabetic drugs: Structure, uses and adverse effects of tolbutamide, phenformin Biguanides-and chlorpropamide, Insulin – chemical structure of Insulin. **Self-study: Antibiotics-Radioactive isotopes, Miscellaneous agents**.	10
Unit IV	**Molecular Recognition in Drug-Receptor Binding**: Molecular forces and binding energetic, enzyme inhibitors - modes of inhibition and general approaches. Antibacterial drugs - major drug classes and drug resistance, antiviral drugs- major drug classes and drug resistance, Analgesic agents – Narcotic analgesics and Non – narcotic analgesics- morphine and Apomorphine.	8
Unit V	**Antibiotics** Antibiotics-Classification of antibiotics –Based on the spectrum of biological action of antibiotics. Structure, properties, uses, structure activity relationship of Streptomycin, Chloramphenicol, Tetracyline, Erythromycin, Rifamycinand Penicillin. **Self-study: Macrolides, Oligomycins, Aminoglycosides, N containing heterocyclic compounds.**	8
	Total Contact Hrs	**45**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

21PCY4EA

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ghose, J	A Text book of Pharmaceutical Chemistry	S. Chand Pub Ltd. New Delhi	2005
2	Silverman, R. B.	The Organic Chemistry of Drug Design and Drug Action	Academic Press. 2nd Edition	2004
3	Williams, D. A Lemke, T. L	Foye's, Principles of Medicinal Chemistry	Wolters Kluwer Health (India) Pvt. Ltd. 5th Edition	2006
4	Ilango, K., & Valentina, P	Text Book of Medicinal Chemistry	Keerthi Publishers, Chennai Vol I.	2007

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Burger, A	Medicinal Chemistry, Vol – I and II	Wiley inter Science, NewYork.	1990
2	Wilson, O Giswold, O George, F	Text book of organic, Medicinal and Pharmaceutical Chemistry	Lippincott Company, Philadelphia, 9th Edn	1991
3	Tripathi, K.D	Essentials of medical pharmacology	Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, Fifth Edition	2004

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=UHEXXGiegd0
https://youtu.be/UHEXXGiegd0
https://youtu.be/8NkX-41b5dw
https://youtu.be/2sF0F2NST38
https://youtu.be/MV_-DfMVW3E

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	M	M	H	M	H	M	H	H	M	M
CO2	H	M	H	M	H	M	M	M	M	H
CO3	H	M	H	M	H	H	H	M	M	H
CO4	H	H	M	H	M	M	M	M	M	H
CO5	H	H	H	H	H	H	H	H	M	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Dr. V. Prabhu Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY4EB			Major Elective III – Computational Chemistry		**Batch:**	2021 – 2023
						Semester:	IV
Lecture Hrs./Week	3	**Tutorial**	-	**Total Hrs/Sem**	45	**Credits:**	3

Course Objectives

* To Draw Chemical structures by Chemdraw and graphs by Origin.
* To gain knowledge about various computational tools and methods.
* To learn Gaussian and DFT studies.

Course Outcome

On the successful completion of the course, students will be able to

#	CO Statement	Knowledge Level
CO1	Know the available free databases like MOL, SMILES.	K2
CO2	Draw the chemical structure and graphs using Chemdraw and Origin.	K3
CO3	Gain the theoretical knowledge about Slater and Gaussian functions.	K3
CO4	Evaluate the molecular mechanics, abinitio, semi empirical and DFT studies.	K5
CO5	Calculate the optimization studies for various molecules.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	Representation of chemical compounds: 1D, 2D, 3D SMILES, InChI, Fingerprints (Daylight), Matrices, Connection Tables, mol & sdf files, Markush structures, Rotatable bonds and conformers, Molecular surfaces. Representation of reactions: SMARTS, SMIRKS, Matrices. Searching chemical structures: Exact (Canonicalizing SMILES: Morgan, CANGEN), Clustering small molecules: Hierarchical and non-hierarchical methods. 3D pharmacophore based searching: Common Pharmacophore features, building hypotheses and searching databases. Chemical Databases: CSD, Pubchem, other relevant databases. Information content and applications. Data mining.	8
Unit II	**Chemdraw Software** Opening and saving Chemdraw applications. Menu Commands: File – Edit – Arrange – Options – Font – Size – Style. Drawing the following features: Lewis dot structure - norbornane – center carbonyl oxygens – double bonds with a short line inside the ring – degree symbol in a caption.	5

Unit III	**Origin Software** Origin software and its applications - graphing - data exploration - exploratory analysis - curve and surface fitting - peak analysis - statistics - signal processing - mathematics - data processing - importing and exporting presentation - batch processing - project and data management - programming and connectivity.	5
Unit IV	**Computational Chemistry** Introduction: computational chemistry as a tool and its scope. Potential energy surface: stationary point, transition state or saddle point, local and global minima. Molecular mechanics methods: force fields-bond stretching, angle bending, torsional terms, non-bonded interactions, electrostatic interactions. Important features of commonly used force fields like MM3, MMFF, AMBER, ADMET and CHARMM. Ab initio methods: A review of Hartee-Fock method. Basis set approximation. General introduction to semi empirical methods: basic principles and terminology. Introduction to Density Functional Theory (DFT) methods: Hohenberg-Kohn theorems. Kohn-Sham orbitals. Exchange correlation functional. Local density approximation. Generalized gradient approximation. Hybrid functionals (only the basic principles and terms need to be introduced).Model Chemistry-notation, effect on calculation time (cost). Comparison of molecular mechanics, ab initio, semiempirical and DFT methods.	18
Unit V	**Computational Chemistry Calculations** Molecular geometry input-cartesian coordinates and internal coordinates, Zmatrix. Z-matrix of: single atom, diatomic molecule, non-linear triatomic molecule, linear triatomic molecule, polyatomic molecules like ammonia, methane, ethane and butane. General format of GAMESS / Firefly input file. GAMESS / Firefly key word for: basis set selection, method selection, charge, multiplicity, single point energy calculation, geometry optimization, constrained optimization and frequency calculation.	9
	Total Contact Hrs	**45**

Softwares
Molecular Mechanics:
1. **Arguslab** available from www.arguslab.com/
2. **Tinker** available from www.dasher.wustl.edu/ffe/
Ab initio, semiempirical and dft:
1. **Firefly / PC GAMESS** available from http://classic.chem.msu.su/gran/gamess/
2. **WINGAMESS** available from http://www.msg.ameslab.gov/gamess/Graphical User Interface (GUI):
1. **Gabedit** available from http://gabedit.sourceforge.net/
2. **wxMacMolPlt** available from http://www.scl.ameslab.gov/MacMolPlt/
3. **Avogadro** from http://avogadro.openmolecules.net/wiki/Get_Avogadr

Pedagogy and Assessment Methods:

Power point Presentations, Demonstrations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

21PCY4EB

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Lewars. E.G	Computational Chemistry: Introduction to the Theory and Applications of Molecular and Quantum Mechanics	Springer, 2nd Edn	2011
2	Jensen. J.H	Molecular Modeling Basics,	CRC Press	2010
3	Leach.A	Molecular Modelling: Principles and Applications	Longman, 2nd Edn.	2001
4	Jr. Fackler J.P. Falvello. L.R. (Eds.)	Techniques in Inorganic Chemistry: Chapter4	CRC Press	2011
5	Ramachandran. K.I. Deepa. G, Namboori. K	Computational Chemistry and Molecular Modeling: Principles and Applications	Springer	2008

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Hinchliffe. A	Molecular Modelling for Beginners	John Wiley & Sons, 2nd Edn.,	2008
2	Cramer. C.J	Essentials of Computational Chemistry: Theories and Models	John Wiley & Sons, 2nd Edn.,	2004
3	Young.D.C	Computational Chemistry: A Practical Guide for Applying Techniques to Real-World Problems	John Wiley & Sons	2001

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=c0y5KJXH6zw
https://www.youtube.com/watch?v=c0y5KJXH6zw
http://www.digimat.in/nptel/courses/video/104101095/L12.html
https://youtu.be/zVlZxHKP1e0
https://youtu.be/nKYrzrwaRmc
https://youtu.be/HCpjAViYbAI

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	H	H	M	H	M	H
CO2	H	H	H	H	H	H	M	M	H	H
CO3	H	H	H	M	-	H	H	M	M	M
CO4	H	M	M	H	-	M	-	M	M	M
CO5	H	H	H	H	H	H	H	H	M	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:	M.Sc			**Programme Title:**		Master of Chemistry	
Course Code:	21PCY4EC			***Major Elective –III - Green Chemistry**		**Batch:**	2021 - 2023
						Semester:	IV
Lecture Hrs./Week	3	**Tutorial**	-	**Total Hrs/Sem**	45	**Credits:**	3

Course Objective

* To understand the basic principles and importance of green chemistry for industrial applications.
* To acquire knowledge about the microwave and ultra sound assisted synthesis.
* To understand the concept of phase-transfer catalysis.
* To gain knowledge about ionic liquids, Crown ethers and their applications.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	Course Outcomes (CO)	Knowledge Level
CO1	Define green chemistry and explain basic principles.	K2
CO2	Discuss and appraise green reagents, microwave and ultrasound assisted Synthesis.	K2
CO3	Analyse the synthetic applications and advantages of ionic liquids.	K4
CO4	Appraise the advantages and the applications of phase transfer catalyst in organic synthesis.	K5
CO5	Propose Crown ethers for various reactions.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Green Chemistry** Definition, need for green chemistry, basic principles, planning a green synthesis in the laboratory- atom efficiency process & atom economy- rearrangement, addition, substitution, elimination. Synthesis involving basic principles of green chemistry – synthesis of styrene, adipic acid, green chemistry in day-today life - dry cleaning of clothes, versatile bleaching agents.	9
Unit II	**Green reagents** Dimethylcarbamate, polymer supported reagents, green catalysts - acidic, basic, oxidation and polymer supported catalysts.	9

	Microwave Induced Green Synthesis Introduction- microwave assisted reactions in water – Hoffmann elimination, hydrolysis, oxidation, inorganic solvents- esterification, chalcone synthesis, Diel's Alder reaction, decarboxylation and Fries rearrangement.	
Unit III	**Ultrasound Assisted Green Synthesis** Introduction- esterification, saponification, oxidation, reduction, hydroboration, coupling reaction, Diels Alder reaction, Cannizaro reaction, Strecker synthesis, Reformatsky reactions. **Ionic liquids** Introduction, applications in organic synthesis - Diels Alder reaction, advantages & disadvantages of ionic liquids.	9
Unit IV	**Phase transfer catalysts** Introduction, definition, mechanism of phase transfer catalysed reaction, types and advantages of phase transfer catalysts, types of phase transfer catalysed reactions, preparation of phase transfer catalysts, applications of phase transfer catalysis in organic synthesis- alcohols from alkyl halides and addition to olefins.	9
Unit V	**Crown ethers:** Introduction, nomenclature, special features, nature of donor site, general synthesis of Crown ethers -synthesis of [12] Crown- 4, [18] Crown -6 and cryptates. Synthetic applications – esterification, saponification and $KMnO_4$ oxidation.	9
	Total Contact Hrs	**45**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity, flip class and Case study.

21PCY4EC

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ahluwalia. V. K	Environmentally Benign Reaction	Ane Books Pvt Ltd, 2nd Edn.	2012
2	Ahluwalia. V. K Kidwai. M	New Trends in Green Chemistry	Anamaya Publishers, Reprint	2012

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Rashmi Sanghi, Srivastava. M. M	Green Chemistry: Environment Friendly Alternatives	Narosa Publishing House, Reprint 4th Edn.	2012

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://www.youtube.com/watch?v=E2ohFKSYhg0
https://www.youtube.com/watch?v=7VHlI7Sk7NY
https://www.youtube.com/watch?v=wjFc_Tj20oA
https://www.youtube.com/watch?v=5mBv_bJ7v8Q
https://www.youtube.com/watch?v=3oIQGJ4xdmg

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	H	M	H	H	H	H
CO2	H	H	H	M	M	M	H	L	H	M
CO3	H	H	H	H	-	M	H	H	M	H
CO4	H	H	H	H	H	L	H	H	H	H
CO5	H	H	H	H	-	M	M	M	M	M

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs R.Mini Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme Code:		M.Sc			**Programme Title:**			Master of Chemistry	
Course Code:		21PCY415			**Inorganic Chemistry Practical –II**			**Batch:**	2021 - 2023
								Semester:	III & IV
Lecture Hrs./Week	**III Sem**	4	**Tutorial**	-	**Total Hrs/ Sem**	**III**	60	**Credits:**	4
	IV Sem	5				**IV**	75		

Course Objective

* To analyse quantitatively the metal ions such as Cu, Ni, Fe, Zn, Ca and Ba in a mixture.
* To estimate quantitatively Magnesium, Calcium and Zinc by complexometry.
* To separate the components in ink and flowers by Chromatography.

Course Outcomes

On the completion of the course the student will be able to

#	CO Outcomes	Knowledge Level
CO1	Separate and estimate the metal ions in a mixture.	K5
CO2	Estimate the metal ions in complexes.	K4
CO3	Separate the components in natural and commercial products.	K4
CO4	Estimation of various inorganic ions.	K5
CO5	Distinguish the chromatographic techniques.	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content
A	**Titrimetry** Complexometric titrations using EDTA - Estimations of Magnesium, Calcium & Zinc.
B	**Estimation of metal ions in a mixture** 1. Estimation of Copper & Nickel 2. Estimation of Iron & Nickel 3. Estimation of Copper & Zinc 4. Estimation of Calcium & Barium 5. Estimation of Copper & Iron

C	**Chromatography (Demonstration only)** **Column, Paper & Thin layer:** Separation of Components in ink & flowers.	
	Total Contact Hrs	**75+60 Hrs**

Pedagogy: Demonstration and hands on Experience

21PCY415

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Vogel. A.I	A Text Book of Quantitative Inorganic Analysis	ELBS & Longmann, Green & Co. Ltd., 9thEdn	2011
2	Venkateswaran, V. Veeraswamy. R and. Kulandaivelu, A.R	Principles of Practical Chemistry	Sultan Chand & Sons, 2nd Edition	1997
3	Giri. S, Bajpai. D.N and Panday O.P	Practical Chemistry Vol. I & II	S.Chand & Co	1997
4	Bassart J. Dennay. R.C. Jeffery G.H. and Mendham	Vogel's text Book of qualitative Inorganic Analysis,	The ELBS & Longman, 4th Edition	2004

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	H	H	M	-	M	M	H	M
CO2	H	H	H	M	H	-	M	M	H	M
CO3	H	H	H	H	H	-	H	M	H	H

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Mrs.M.Anusuya Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

<table>
<tr><td colspan="2">Programme Code:</td><td colspan="2">M.Sc</td><td colspan="2">Programme Title:</td><td colspan="3">Master of Chemistry</td></tr>
<tr><td colspan="2">Course Code:</td><td colspan="2">21PCY416</td><td colspan="2">Organic Chemistry Practical –II</td><td>Batch:</td><td colspan="2">2021 – 2023</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td>Semester:</td><td colspan="2">III & IV</td></tr>
<tr><td rowspan="2">Lecture Hrs./Week</td><td>III Sem</td><td>4</td><td rowspan="2">Tutorial</td><td rowspan="2">-</td><td rowspan="2">Total Hrs/ Sem</td><td>III</td><td>60</td><td rowspan="2">Credits:</td><td rowspan="2">4</td></tr>
<tr><td>IV Sem</td><td>5</td><td>IV</td><td>75</td></tr>
<tr><td colspan="10">Course Objective</td></tr>
<tr><td colspan="10">* To estimating organic compounds quantitatively.</td></tr>
<tr><td colspan="10">* To learn and practice the methods of preparation of some organic compounds.</td></tr>
<tr><td colspan="10">* To understand some chromatographic techniques.</td></tr>
</table>

Course Outcomes

On the completion of the student will be able to

#	Course Outcomes	Knowledge Level
CO1	Remember and practice aromatic substitution reactions and the basic principles of various chromatographic techniques.	K2, K4
CO2	Understand and evaluate the estimation of phenol, aniline, ketone and glucose.	K5
CO3	Estimate certain natural products and separate the compounds using chromatographic technique.	K4
CO4	Test the different types of chemical constituents in plant extracts.	K6
CO5	Furnish the pupil to estimate the adulteration level in the oil.	K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate		

Units	Content
A	**Quantitative estimations:** 1. Estimation of phenol, aniline, ethyl methyl ketone, Glucose (iodimetry method and Bertrand's method). 2. Citric acid or ascorbic acid from a tablet or from a natural source.
B	**Two stage preparations:** **1.** Benzanilide from benzophenone. **2.** Acetyl salicylic acid from methyl salicylate.

	3. Preparation of m- nirtrobenzoic acid from methyl benzoate. **4.** Preparation of p- nitroaniline from acetanilide. **5.** Preparation of p-bromo acetanilide from aniline.	
C	**6.** Extraction: (Not for ESE examination) **7.** Lactose from milk. **8.** Caffeine from tea. **9.** Curcumin from Curcuma longa. **10.** Nicotine from tobacco extract. **11.** Citric acid or ascorbic acid from a tablet or from a natural source.	
D	**12.** Analysis of oil: (Not for ESE examination) **13.** Reichart-Meisel value, saponification value and acetyl value. **14.** Chromatography: **15.** Column, Paper and thin layer.	
	Total Contact Hrs	**60+75 Hrs**

Pedagogy: Demonstration and hands on Experience

Reference Books

21PCY416

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Gnanprakasam and Ramamurthy	Organic Chemistry Laboratory Manual	Ananda Book Depot, Chennai.	2000
2	Arthur I. Vogel	Elementary Practical Organic Chemistry (part 2)Qualitative Organic Analysis	Pearson Education/ 2nd Edition	2011

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	M	H	H	H
CO2	H	M	H	H	M	H	M	H	H	H
CO3	M	M	H	H	L	-	-	-	H	H
CO4	H	H	H	H	H	H	H	H	H	H
CO5	M	M	H	H	L	-	M	-	H	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.V.Prabhu Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme code:		M.Sc.			**Programme Title :**			Master of Chemistry	
Course Code:		21PCY417			Physical Chemistry Practical –II			**Batch :**	2021-2023
								Semester	III & IV
Lecture Hrs/Week:	**III Sem**	4	**Tutorial :**	-	**Total Hrs/Sem:**	**III**	60	**Credits:**	4
	IV Sem	5				**IV**	75		

Course Objective

* To equip the future chemist with the knowledge of electrical conductance measurement, kinetics, UV visible spectrometer and conductometric titrations.
* To learn maintain the record observations on conductometric titrations and chemical kinetics and ability to use various instruments.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	**Course Outcomes (CO)**	**Knowledge Level**
CO1	Aquire knowledge about conductometric titration, fundamentals of adsorption, metal ligand ratio and the acid hydrolysis of ester.	K2
CO2	Understand various laws of electrochemistry and applications of electrical conductance measurements and the applications of chemical kinetics.	K3
CO3	Determine the cell constant and verify the Debye-Huckel Onsager equation and Kohlrausch's law.	K5
CO4	Determine the relative strength of acids and rate of reaction.	K5
CO5	Estimate the amount of ions condutometrically and evaluate the amount of oxalic acid adsorbed using charcoal as adsorbent.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

	Content	**Hrs**
A	**Electrical Conductance measurements** 1. Determination of hydrolysis constant of aniline hydrochloride 2. Verification of Debye-Huckel Onsager equation 3. Ostwald's dilution law 4. Verification of Kohlrausch's law 5. Solubility Product of sparingly soluble salt 6. Determination of metal to ligand ratio of complexes by Job's method using UV-visible Spectrophotometer. 7. Determination of solubility of a sparingly soluble salt.	
B	**Conductometric Titrations: Acid-Base titrations** 8. Strong Base Vs Weak Acid, Strong Acid vs Strong Base 9. Strong Base Vs Mixture of (weak and strong) Acids	
C	**Precipitation titrations** 10. AgNO3 Vs mixture of halides (KCl & KI) 11. BaCl2 Vs $MgSO_4$ 12.Buffer Vs Strong acid.	

D	**Chemical Kinetics** 13. Acid hydrolysis of an ester - Relative strength of acids 14. Reaction kinetics of KI and K2S2O8 15. Iodination of acetone	
E	**Adsorption** 16. Adsorption of oxalic acid on charcoal 17. Study of adsorption of acetic acid on activated carbon	
	Total Contact Hrs	**75+60 Hrs**

Pedagogy: Demonstration and hands on practicals

21PCY417

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Palit S.R. and De S.K	Practical Physical Chemistry	Science Book Agency, Calcutta	2003
2	Sharma P.C. and Agarwal	Practical Chemistry	Goel Publishing House, Meerut.	1998
3	Venkateswaran and Kulaindaivelu	Practical Physical Chemistry	S. Chand & Co	2005
4	Sundaram.S and Raghavan. K	Practical Chemistry.	S. Viswanathan Co	1996
5	Yadav. J. B	Advanced Practical Physical Chemistry	Goel Publishing House	2001
6	Gurthu. J. N. Kapoor. R	Advanced Experimental Chemistry	S. Chand and Co	1987

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H	H	H
CO2	H	M	H	H	M	H	H	H	H	M
CO3	H	H	M	H	H	M	H	M	M	H
CO4	M	H	H	M	H	H	H	H	H	H
CO5	H	H	M	H	H	M	-	-	M	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme code:	M.Sc.			**Programme Title :**		Master of Chemistry	
Course Code:	21PCY418			Project Work & Viva-Voce		**Batch**	2021-2023
						Semester	IV
Lecture Hrs/Week:	-	**Tutorial**	-	**Total Hrs/Sem**	-	**Credits:**	5
Course Objective							
* Make the students to understand the importance of experimental analysis, scientific approach in solving problems related to the environment and society.							
* Educate and train the students to write scientific papers.							

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	Course Outcomes (CO)	Knowledge Level
CO1	Apply the various preliminary skills in laboratory.	K3
CO2	Analyze the various sources of literature review.	K4
CO3	Evaluate the various techniques from the previous studies.	K5
CO4	Apply the suitable parameters in the project work.	K5
CO5	Synthesis the various organic, nano and co-ordination compounds	K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate		

Individual Project and Viva Voce

- Each faculty will be allotted 4/5 students.
- The topic/area of work will be finalized at the end of III semester, allowing scope for the students to gather relevant literature during the vacation.
- The research work can be carried out in the college or at any other organization approved by the College.
- Viva Voce/Power point presentation will be conducted by a panel comprising of HOD, internal / external examiners.

Research Areas

Synthetic Organic Chemistry, Coordination Chemistry, Phytochemistry, Surface Chemistry and Nanochemistry, etc.,

Methodology

Each project should contain Introduction, Review of Literature, Materials and Methods**,** Results and Discussions – evidences in the form of figures, tables and photographs, Summary and Bibliography

Evaluation - Total - 100 Marks (Internal – 50 marks, External – 50 marks)

Internal **Total – 50 marks**

Review		Marks
I	Selection of the field of study, Topic & Literature collection	50
II	Research Design and Data Collection	
III	Analysis & Conclusion, Preparation of rough draft	
IV	Paper Presentation in National / InternationalConference (Or) Paper Publication in UGC Care list Journals	

RULES GOVERNING THE EVALUATION OF PROJECT REPORT AND *VIVA VOCE*

1. SELECTION OF TOPIC:

Each student shall select a topic for his / her project in consultation with his / her Guide and the Head of the Department.

2. The project report should contain a minimum of 50 pages in A4 format excluding bibliography and appendices.

3. Each student should submit two copies of his / her project report for evaluation.

4. Last date for the submission of Project Report:

The project report should be submitted to Department (P.G. Courses) through the Guide **on or before the last working day** for the students of the College for the academic year. If a student fails to submit the project report on or before the last working day, he / she will not be eligible for getting rank.

FIRST EXTENSION :

If the student fails to submit the project report within the stipulated time, he / she may be permitted to submit the same one day prior to the date of *viva voce*.

SECOND EXTENSION :

If the student fails to submit the project report one day prior to the date of viva voce then, he / she may apply for a second extension of three months duration.

The above two extensions may be granted by the Principal based on the written recommendations from the Guide and the Head of the Department.

5. Any other unforeseen problems / situations, not mentioned above if arise regarding the project report and *viva voce*, will be placed in the College Council and suitably resolved.

External **Total – 50 marks**

Project	**Total – 30 marks**
Relevance of the topic to the academic / society	05 Marks
Objectives	05 Marks
Experimental design	10 Marks
Expression of results and discussion	10 Marks
Viva Voce	**Total – 20 marks**
Presentation	10 Marks
Discussion	10 Marks

Mapping

PO/PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**
CO1	H	H	H	H	H	H	M	H	H	H
CO2	H	M	H	H	M	H	M	H	H	H
CO3	M	M	H	H	L	-	-	-	H	H
CO4	H	H	H	H	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Mrs. K. Vimaladevi Mrs. R. Mini Dr.V.Prabhu Mrs.M.Anusuya Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

VALUE ADDED COURSES

Programme code:	M.Sc.	**Programme Title :**		Master of Chemistry	
Course Code:	21PCY3V01	**Value added course** Chemistry in Household Products		**Batch**	2021-2023
				Semester	III
Lecture Hrs/Week:	2	**Total Hrs/Sem**	30	**Credits:**	2

Course Objectives
* To provide knowledge of household products to address the needs of chemical industry.
* Able to synthesize house hold Cleaning agents, formulation of cosmeceuticals and hygiene products.
* To enhance student sense of enthusiasm for chemistry and to involve them in an intellectually stimulating experience of learning in a supportive environment.
* To impart knowledge on marketing approaches on studying consumer need, need gaps and global markets.
Employability * To provide worldwide opportunity to study household products. * Students have the opportunity to undertake an optional placement and enhance their entrepreneur skill by offering valuable experience.
Advantages Students will be familiar with the different exposure of chemicals used in day to day life such as Cleaning agents, surfactants and Insect repellent one can design and practice ecofriendly cosmetics of their own.

Course Outcomes
* To acquire basic information about the possibilities and limitations of household products, their importance and marketing. * To familiarize the authorized ingredients for household products, their origin,chemical nature and importance. * Develop new innovations in Chemical, pharmaceutical, cosmetics and allied chemical industries and successfully implement them at an industrial scale.

Units	Content	Hrs
Unit I	**Cleaning agents:** Introduction**,** synthesis and applications of Natural cleaning agents, cleaning action, Floor cleaner, Toilet Cleaner, Bathroom Cleaner and Kitchen Cleaner.	**8**
Unit II	**Detergents and surfactants:** Introduction; Different terms used in detergents; Raw materials for detergents; Washing action of detergents; Types of detergents; Introduction of surfactants; Types of surfactants. Basic raw materials, preparation and uses of Hair dye, Handmade herbal Soap, Herbal tooth powder, Phenyl making.	**12**
Unit III	**Insect repellent-** Effectiveness, safety issues-humans and toxicity for other animals. Common insect repellent-synthetic insect repellents, natural insect repellents and insect repellent from natural sources and less effective methods. Alternatives to repellent.	**10**
	Total Contact Hrs	**30**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and Case study.

21PCY3V01

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \EDITION	YEAR OF PUBLICATION
1	Gaurav Kumar Sharma, Jayesh Gadiya Meenakshi Dhanawat,	Textbook of Cosmetic Formulations	Kbuuk publications	2018
2	Perry Romanowski RandySchueller,	Beginning Cosmetic Chemistry	Allured Pub Corp, 3rd Edition	1973
3	Giriraj Prasad	Manufacture of perfumes, cosmetics and detergents	Small Industry Research Institute	1978
4	Vogel, Bassett, Jeffrey, Mendam, Denney	Vogel's text book of Qualitative Chemical Analysis	Longman ELBS Edition	1994

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Stocchi. E	Industrial Chemistry, Vol – I,	Ellis Horwood Ltd. UK.	1990
2	Jain. P.C. and Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company. 15th edition	2013
3	Sharma. B.K	Industrial Chemistry,	Goel Publishing House, Meerut.	2014
4	Williams. D.F	Chemistry and Technology of the Cosmetics and Toiletries Industries	Springer International Edition.	1992
5	Robert. D. Hisrion Michael P. Peters,	Entrepreneurship	Eleventh Edition	2020

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Mrs. K. Vimaladevi Mrs. R. Mini Dr.V.Prabhu Mrs.M.Anusuya Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme code:	M.Sc.	**Programme Title :**		Master of Chemistry	
Course Code:	21PCY3V02	**Value added course** Chemistry of Industrial Process : An Introduction		**Batch**	2021-2023
				Semester	III
Lecture Hrs/Week:	2	**Total Hrs/Sem**	**30**	**Credits:**	2

Scope

* This course will train participants with the knowledge, skills and competencies required for success in the practical operation of water treatment plants.
* This course is designed to expertise regulations governing industrial wastes, sources of wastes, methods for preventing and minimizing wastes at the source, and industrial waste monitoring.

Course Objectives

Upon completion, the participant should be able to:

* Define and implement cleaner production activities, industrial water management strategies for pollution and toxicity prevention.
* To Select the most appropriate treatment technology and design a wastewater treatment methods to treat an industrial effluent stream for a selected industry.
* Integrate cleaner production, industrial water management, wastewater treatment processes, and disposal in the design on an industrial waste treatment process for a selected industry.

Employability

* Graduates will be qualified to work in Wastewater Treatment Plants as operators to the expected industry standard.
* Students have the opportunity to undertake an optional placement and enhance their entrepreneur skill by offering valuable experience.

Advantages

* To reduce, recycle and reuse water for different purposes

Course Outcomes

* Aquire the essential role of water in industries.
* Learn the 115hysic chemical properties of water, different wastewater treatment processes and water management strategies.
* Anlyse the various methods involved in analytical techniques.
* Develop the methodology to manage and prevent water pollution.

Units	Content	Hrs
Unit I	**Characteristics of Water** *Introduction – sources of water* – Characteristics of water, Water Analysis- study of water samples – acidity, alkalinity, Hardness, free chlorine, chlorine demand, calcium, magnesium, iron, manganese, zinc, ammonia, nitrate, sulphate and fluoride, DOC, BOD, COD and their importance- Disadvantages of hard water – Scale and sludge formation in boiler – Boiler Corrosion – Softening methods –desalination of Brackish water: Distillation, Electro dialysis and reverse osmosis.	10
Unit II	**Water Pollution** *Introduction –water Pollutants* – physical and chemical pollution of water – ground water pollution – harmful effects of ground water pollution – surface water. River water and sea water pollution, Oil pollution of water. Effects oil pollution in marine water – Radioactive materials in water- Role of pollution control boards.	10
Unit III	**Physico chemical Examination of water** Collection of samples – colour – odour Turbidity pH – temperature – Soilds: Total Solids, Dissolved solids, suspended solids, settable solids – Acidity — Alkalinity – Hardness – calcium, Magnesium, Sodium – Potassium – Iron–*Dissolved Oxygen*, *BOD*, *COD*, biological and chemical treatments by WQI and GIS methods.	10
	Total Contact Hrs	**30**

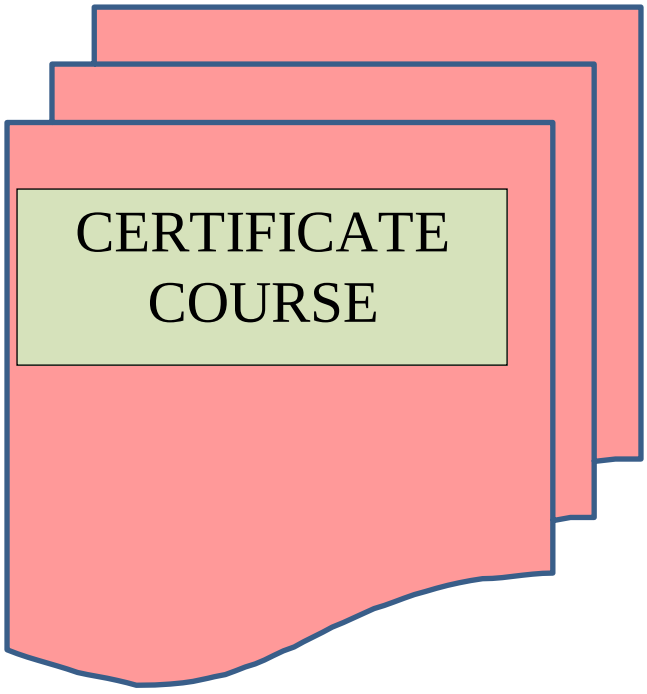
Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Mark C. M. van Loosdrecht, Per Halkjaer Nielsen, C. M. Lopez-Vazquez, Damir Brdjanovic	Experimental methods in waste water treatment	IWA Publishing.	2016
2	Vivek V. Ranade, Vinay M	Industrial Wastewater Treatment, Recycling and Reuse	Bhandari Butterworth-Heinemann Publications,	2014

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Mukhlyonov.	Chemical Technology, Moscow	Mir publication, 3rd Edition	1979
2	Norris Shreve. R &. Brink, J.A	Chemical Process Industries	McGraw Hill Tokyo. 4th Edition	1977
3	Agarwal. S.K	Water Pollution	APH Publishing	2005
4	Chakrabarty, B.N.	Industrial Chemistry	Oxford & IBH Publishing Co., New Delhi.	1981
5	Singh, P.P. Joseph, T.M. Dhavale, R.G	College Industrial Chemistry	Himalaya Publishing House, Bombay, 4th Edition	1983
6	De. A.K.	Environmental Chemistry, 11th Edition	Wiley Eastern Ltd. Meerut.	1989

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Ms. K.Vimaladevi Ms. R. Mini Dr.V.Prabhu Ms. M. Anusuya Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Muthukumaran Signature:


CERTIFICATE
COURSE

Programme code:	M.Sc.			**Programme Title :**	MSc Chemistry
Course Code:	**CERTIFICATE COURSE-I**			**Batch**	2021-2023
21PCYCFC01	Fundamentals of Pharmaceutical Chemistry			**Semester:**	III
				Credits:	2
Lecture Hrs/Week	2	**Tutorial**	-	**Total Hrs/Sem:**	40

Course Objectives:

* To compete during their search for jobs in the pharmaceutical companies.
* To acquire the knowledge about medicinal plants and medicinally important compounds.
* To recognize the importance of Antibiotics, sulphadrugs, Analgesics.
* To analyze the Antipyretics, Antihypertensive, hypotensive and antineoplastic drugs.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	CO Outcomes	Knowledge Level
CO1	Acquire knowledge about theimportant terminologies used in pharmaceutical chemistry, naming of drugs and mechanism of drug action.	K2
CO2	Learn about medicinal plants and medicinally importantcompounds.	K4
CO3	Recognize the importance of Blood, receptor and drug design.	K5
CO4	Analyzethe Antipyretics,Antihypertensive,hypotensiveandantineoplasticdrugs.	K4
CO5	Explain receptors and drug design	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Introduction to Pharmaceutical Chemistry** Introduction Important terminologies used in pharmaceutical chemistry – pharmacology – drug – pharmocophore – antimetabolites – mutation – grams test – actinomycetes – immunological agents – vaccines – toxoids – immune – human sera – primary immunization – routes of drug administration – additive effect – synergism – antagonism – placebo – important drugs which cause dependence – dosage – mechanism of drug action – factors influencing the metabolism of drugs – principles of bio assay – encapsulation – naming of drugs.	8

Unit II	**Medicinal Plants** Medicinal plants and medicinally important compounds Indian medicinal plants – medicinal plants incure of diseases – spices as medicines – medicinal plants in the kitchen garden – plant poisoning –medicinally important compounds of Mg, Al, P, As, Hg and Fe-testing cholesterol in serum-estimationofbilirubinin serum– estimation ofureain serumand estimation ofinorganicchloridesinblood serum.	8
Unit III	**Clinical Chemistry** Blood: Composition of blood – estimation of haemoglobin – red cell count. Diagnostic tests in Serum: Na and K salts, chlorides and cholesterol. Estimation Methods: Determination of sugar (glucose) in serum – Folin and Wu's method, Determination of serum cholesterol – Sackett's method for total cholesterol. Estimation of glucose in urine – Benedict's test.	8
Unit IV	**Analgesics and Antipyretics** Analgesics and Antipyretics Introduction to pharmaceutical chemistry analgesics – Morphine analogues and its modification – Codeine – Synthetic narcotic analgesiscs – Pethidines and methadones – Narcotic antagonists – Nalorphine – Antipyretic analgesics – pyrazoles – salicylic acid – paraaminophenol derivatives – Aspirin and salol hypnotics and sedatives – Barbiturates –Benzodiazipines.	8
Unit V	**Receptors and Drug Design** Receptor: Nature of receptors, criteria for receptor identity, types of drug-receptor binding interactions. Drug design: introduction – identification of lead compound by serendipity, endogenous sources, exogenous sources, rational drug design, screening. Optimization of lead compound: analog synthesis. QSAR: Hammett equation, Taft equation and Hansch equation. Clinical trials.	8
	Total Contact Hrs	**40**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

21PCYCFC01

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Berger	Medicinal Chemistry	A, Wiley interscience, New York, Volume I and II,	1990.
2	AsutoshKar	Medicinal Chemistry	Wiley Eastern Ltd, Chennai,	1992

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Bentley Driver‘s	Textbook of Pharmaceutical Chemistry		1985
2	Wilson, O. Giswold George.F	Textbook of Organic medicinal and pharmaceutical chemistry,	Philadelphia,	1991

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

https://nptel.ac.in/courses/104/106/104106106/

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.K.Poonkodi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature:

Programme code:	M.Sc.			Programme Title :	MSc Chemistry
Course code 21PCYCFC02	CERTIFICATE COURSE-II			Batch:	2021-2023
	Phytochemical Techniques and Health Chemistry			Semester:	IV
				Credits:	2
Lecture Hrs/Week	2	Tutorial	-	Total Hrs/Sem:	40

Course Objectives

* To enable post graduate students in Chemistry to gain knowledge on phyto chemical techniques.
* To enable them to be familiar with techniques of extraction, separation and purification and simple identification strategies of drugs/natural products.
* To acquaint with health and hygiene food system along carbohydrates and vitamins.
* To learn the mode of mechanism for common diseases.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

#	CO Outcomes	Knowledge Level
CO1	Understanding on necessity and role of carbohydrates and vitamins for	K2
CO2	Remember the phytochemical techniques -extraction, separation and	K2
CO3	Implement the basic values and analyze the functions of food, food pyramid and hygiene food system.	K3
CO4	Evaluate the mechanism for biological function of carbohydrates and vitamins.	K4
CO5	Analyze the mechanism and causes of common diseases.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

Units	Content	Hrs
Unit I	**Extraction strategies of drugs/natural products** **Extraction Techniques** Cold and hot extraction methods, liquid-liquid extraction techniques, liquid-carbon dioxide extraction, concentration and evaporation techniques, lyophilisation, principles and technique of simple distillation -reduced pressure distillation- fractional distillation- steam distillation-rotary evaporation and centrifugation.	8

Unit II	**Separation Techniques of drugs/natural products** **Separation Techniques** – Simple crystallization- experimental aspects – solvents for crystallization. Special methods– flavanoid, pigment extraction - GC-MS, LC-MS- identification of phytochemicals by NIST Library.	8
Unit III	**Purification Techniques of drugs/natural products** **Purification Techniques** – Preliminary methods of identification of extracts – Cermin chemical aspects-colour tests – TLC and fluorescent characteristics, proximate methods.Theory of melting and freezing – melting point and vapour pressure., Biological assays- antibacterial, antifungal, antioxidant and invitro anticancer activities.	8
Unit IV	**Health** Definition: - Food, Food Pyramid, Health, Hygiene, mal under over nutrition, their causes and remedies, sanitation. Carbohydrates: Classification, biological functions,Vitamins: Classification, biological functions.	8
Unit V	**Common diseases** Toxicants in food cancer, types and causes, common diseases- jaundice, vomiting, fever, rickets, scurvy, beriberi, pellagra, gout, goiter, diabetes anemia, night blindness, ulcer, their causes.	8
	Total Contact Hrs	**40**

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar, Quiz, Assignment, Experience Discussion, Brain storming activity and flip class.

21PCYCFC01

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Harborne. J. B	Phytochemical methods-A guide to modern techniques of Plant analysis, 3rd edition,	Springer publication.	2008

2	Ahluwalia & Madhu Chopra. V.K	Medicinal Chemistry	Ane Books India	2008
3	Ashutosh kar	Medicinal Chemistry, 5th Edition	New Age international publishers	2010
4	Jayashree Ghosh	A Textbook of Pharmaceutical Chemistry	S. Chand and Co. Ltd.	1999
5	Alex V Ramani	Food Chemistry	MJP Publishers, Chennai.	2009
6	Satake M and MidoY	Chemistry for the Health Science	Discovery Publishing House, New Delhi.	2003

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Graham L. Patrick	An Introduction to Medicinal Chemistry, 4th Indian Edition	Oxford Publishers.	2009
2	Krishnaswamy. N. R	Chemistry of Natural Products, 2nd Edition	An Unified Approach, Unified Press.	2010
3	Krishnaswamy. N. R	Chemistry of Natural Products A Laboratory Handbook,1st Edition	University press India Pvt. Ltd.	2003

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.V.Prabhu Dr.K.Poonkodi Signature:	Name: Dr.K.Poonkodi Signature:	Name: Mr.K.Srinivasan Signature:	Name: Dr.R.Manicka Chezhian Signature: