

# PG DEPARTMENT OF CHEMISTRY

## SYLLABUS

2022-2024 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**

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**

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

<b>PEO1</b>	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.
<b>PEO2</b>	To qualify State, National and International eligibility exams to carry out research in National/International institutes.
<b>PEO3</b>	To pursue successful professional careers in the chemical industry, government, academia, national and international research institutions as innovative scientists.
<b>PEO4</b>	To develop leaders, entrepreneurs and professional employees in contemporary and also global outlook.
<b>PEO5</b>	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 must be able to**

<b>PO1</b>	<b>Disciplinary knowledge and skills:</b> Capable of demonstrating (i) comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in chemistry and its different subfields (analytical, inorganic, organic and physical), and other related fields of study, including broader interdisciplinary subfields such as life science, environmental science and material sciences; (ii) ability to use modern instrumentation for chemical analysis and separation.
<b>PO2</b>	<b>Skilled communicator:</b> Ability to transmit complex technical information relating to chemistry in a clear and concise manner in writing and orally skills.

<b>PO3</b>	<b>Critical thinker and problem solver:</b> Ability to employ critical thinking and efficient problem solving skills in the four basic areas of chemistry (analytical, inorganic, organic, and physical).
<b>PO4</b>	<b>Sense of inquiry:</b> Capability for asking relevant/appropriate questions relating to issues and problems in the field of chemistry, and planning, executing and reporting the results of an experiment or investigation.
<b>PO5</b>	<b>Team player/ lifelong learners:</b> Capable of working effectively in diverse teams in both classroom, laboratory and in industry and field-based situations as well as Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling.
<b>PO6</b>	<b>Skilled project manager:</b> Capable of identifying/mobilizing appropriate resources required for a project, and manage a project through to completion, while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.
<b>PO7</b>	<b>Digital literacy:</b> Capable of using computers for chemical simulation and computation and appropriate software for analysis of data, and employing modern library search tools to locate, retrieve, and evaluate chemistry-related information.
<b>PO8</b>	<b>Ethical awareness/reasoning:</b> Avoiding unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, and appreciate environmental and sustainability issues.

## Programme Specific Outcomes

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

<b>PSO – 01</b>	Become Proficient in synthetic, analytical, electrochemistry, Phytochemistry, spectral techniques, characterization to develop interdisciplinary approach.
<b>PSO – 02</b>	Develop new innovations in chemical, pharmaceutical and allied chemical industries and successfully implement them at an industrial scale.

## Mapping

PEOs POs \ PSOs	PEO1	PEO2	PEO3	PEO4	PEO5
<b>PO1</b>	H	H	H	H	H
<b>PO2</b>	M	H	M	H	H
<b>PO3</b>	H	M	H	H	H
<b>PO4</b>	H	H	H	H	H
<b>PO5</b>	H	H	M	H	H
<b>PO6</b>	H	M	H	H	H
<b>PO7</b>	H	H	H	H	H
<b>PO8</b>	H	H	M	H	H
<b>PSO1</b>	H	M	H	H	H
<b>PSO2</b>	H	M	H	H	H



## SCHEME OF SYLLABUS & EXAMINATION



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### 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	22PCY101	Inorganic Chemistry –I- Solid State and Nuclear Chemistry	5	--	75	3	50	50	100	4
	22PCY102	Organic Chemistry – I- Organic Reaction Mechanisms	5	--	75	3	50	50	100	5
	22PCY103	Physical Chemistry – I- Group Theory and Chemical Kinetics	5	--	75	3	50	50	100	5
	22PCY207	Inorganic Chemistry Practical-I	--	5	75	--	--	--	--	--
	22PCY208	Organic Chemistry Practical-I	--	5	75	--	--	--	--	--
	22PCY209	Physical Chemistry Practical –I	--	5	75	--	--	--	--	--
<b>Total</b>			<b>15</b>	<b>15</b>	<b>450</b>	<b>9</b>	<b>150</b>	<b>150</b>	<b>300</b>	<b>14</b>

## 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	22PCY204	Inorganic Chemistry –II- Coordination Chemistry	5	--	75	3	50	50	100	4
	22PCY205	Organic Chemistry-II –Organic Reactions and Stereochemistry	5	--	75	3	50	50	100	5
	22PCY206	Physical Chemistry-II – Quantum Chemistry and Nano Chemistry	5	--	75	3	50	50	100	4
	22PCY2E1	*Major Elective –I – Green Chemistry, Research Methodology & Cyber Security	3	--	45	3	50	50	100	3
	22PCY2E2	*Food Science and Technology								
	22PCY2E3	* Advanced Polymeric Materials								
	22PCY2N1	*Non Major Elective Chemistry in day to day life	2		30	3	--	100	100	2
	22PCY207	Inorganic Chemistry Practical –I	--	4	60	6	50	50	100	4
	22PCY208	Organic Chemistry Practical-I	--	3	45	6	50	50	100	4
22PCY209	Physical Chemistry Practical –I	--	3	45	6	50	50	100	4	
<b>Total</b>			<b>20</b>	<b>10</b>	<b>450</b>	<b>33</b>	<b>350</b>	<b>450</b>	<b>800</b>	<b>30</b>



### 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	22PCY310	Organic Chemistry –III– Natural Products and Organic Reagents	5		75	3	50	50	100	5
	22PCY311	Physical Chemistry –III –Classical and Statistical Thermodynamics	5		75	3	50	50	100	4
	22PCY312	Organic Spectroscopy	5		75	3	50	50	100	5
	22PCY3E4	Major Elective -II – *Organometallic Chemistry	3		45	3	50	50	100	3
	22PCY3E5	* Nanoscience and Nanotechnology								
	22PCY3E6	*Dye Chemistry								
	22PCY3AL	Applied Chemistry (Optional)	-	-	-	3	-	100	100	Grade**
	22PCY415	Inorganic Chemistry Practical-II	--	4	60	--	--	--	--	--
22PCY416	Organic Chemistry Practical–II	--	4	60	--	--	--	--	--	
22PCY417	Physical Chemistry Practical–II	--	4	60	--	--	--	--	--	
<b>Total</b>			<b>18</b>	<b>12</b>	<b>450</b>	<b>15</b>	<b>200</b>	<b>300</b>	<b>500</b>	<b>17</b>

## 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	22PCY413	Inorganic Chemistry –III- Bioinorganic chemistry	5	--	75	3	50	50	100	5
	22PCY414	Instrumental Methods of Chemical Analysis	5	--	75	3	50	50	100	4
	22PCY4E7	*Major Elective –III- Phytochemical Techniques and Health Chemistry	3		45	3	50	50	100	3
	22PCY4E8	*Computational Chemistry								
	22PCY4E9	*Green Chemistry								
	22PCY415	Inorganic Chemistry Practical-II	--	5	75	6	50	50	100	4
	22PCY416	Organic Chemistry Practical-II	--	5	75	6	50	50	100	4
	22PCY 417	Physical Chemistry Practical –II	--	5	75	6	50	50	100	4
	22PCY 4P1	Project Work & Viva Voce	--	-	-	6	50	50	100	5
		Library	2							
* Students can choose any one of the papers as electives										
<b>Total</b>			<b>15</b>	<b>15</b>	<b>420</b>	<b>33</b>	<b>350</b>	<b>350</b>	<b>700</b>	<b>29</b>
<b>Grand Total ( Total Marks + Total Credits)</b>									<b>2200+100</b>	<b>90</b>

## LIST OF ELECTIVES

SEMESTER	SUBJECT CODE & TITLE
<b>II</b>	<b>MAJOR ELECTIVE-I</b> 22PCY2E1 – Green Chemistry, Research Methodology & Cyber Security 22PCY2E2 - Food Science and Technology 22PCY2E3 - Advanced Polymeric Materials
<b>III</b>	<b>MAJOR ELECTIVE-II</b> 22PCY3E4 - Applied Electrochemistry 22PCY3E5 - Nanoscience and Nanotechnology 22PCY3E6 - Dye Chemistry
<b>IV</b>	<b>MAJOR ELECTIVE-III</b> 22PCY4E7 - Phytochemical Techniques and Health Chemistry 22PCY4E8 – Computational Chemistry 22PCY4E9 - Green Chemistry

### CO-SCHOLASTIC COURSES

#### ADVANCED LEARNERS (Optional)

S. No	Semester	Course	Hours/ Week	Total Hours	Internal Marks	External Marks	Total Marks	Credits
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#### ONLINE COURSES

1	I/II	Swayam, MOOC Course etc.,	-	-	-	-	-	2*
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#### VALUE ADDED COURSES

2	II & IV	Value Added Course-I <b>22PCY2VA- Entrepreneurial Ventures in Chemistry</b>	2	30	25	25	50	2*
3	II & IV	Value Added Course-II <b>22PCY4VA-Analytical techniques</b>	2	30	25	25	50	2*

#### CERTIFICATE COURSES (Optional)

4	III	Certificate Course-I <b>22PCYCFC01-Fundamentals of Pharmaceutical Chemistry</b>	2	40	50	50	100	2*
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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: 50 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	<b>50</b>
K3 (Q 11-15)	B (Either or pattern)	5 x 3 = 15	Short Answers	
K4 & K5 (Q 16 – 20)	C (Either or pattern)	5 x 5 = 25	Descriptive/ Detailed	

### 2. Theory Examinations: 100 Marks (NME)

Knowledge Level	Section	Marks	Description	Total
K3 (Q 1 -8)	A (Q 1 – 8) Answer any Five	5 x 5 = 25	Short Answers	<b>100</b>
K4 & K5 (Q 9-16)	B (Q 9 – 16) Answer any Five	5 x 15 = 75	Descriptive/ Detailed	

### 3. Practical Examinations: 100/50 Marks

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

## Components of Continuous Assessment

### THEORY

**Maximum Marks: 100; CIA Mark: 50**

Components		Calculation	CIA Total
Test 1	(50 / 3.33) = 15	15+15+10+05+05	50
Test 2 / Model	(50 / 3.33) = 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
<b>Viva Voce</b>	<b>Total – 20 marks</b>
Presentation	10 Marks
Discussion	10 Marks

**STUDENT SEMINAR EVALUATION RUBRIC**

Grading Scale:

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>5</b>	<b>4</b>	<b>2 - 3</b>	<b>0 - 1</b>

<b>CRITERIA</b>	<b>A - Excellent</b>	<b>B – Good</b>	<b>C - Average</b>	<b>D - Inadequate</b>
<b>Organization of presentation</b>	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
<b>Knowledge of subject &amp; References</b>	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
<b>Presentation Skills using ICT Tools</b>	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
<b>Eye Contact</b>	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
<b>Elocution – (Ability to speak English language)</b>	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:

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

<b>CRITERION</b>	<b>A – Excellent</b>	<b>B – Good</b>	<b>C - Average</b>	<b>D - Below Average</b>	<b>F - Inadequate</b>
<b>Content &amp; Focus</b>	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
<b>Sentence Structure &amp; Style</b>	<ul style="list-style-type: none"> <li>* Word choice is rich and varies</li> <li>* Writing style is consistently strong</li> <li>* Students own formal language</li> </ul>	<ul style="list-style-type: none"> <li>* Word choice is clear and reasonably precise</li> <li>* Writing language is appropriate to topic</li> <li>* Words convey intended message</li> </ul>	<ul style="list-style-type: none"> <li>* Word choice is basic</li> <li>* Most writing language is appropriate to topic</li> <li>* Informal language</li> </ul>	<ul style="list-style-type: none"> <li>* Word choice is vague</li> <li>* Writing language is not appropriate to topic</li> <li>* Message is unclear</li> </ul>	* Not adequate
<b>Sources</b>	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 all cited
<b>Neatness</b>	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
<b>Timeliness</b>	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



<b>Programme Code:</b>	M.Sc		<b>Programme Title:</b>		Master of Chemistry		
<b>Course Code:</b>	22PCY101		Inorganic Chemistry –I- Solid State and Nuclear Chemistry		<b>Batch:</b>	2022 - 2024	
					<b>Semester:</b>	I	
<b>Lecture Hrs./Week</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/ Sem</b>	75	<b>Credits:</b>	4

#### Course Objectives

- \* To gain knowledge in solid state Chemistry.
- \* To emphasize the significance of crystallographic properties and description of crystal structures.
- \* To acquire awareness about the defects in crystal structure and its effect in electrical properties
- \* 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	Student will know through knowledge about the basics of solid state chemistry, X-ray crystal structure of the compounds	K2
CO2	Student will understand the various types of close packing arrangements of different solid structures.	K2
CO3	Distinguish the types of solids, their defects and electrical properties of solids.	K4
CO4	Evaluate n/p ratio, binding energy and Q-value of nuclear reactions.	K4
CO5	Apply the nuclear chemistry principles and its application in various fields.	K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Solid State Chemistry –I</b> The growth and form of crystals - the crystal systems and Bravais lattices - Miller indices and labelling of planes - symmetry properties - crystallographic point groups and space groups - fundamentals of X-ray diffraction - powder and rotating crystal methods - systematic absences and determination of lattice types - analysis of X-ray data for cubic system - structure factor and Fourier synthesis - electron and neutron diffraction and structure determination.	15

<b>Unit II</b>	<b>Solid State Chemistry –II</b> Types of solids - close packing of atoms and ions - bcc , fcc and hcp voids - radius ratio - derivation - its influence on structures - structures of rock salt - cesium chloride - wurtzite – zinc blende - rutile - fluorite - antiferite - diamond and graphite - spinel - normal and inverse spinels and perovskite - lattice energy of ionic crystals - Madelung constant - Born-Haber cycle and its applications.	15
<b>Unit III</b>	<b>Solid State Chemistry –III</b> Metallic state - free electron and band theories - non - stoichiometry - point defects in solids - Schottky and Frenkel defects - linear defects - dislocations - effects due to dislocations - electrical properties of solids - insulators - intrinsic semiconductors - impurity semiconductors (n and p- type) and superconductors - elementary study of liquid crystals.	15
<b>Unit IV</b>	<b>Nuclear Chemistry –I</b> 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. Radioactive isotopes - 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.	15
<b>Unit V</b>	<b>Nuclear Chemistry – II</b> 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 - 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, Disposal of Nuclear Waste.	15
	<b>Total contact Hrs</b>	<b>75</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**Text Book****22PCY101**

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, 41 <sup>st</sup> edition	2006
2	Gurdeep Raj	Advanced Inorganic Chemistry, Vol-I	Geol Publishing House, 12 <sup>th</sup> Edition	2014
3	Madan. R.D	Advanced Inorganic Chemistry, Vol-I	S. Chand & company, New Delhi, 3 <sup>rd</sup> Edition	2012
4	Arnikar, H.J	Essentials of Nuclear Chemistry	New Age International, 4 <sup>th</sup> Edition	2000

**Reference Books**

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	James E. Huheey Ellen A. Keiter	Inorganic chemistry	Pearson India Limited. 4 <sup>th</sup> Edition	2006
2	Albert Cotton. F and Geoffrey Wilkinson	Advanced Inorganic Chemistry	Wiley & Sons, 6 <sup>th</sup> edition	2014
3	Anthony R. West	Solid State Chemistry and its Application	Wiley India	2011
4	Lee. J.D	Concise Inorganic Chemistry	Wiley India	2010 Reprint
5	Keith F. Purcell and John, C. Kotz	Inorganic chemistry	Holt- Saunders International Editions,	1980
6	Bodie E. Douglas, Darl H. McDaniel John J. Alexander.	Concepts and Models of Inorganic Chemistry	Wiley & Sons, 3 <sup>rd</sup> edition	1970
7	Gary L. Miessler and Tarr, D. A	Inorganic Chemistry	Pearson Publication, 3 <sup>rd</sup> edition	2004

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

<a href="#">Lecture 4 - Crystal Structure - 5 (Miller-Bravais Indices, Linear and Planar Density) - Bing video</a>
<a href="#">Calculation of X-ray Density for Cubic crystal system using Lattice parameter and Bragg's Law - YouTube</a>
<a href="#">XII- 1 # 8, Formula Of A Compound And Number Of Voids - Bing video</a>
<a href="https://nptel.ac.in/courses/104/103/104103069/">https://nptel.ac.in/courses/104/103/104103069/</a>
<a href="https://nptel.ac.in/courses/104/104/104104101/">https://nptel.ac.in/courses/104/104/104104101/</a>
<a href="https://nptel.ac.in/courses/112/103/112103243/">https://nptel.ac.in/courses/112/103/112103243/</a>

**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 Dr.V. Prabhu Mrs. M.Anusuya  Signature:	Name: Dr.K.Poonkodi  Signature:	Name: Mr.K.Srinivasan  Signature:	Name: Dr.R.Manicka Chezhan  Signature:

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>		Master of Chemistry	
<b>Course Code:</b>	22PCY102			Organic Chemistry –I- Organic Reaction Mechanisms		<b>Batch:</b>	2022 – 2024
						<b>Semester:</b>	I
<b>Lecture Hrs./Week</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	75	<b>Credits:</b>	5
<b>Course Objectives</b>							
* 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 mechanisms.	K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<p><b>Aromaticity</b> Aromatic character – Huckel’s Molecular orbital theory for aromaticity (HMO), concept of aromaticity and anti aromaticity – Criteria 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 and sydnone.</p> <p><b>Kinetic and Non-kinetic Methods of Determination of Reaction Mechanisms</b> Guidelines for proposing reasonable mechanism – Energetics and energy profile diagrams Reaction Mechanism: <b>Non kinetic methods</b>- Product analysis, intermediate criteria (isolation, trapping and detection) - Isotopic labeling and cross over</p>	15

	Experiments, Stereochemical evidence. <b>Kinetic methods</b> - 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.	
<b>Unit II</b>	<p><b>Electrophilic substitution reactions</b>  <b>Aromatic electrophilic substitution reactions</b>  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 &amp; acylation, Vilsmeier-Haack reaction, Gattermann-Koch reaction, Hofmann-Martius, Jacobsons reaction, Houben-Hoesch reaction, Diazonium coupling, Stork enamine reactions and Bischler-Napieralski reaction.</p> <p><b>Aliphatic electrophilic substitution reactions – Mechanism</b>  SE1, SE2, and SEi mechanism. -Factors affecting reactivity in SE reactions - Typical reactions –hydrogen exchange and migration of double bond, halogenation of carbonyl compounds.</p>	15
<b>Unit III</b>	<p><b>Nucleophilic substitution reactions</b>  <b>Aliphatic nucleophilic substitution</b>  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 <math>\sigma</math> and <math>\pi</math> bonds. Typical reactions - Wurtz reaction - Claisen and Dieckmann condensation - Williamson reactions.</p> <p><b>Aromatic nucleophilic substitution: SNAr</b> - benzyne mechanism - Zeigler alkylation - Chichibabin reaction - Rosendmund Reactions - Vonbraun reaction - Cine substitution.</p>	15
<b>Unit IV</b>	<p><b>Addition reactions</b> - Electrophilic, nucleophilic and free radical addition to double and triple bonds- hydration, hydroxylation, Michael addition, hydroboration and epoxidation. Addition reactions to carbonyl compounds – Mannich reaction, Meerwein Ponderoff- Verley reduction, Grignard, Claisen, Dieckmann, Stobbe, Knoevenagel, Darzen, Wittig, Thorpe and Benzoin reactions.</p>	15
<b>Unit V</b>	<p><b>Elimination reactions</b>-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.</p> <p><b>Reactive Intermediates:</b> Carbenes and nitrenes-structure, generation and reactions.</p>	15
	<b>Total Contact Hrs</b>	<b>75</b>

### Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

### Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

**Text Book****22PCY102**

<b>S.NO</b>	<b>AUTHOR</b>	<b>TITLE OF THE BOOK</b>	<b>PUBLISHERS \ EDITION</b>	<b>YEAR OF PUBLICATION</b>
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	Mukherjee, S.M and Singh, S.P.	Reaction Mechanism in Organic Chemistry	New Age International Publishers, 10 <sup>th</sup> Edition,	2004
4	Ahluwalia, V.K. Rakesh K. Parashar	Organic Reaction Mechanisms	Narosa Publishing House. 4th Edition.	2010
5	Jagadamba Singh and Yadav, L.D.S	Advanced Organic Chemistry	Pragati prakasham publishers. 20 <sup>th</sup> Edition.	2014

**Reference Books**

<b>S.NO</b>	<b>AUTHOR</b>	<b>TITLE OF THE BOOK</b>	<b>PUBLISHERS \ EDITION</b>	<b>YEAR OF PUBLICATION</b>
1	Agarwal, O.P.	Reactions and Reagents in Organic Chemistry	Goel publishing house. 49th Edition.	2014
2	Tewari, Vishnoi, K.S	Text book of Organic Chemistry	Vikas Publishing House, 3 <sup>rd</sup> Edition	2006
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, 6 <sup>th</sup> edition	2014
5	Ahluwalia. V.K	Organic Chemistry Fundamental concepts,	Narosa Publishing House	2013



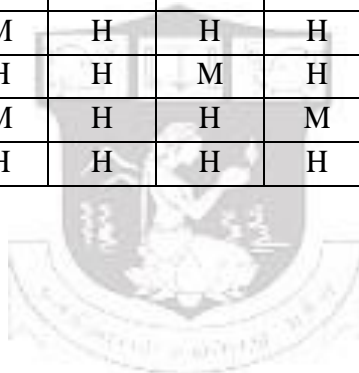
**Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]**

<a href="https://www.youtube.com/watch?v=T1ePwEQ4Fa0">https://www.youtube.com/watch?v=T1ePwEQ4Fa0</a>
<a href="https://www.youtube.com/watch?v=QkQUJhJYPA0">https://www.youtube.com/watch?v=QkQUJhJYPA0</a>
<a href="https://www.youtube.com/watch?v=hsBn-BxuNOM">https://www.youtube.com/watch?v=hsBn-BxuNOM</a>
<a href="https://www.youtube.com/watch?v=RtV_JxzZoss">https://www.youtube.com/watch?v=RtV_JxzZoss</a>
<a href="https://www.youtube.com/watch?v=-D8tYR3LTsI">https://www.youtube.com/watch?v=-D8tYR3LTsI</a>
<a href="https://nptel.ac.in/courses/104/101/104101115/">https://nptel.ac.in/courses/104/101/104101115/</a>
<a href="https://nptel.ac.in/courses/104/103/104103110/">https://nptel.ac.in/courses/104/103/104103110/</a>
<a href="https://nptel.ac.in/courses/104/101/104101005/">https://nptel.ac.in/courses/104/101/104101005/</a>

**Mapping**

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

H-High; M-Medium; L-Low



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

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>	Master of Chemistry		
<b>Course Code:</b>	22PCY103			Physical Chemistry –I – Group Theory and Chemical Kinetics	<b>Batch:</b>	2022 - 2024	
					<b>Semester:</b>	I	
<b>Lecture Hrs./Week</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	75	<b>Credits:</b>	5
<b>Course Objective</b>							
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Group theory-I</b> 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- Abelian group, Non - abelian group, sub group, isomorphic group - similarity transformation and classes. Point group classification- identification of point groups of simple molecules - group multiplication table ( $C_{2v}$ and $C_{3v}$ point group) – Definition of matrix, square, diagonal, null, unit, row, column, symmetric matrices - Matrix multiplication (Commutative and non-Commutative)	15

	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 $C_{2v}$ and $C_{3v}$ point groups (use of vectors) construction of character tables for $C_{2v}$ and $C_{3v}$ point groups.	
<b>Unit II</b>	<p><b>Group theory-II</b></p> <p>Reducible and Irreducible representations – The Great Orthogonality Theorem and its consequences (statement only, proof not needed)- Determination of the characters for irreducible representation of <math>C_{2v}</math> and <math>C_{3v}</math> 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.</p> <p>Symmetry selection rule for IR, Raman spectra, rotational spectroscopy and Mutual Exclusion Principle - infrared spectral activity of vibrational modes in <math>NH_3</math> and <math>H_2O</math> molecules - classification of vibrational modes - application of group theory to bonding: hybridization scheme for orbital in simple molecules - <math>AB_4</math> (<math>T_d</math>, <math>CH_4</math>), <math>AB_5</math> (<math>D_{3h}</math> <math>Fe(CO)_5</math>) and <math>AB_6</math> (<math>O_h</math> <math>[Co(NH_3)_6]^{3+}</math>).</p>	15
<b>Unit III</b>	<p><b>Chemical Kinetics-I</b></p> <p>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.</p> <p>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.</p>	15
<b>Unit IV</b>	<p><b>Chemical Kinetics-II</b></p> <p>Chain Reactions - general characteristics - Experimental methods of fast reactions - shock tubes and pulse radiolysis techniques - kinetics of decomposition of <math>N_2O_5</math>, <math>H_2-Cl_2</math>. Photochemical reactions and <math>H_2-Br_2</math> thermal reaction - non-stationary chain reaction - <math>H_2-O_2</math> reaction and explosion limits. Effect of temperature, relative permittivity, ionic strength and solvent (Grunwald-Winstein equation) on reaction rates.</p>	15

<b>Unit V</b>	<b>Surface Chemistry</b> Basic concepts of Micelles and Reverse Micelles - 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.	15
<b>Total Contact Hrs</b>		<b>75</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**Text Book****22PCY103**

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, 3 <sup>rd</sup> Edition.	2008
2	Laidler. K. J	Chemical Kinetics	Pearson Education India, 3 <sup>rd</sup> Edition.	2003
3	Gopinathan, M. S. and Ramakrishnan, V	Group Theory in Chemistry	Vishal Publishers, 2 <sup>nd</sup> 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	Adamson A.M.	Physical Chemistry of Surfaces	John Willey, UK, 5th Edition	2002
2	Raman, K.V.	Group Theory and its applications to chemistry	Tata McGraw Hill publishing company Ltd, 3 <sup>rd</sup> reprint.	2000

3	Bhattacharya, P.K.	Group theory and its chemical applications, second edition.	Himalaya Publishing House, 2 <sup>nd</sup> edition	2020
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### Related Online Contents [MOOC, SWAYAM, NPTEL, Websites]

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

### Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
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 Chezhan  Signature:

<b>Programme code:</b>	M.Sc.			<b>Programme Title :</b>	Master of Chemistry		
<b>Course Code:</b>	22PCY204			Inorganic Chemistry - II Coordination Chemistry	<b>Batch :</b>	2022-2024	
					<b>Semester</b>	II	
<b>Lecture Hrs./Week</b>	5	Tutorial	-	<b>Total Hrs/ Sem</b>	75	<b>Credits:</b>	4
<b>Course Objectives</b>							
* Acquire knowledge about theories of complexes, basics of electronic spectroscopy of transition metal complexes, mode of coordination with various geometry.							
* To apply the knowledge of coordination chemistry to research and analyze the term symbols.							
* Realize the importance of the important inorganic polymers and their applications.							

### Course Outcomes (CO)

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

#	Course Outcomes (CO)	Knowledge Level
CO1	Understand the various concepts of coordination chemistry and realize the importance of electronic spectroscopy and magnetic properties of coordination compounds.	K2
CO2	Gaining the knowledge on various types of inorganic reaction mechanism in different geometries.	K2
CO3	Acquiring knowledge on various types of electron transfer mechanism of metalcomplexes and their importance.	K3
CO4	Inferring various symmetries/geometries of coordination complexes and their isomerism and important applications of some inorganic polymers.	K4
CO5	Prepare some important coordination complexes as catalyst for reactions.	K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Coordination Chemistry - I</b> Theories of coordination compounds - valence bond theory - crystal field theory - splitting of d orbitals in different symmetries - crystal field stabilization energy - factors affecting the magnitude of $10 Dq$ - evidence for crystal field stabilization - spectrochemical series - site selection in spinels - tetragonal distortion from octahedral symmetry - Jahn-Teller distortion - molecular orbital theory - octahedral complexes - tetrahedral and square planar complexes - $\pi$ bonding and molecular orbital theory - experimental evidence for $\pi$ bonding.	15

<b>Unit II</b>	<p><b>Coordination Chemistry - II</b></p> <p>Quantum number of multi electron atoms- R-S coupling and micro states- ground state terms of <math>d^n</math> - Hund's rule in determination of low energy states - electronic spectra of coordination compounds - selection rules - band intensities and band widths - energy level diagrams of Orgel and Tanabe - Sugano - spectra of <math>Ti^{3+}</math>, <math>V^{3+}</math>, <math>Ni^{2+}</math>, <math>Cr^{3+}</math>, <math>Co^{2+}</math>, <math>Cr^{2+}</math> and <math>Fe^{2+}</math> - calculation of <math>10Dq</math> and <math>B</math> for <math>V^{3+}</math> (oct) and <math>Ni^{2+}</math> (oct) complexes. Magnetic properties of coordination compounds - change in magnetic properties of complexes in terms of spin orbit coupling - temperature independent paramagnetism - spin cross over phenomena.</p>	15
<b>Unit III</b>	<p><b>Coordination Chemistry - III</b></p> <p>Substitution reactions in square planar complexes - the rate law for nucleophilic substitution in a square planar complex - the trans effect - theories of trans effect - mechanism of nucleophilic substitution in square planar complexes - kinetics of octahedral substitution - ligand field effects and reaction rates - mechanism of substitution in octahedral complexes - mechanisms of redox reactions - outer sphere mechanisms - excited state outer sphere electron transfer reactions - inner sphere mechanisms - mixed valent complexes.</p>	15
<b>Unit IV</b>	<p><b>Coordination Chemistry - IV</b></p> <p>Structure of coordination compounds with reference to the existence of various coordination numbers - complexes with coordination number two - complexes with coordination number three - complexes with coordination number four - tetrahedral and square planar complexes - complexes with coordination number five - regular trigonal bipyramidal and square pyramidal - site preference in trigonal bipyramidal complexes - site preference in square planar complexes - isomerism in five coordinate complexes - coordination number six - distortion from perfect octahedral symmetry - trigonal prism - geometrical isomerism in octahedral complexes - coordination number seven and eight.</p>	15
<b>Unit V</b>	<p><b>Inorganic chains, rings, cages and clusters</b></p> <p>Inorganic chains - rings - cages and clusters - catenation - heterocatenation - intercalation chemistry - isopolyanions - heteropolyanions - borazines - phosphazenes - phosphazene polymers - ring compounds of sulphur and nitrogen - homocyclic inorganic systems - cages - boron cage compounds - metal clusters - dinuclear clusters - trinuclear clusters - tetranuclear clusters - hexanuclear clusters - structural prediction of organometallic clusters.</p>	15
<b>Total Contact Hrs</b>		<b>75</b>



**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**Text Book****22PCY204**

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	J. E. Huheey, E. A. Keiter and R. L. Keiter	Inorganic Chemistry - Principles of structure and reactivity	Addison Wesley Publishing Co, NY, Fourth Edition	1993
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, 3 <sup>rd</sup> edition.	2001
4	Cotton. F. A And Wilkinson.G	Advanced Inorganic Chemistry	Wiley Inter science 6 <sup>th</sup> edition	1999

**Reference Books**

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Lee. J.D	Concise Inorganic Chemistry	Wiley India, 4 <sup>th</sup> edition	2010
2	Gurdeep Raj	Advanced Inorganic Chemistry. 12th Edition	Geol Publishing House.	2014
3	R. Gopalan. V. Ramalingam	Concise Coordination Chemistry, 3rd edition	Vikas Publishing house pvt. Ltd.	2001

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

<a href="https://www.youtube.com/watch?v=z9CmSAV1wcY">https://www.youtube.com/watch?v=z9CmSAV1wcY</a>
<a href="https://www.youtube.com/watch?v=86rNPVAtj0Y">https://www.youtube.com/watch?v=86rNPVAtj0Y</a>
<a href="https://www.youtube.com/watch?v=oCEAN6PR3Tg">https://www.youtube.com/watch?v=oCEAN6PR3Tg</a>
<a href="https://www.youtube.com/watch?v=1V-Bu04LKM4">https://www.youtube.com/watch?v=1V-Bu04LKM4</a>
<a href="https://www.youtube.com/watch?v=4pJqBEOy_OM">https://www.youtube.com/watch?v=4pJqBEOy_OM</a>
<a href="https://www.youtube.com/watch?v=A6NeTLwKvbk">https://www.youtube.com/watch?v=A6NeTLwKvbk</a>
<a href="https://www.youtube.com/watch?v=SzfQ-DBHAec">https://www.youtube.com/watch?v=SzfQ-DBHAec</a>
<a href="https://www.youtube.com/watch?v=A32k0JAfVC4">https://www.youtube.com/watch?v=A32k0JAfVC4</a>
<a href="https://nptel.ac.in/courses/104/101/104101121/">https://nptel.ac.in/courses/104/101/104101121/</a>
<a href="https://nptel.ac.in/courses/104/101/104101090/">https://nptel.ac.in/courses/104/101/104101090/</a>
<a href="https://nptel.ac.in/courses/104/106/104106064/">https://nptel.ac.in/courses/104/106/104106064/</a>

**Mapping**

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

H-High; M-Medium; L-Low

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

<b>Programme Code:</b>	M.Sc		<b>Programme Title:</b>	Master of Chemistry			
<b>Course Code:</b>	22PCY205		Organic Chemistry –II – Organic Reactions and Stereochemistry	<b>Batch:</b>	2022 - 2024		
				<b>Semester:</b>	II		
<b>Lecture Hrs./Week</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	75	<b>Credits:</b>	5
<b>Course Objective</b>							
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<p><b>Oxidation, Reduction</b></p> <p><b>Oxidation</b> - Chromyl chloride, ozone, DDQ, dioxiranes, lead tetraacetate, selenium dioxide, DMSO with either Ac<sub>2</sub>O or oxalyl chloride, Dess-Martin reagent. Synthesis involving phase transfer catalysis (PTC), use of crown ethers, Merrifield resin, Baker's yeast, Oppenauer oxidation, Jones oxidation. Allylic oxidation - oxidation of alcohols, glycols, halides.</p> <p><b>Reduction</b> - Catalytic hydrogenation - Wilkinson catalyst, dehydrogenation, reduction with LiAlH<sub>4</sub>, aluminium tertiary butoxide, NaBH<sub>4</sub>, tertiary butoxy aluminum hydride, NaCNBH<sub>3</sub>, tributyl tin hydride, alkali metals for reduction, reductions involving hydrazines, Clemmensen and Wolffkisher reduction. DIBAL and hydroboration.</p>	15

<b>Unit II</b>	<p><b>Organic photochemistry</b> 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 - Paterno-Buchi reaction. Photochemistry of olefins - cis and trans isomerization - dimerization reactions - cycloaddition reactions - 1, 2 cycloadditions – photooxidation - Photo substitution reactions of benzene derivatives. Chemiluminescence and bioluminescence.</p>	15
<b>Unit III</b>	<p><b>Pericyclic reactions</b> 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 electrocyclic reactions - conrotatory and disrotatory motions <math>4n\pi</math> and <math>(4n+2)\pi</math> systems. Cycloadditions reactions - correlation diagram and FMO approach, <math>p2s + p2s</math>, <math>p2s + p4s</math> (Diels-Alder reaction) systems. Woodward-Hoffman selection rule for cycloaddition reactions. Sigmatropic rearrangements - analysis of sigmatropic rearrangements by FMO method - 1,3 &amp; 1,5 sigmatropic rearrangements, other sigmatropic shifts - Cope and Claisen rearrangements, Di pi methane rearrangement, ene reaction - Simple problems in pericyclic reaction.</p>	15
<b>Unit IV</b>	<p><b>Stereochemistry</b> 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 &amp; faces - stereo selective and stereo specific reactions – stereochemistry of sulfur and nitrogen compounds. Asymmetric synthesis: Cram's rule and Prelog's rule. <b>Geometrical Isomerism</b> E,Z –notation – Determination of configuration of geometrical isomers. Stereoisomerism of cyclic compounds (up to six membered ring) – aldoximes &amp; ketoximes. <b>Conformational Analysis</b> Configuration and conformation – Conformation of acyclic compounds – ethane, butane, cyclohexane, decalins - stability and reactivity in relation to conformation – perhydro phenanthrenes.</p>	15
<b>Unit V</b>	<p><b>Alkaloids</b> General methods for determination of structure of alkaloids - Structural elucidation and synthesis of morphine, reserpine, quinine, atropine, lysergic acid and nicotine.</p>	15
<b>Total Contact Hrs</b>		<b>75</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**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, 3 <sup>rd</sup> Edition	2013
2	Ahluwalia, V.K. Rakesh K. Parashar	Organic Reaction Mechanisms	Narosa Publishing House, 4 <sup>th</sup> Edition.	2010
3	Kalsi. P.S	Stereochemistry, Conformation and Mechanism	John Wiley sons, 3 <sup>rd</sup> edition.	1995
4	Nasipuri, M	Stereochemistry of Organic Compounds	New Age International, New Delhi, 3 <sup>rd</sup> Edition.	2007
5	Agarwal O. P	Natural product Chemistry	Goel Publishing house, 20 <sup>th</sup> Edition	2001
6	Jagadambal Singh	Advanced Organic Chemistry	Pragati prakasham publishers, 20 <sup>th</sup> Edition.	2014
7	Eliel, E.L	Stereochemistry of Carbon Compounds	McGraw Hill, New Delhi, 1 <sup>st</sup> Edition.	2013
8	Viswanathan, B. & Aulice Scibioh, M	Photoelectrochemistry – Principles and Practices	Narosa Publishing House, New Delhi	2014
9	Finar. I.L	Organic Chemistry, Volume I & II, The fundamental principles	Pearson education Ltd, 6 <sup>th</sup> edition.	2014
10	Finar. I.L	Organic Chemistry, Volume II, The fundamental principles	Pearson education Ltd, 5 <sup>th</sup> edition.	2011

**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. Bknazarov. A	Stereochemistry	Mir Publications, Russia	1980
4	Jerry March	Advanced organic chemistry	A Wiley-Interscience, 4 <sup>th</sup> Edition.	2007

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

<a href="https://www.youtube.com/watch?v=uwia3_Her8s">https://www.youtube.com/watch?v=uwia3_Her8s</a>
<a href="https://www.youtube.com/watch?v=qB9V2uMaxA8">https://www.youtube.com/watch?v=qB9V2uMaxA8</a>
<a href="https://www.youtube.com/watch?v=Pp0LeL0SkRg">https://www.youtube.com/watch?v=Pp0LeL0SkRg</a>
<a href="https://www.youtube.com/watch?v=J_b1Y4QhhZc">https://www.youtube.com/watch?v=J_b1Y4QhhZc</a>
<a href="https://www.youtube.com/watch?v=BB1jnB-6420">https://www.youtube.com/watch?v=BB1jnB-6420</a>
<a href="https://www.youtube.com/watch?v=JROZc-9DayM">https://www.youtube.com/watch?v=JROZc-9DayM</a>
<a href="https://www.youtube.com/watch?v=wNyiJTbpOrI">https://www.youtube.com/watch?v=wNyiJTbpOrI</a>

**Mapping**

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>CO1</b>	M	M	H	H	M	M	M	M	M	M
<b>CO2</b>	H	H	H	H	H	M	M	H	H	H
<b>CO3</b>	H	H	H	H	H	M	M	H	H	M
<b>CO4</b>	M	H	H	H	H	H	H	H	M	H
<b>CO5</b>	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 Chezian  Signature:

<b>Programme Code:</b>	M.Sc		<b>Programme Title:</b>		Master of Chemistry		
<b>Course Code:</b>	22PCY206		Physical Chemistry –II - Quantum Chemistry and Nano Chemistry		<b>Batch:</b>	2022 – 2024	
					<b>Semester:</b>	II	
<b>Lecture Hrs./Week</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	75	<b>Credits:</b>	4
<b>Course Objective</b>							
* To motivate the students to comprehend knowledge in quantum mechanics.							
* To apply the quantum mechanical concept to simple molecules and experiment approximation methods.							
* To appraise the practical applications of nano material synthesis 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	To understand and analyze nano material synthetic strategy for various applications.	K3
CO5	Realize the practical applications of designing and synthesizing nano materials.	K3
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Quantum Chemistry-I</b> 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) - 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. Harmonic oscillator and rigid rotator.	15

<b>Unit II</b>	<p><b>Quantum Chemistry-II</b></p> <p>Central force problem - H-atom - method of separation of variables - final solution - the energy and wave function for the problem.</p> <p>Approximation Methods: Approximate methods in quantum mechanics and need for approximation methods. Approximation methods applicable to multi electron systems - perturbation method applicable to H atom in ground state - He atom in the ground state. Variation methods applicable to H atom in ground state - He atom in the ground state. Shapes of the wave functions and Quantum numbers.</p>	15
<b>Unit III</b>	<p><b>Quantum Chemistry-III</b></p> <p>Slater determinant - HMO treatment of simple and conjugated <math>\pi</math>- 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. Determination of bond order</p>	15
<b>Unit IV</b>	<p><b>Nano Chemistry - I</b></p> <p>Introduction- definition – types- nanoparticles, nano cluster, nano rod, nanotube (CNT) and nano wire. Properties of nano materials, Bottom up and Top down approaches - methods of preparation of nano materials – Laser ablation, chemical vapour deposition, electrodeposition, precipitation, thermolysis. Application of nanomaterials. Catalysis, environmental and biomedical (drug delivery) applications. Nano materials- Environmental hazards.</p>	15
<b>Unit V</b>	<p><b>Nano Chemistry - II</b></p> <p>Experimental Techniques for the characterization of nanomaterials - UV-Visible spectroscopy (UV-DRS), FT-IR spectroscopy, Instrumentation, principle and applications of scanning electron microscopy (SEM), transmission electron microscopy (TEM), atomic force microscopy (AFM), scanning tunnelling microscopy (STM) , ESCA, BET and Photoluminescence study.</p>	15
<b>Total Contact Hrs</b>		<b>75</b>

### Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

### Assessment Methods:

Seminar, Quiz, Assignments, Group Task.



**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, 4 <sup>th</sup> Edition	2010
2	Chandra, A.K.	Introductory Quantum Chemistry	Tata-McGraw Hill Publication Co. Ltd., New Delhi, 4 <sup>th</sup> Edition	2012
3	Ira N. Levine.	Quantum Chemistry	PHI learning Pvt. Ltd, 7 <sup>th</sup> Edition	2014
4	Puri, B.R & Sharma. L. R.	Advanced Physical Chemistry	Milestone Publishers & Distributors, 2 <sup>nd</sup> Edition	2009
5	Atkins, P. and De Paula, J.	Physical Chemistry	Oxford University Press, New Delhi, 9 <sup>th</sup> Edition	2012
6	Cao.G	Nanostructures and Nanomaterials: Synthesis, Properties and Applications,	Imperial College Press	2004
7	Pradeep.T	Nano: The Essentials in Understanding Nanoscience and Nanotechnology	Tata McGraw Hill, New York, 1st Edition	2007
8	Köhler, M. Fritzsche, W	Nanotechnology: An Introduction to Nanostructuring Techniques	WILEY-VCH Verlag GmbH & Co.,	2004
9	Bhagyaraj, S.M. Oluwafemi, O.S. Kalarikkal,N Thomas,S	Synthesis of Inorganic Nanomaterials: Advances and Key Technologies	Woodhead Publishers, Elsevier	2018

**Reference Books****22PCY206**

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Melvin W. Hanna.	Quantum Mechanics in Chemistry	Addison Wesley Longman, 2 <sup>nd</sup> Edition.	1969
2	Mc Quarrie. D.A	Quantum Chemistry	University Science Books, 2 <sup>nd</sup> Edition	2008
3	Thomas Engel	Quantum Chemistry & Spectroscopy	Pearson Education, 2 <sup>nd</sup> 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/ 1 <sup>st</sup> South Asian Edition	2015

6	Charles P. Poole, Jr. Frank J. Owens	Introduction to Nanoscience and Nanotechnology	Wiley India Pvt. Ltd, New Delhi/ Indian Edition	2021
7	Jain P C and Monika Jain	Engineering Chemistry	Dhanpat Rai Publishing Co, 16 <sup>th</sup> Edition	2015

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

<a href="https://www.youtube.com/watch?v=LnmCsNQsR68">https://www.youtube.com/watch?v=LnmCsNQsR68</a>
<a href="https://www.youtube.com/watch?v=uPvWlwOhCTo">https://www.youtube.com/watch?v=uPvWlwOhCTo</a>
<a href="https://www.youtube.com/watch?v=p82enyv3XA0">https://www.youtube.com/watch?v=p82enyv3XA0</a>
<a href="https://www.youtube.com/watch?v=gLesbQ8MPIU">https://www.youtube.com/watch?v=gLesbQ8MPIU</a>
<a href="https://www.youtube.com/watch?v=ASPuNKrCzDE">https://www.youtube.com/watch?v=ASPuNKrCzDE</a>
<a href="https://onlinecourses.nptel.ac.in/noc20_cy27/preview">https://onlinecourses.nptel.ac.in/noc20_cy27/preview</a>
<a href="https://onlinecourses.swayam2.ac.in/arp19_ap51/preview">https://onlinecourses.swayam2.ac.in/arp19_ap51/preview</a>

### 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 Chezhan  Signature:

<b>Programme Code:</b>	M.Sc		<b>Programme Title:</b>	Master of Chemistry			
<b>Course Code:</b>	22PCY2E1		Major Elective –I: Green Chemistry, Research methodology and Cyber Security	<b>Batch:</b>	2022 - 2024		
				<b>Semester:</b>	II		
<b>Lecture Hrs./Week</b>	3	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	45	<b>Credits:</b>	3
<b>Course Objective</b>							
* 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	Understand the principles and tools of green chemistry.	K2, K3
CO2	Recollect the hazardous effect of chemicals and solvents used in laboratory.	K3
CO3	Ability to write a good research report.	K5
CO4	Get the idea about cyber security.	K3
CO5	Apply the ideas of legal and ethical issues for cybercrime and plagiarism.	K4
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Green Chemistry Principles</b> Definition, need of green chemistry, twelve basic principles of green chemistry- planning a green synthesis in a chemical laboratory- solvent-less reactions, selection of appropriate solvent, use of microwaves-fundamentals of closed-vessel heating and sonication. Atom efficient processes and atom efficiency, atom economy (with specific reaction).	9
<b>Unit II</b>	<b>Greener Reactions</b> 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).	9

<b>Unit III</b>	<p><b>Research Methodology</b></p> <p><b>Concepts of Research</b> - 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 mark, Copyrights, Plagiarism. Web of science, Scopus, citations-Science citation index- H – Index, I-10 Index.</p> <p><b>Scientific Writing</b></p> <p>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.</p>	13
<b>Unit IV</b>	<p><b>Over view of cyber security</b></p> <p>Confidentiality, integrity and availability <b>Threats:</b> Malicious software (viruses, Trojans, root kits, worms, and botnets), Memory exploits (buffer overflow, heap overflow, integer overflow, format string).</p> <p><b>Cryptography-</b> Authentication, password system- windows security.</p>	7
<b>Unit V</b>	<p><b>Network security:</b> Network intrusion detection and prevention system, firewalls.</p> <p><b>Software security:</b> Vulnerability auditing, penetration testing, sandboxing, control flow integrity – <b>web security:</b> user authentication- Legal and ethical issues: trade secret, hacking and intrusion, privacy, identity theft- Legal and ethical issues and Cybercrime.</p>	7
<b>Total Contact Hrs</b>		<b>45</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**Text Book****22PCY2E1**

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	Asim K. Das	Environmental Chemistry with Green Chemistry	Arunabha sen books and allied Pvt. Limited.	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, 2 <sup>nd</sup> 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	Rashmi Sanghi & M. M. Srivastava	Green Chemistry – Environment friendly alternatives	Narora Publishing House,	2003
2	Singh, Y.K,Nath, R	Research Methodology	APH Publishing Corporation, 1 <sup>st</sup> 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]

<a href="https://youtu.be/ooJSgsB5fIE">https://youtu.be/ooJSgsB5fIE</a>
<a href="https://youtu.be/iy_h0tr_CMc">https://youtu.be/iy_h0tr_CMc</a>
<a href="https://youtu.be/E03gh1huvW4">https://youtu.be/E03gh1huvW4</a>
<a href="https://www.youtube.com/watch?v=Yzf13rtF0SM">https://www.youtube.com/watch?v=Yzf13rtF0SM</a>
<a href="https://www.youtube.com/watch?v=zL356VB1cDA">https://www.youtube.com/watch?v=zL356VB1cDA</a>
<a href="https://www.youtube.com/watch?v=C2pN3I2BGc4">https://www.youtube.com/watch?v=C2pN3I2BGc4</a>
<a href="https://www.youtube.com/watch?v=-emrdVazBN8">https://www.youtube.com/watch?v=-emrdVazBN8</a>
<a href="https://www.youtube.com/watch?v=ooJSgsB5fIE">https://www.youtube.com/watch?v=ooJSgsB5fIE</a>
<a href="https://nptel.ac.in/courses/118/102/118102003/">https://nptel.ac.in/courses/118/102/118102003/</a>
<a href="https://nptel.ac.in/courses/121/106/121106007/">https://nptel.ac.in/courses/121/106/121106007/</a>

### Mapping

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

H-High; M-Medium; L-Low

<b>Course Designed by</b>	<b>Head of the Department</b>	<b>Curriculum Development Cell</b>	<b>Controller of the Examination</b>
<b>Name and Signature</b>	<b>Name and Signature</b>	<b>Name and Signature</b>	<b>Name and Signature</b>
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 Chezhan  Signature:

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>		Master of Chemistry	
<b>Course Code:</b>	22PCY2E2			*Major Elective –I Food Science and Technology		<b>Batch:</b>	2022 - 2024
						<b>Semester:</b>	II
<b>Lecture Hrs./Week</b>	3	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	45	<b>Credits:</b>	3
<b>Course Objective</b>							
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Physico-chemical properties of foods:</b> Moisture in Foods, Hydrogen Bonding, Bound Water, Water Activity in Foods, Determination of Moisture Content in Foods, True Solutions- Colloids and Emulsions- Dispersions, Sols, Gels, and Foams. <b>Cereals and millets:</b> 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.	9
<b>Unit II</b>	<b>Vegetables, Fruits and Milk:</b> Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments. Milk and milk products, composition, nutritive value, properties- Processing of milk.	9
<b>Unit III</b>	<b>Fleshy Foods:</b> 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. <b>Fish-</b> composition, classification, nutritive value.	9

<b>Unit IV</b>	<b>Sugar, Fats and Oil Seeds:</b> Sugar - composition, nutritive value, stages of sugar boiling. Nuts and oilseeds: classification, composition, nutritive value, uses of nuts and oilseeds. <b>Spices and condiments:</b> types, functions and uses.	9
<b>Unit V</b>	<b>Food Additives:</b> Introduction, need of food additives in food processing and preservation. Characteristics and classification of food additives. <b>Antimicrobial agents</b> - Nitrites, sulphides, sulphur dioxide, sodium chloride, hydrogen peroxide. <b>Antioxidants</b> - Introduction, mechanism of action, natural and synthetic antioxidants, technological aspect of antioxidants. <b>Sweeteners</b> - Introduction, importance, classification- natural and artificial, chemistry- technology and toxicology, consideration for choosing sweetening agents. Colors- Introduction, importance, classification- natural, artificial, and natural.	9
<b>Total Contact Hrs</b>		<b>45</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**22PCY2E2****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, 2 <sup>nd</sup> 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/ 5 <sup>th</sup> Edition	2009

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

<a href="https://www.youtube.com/watch?v=roF_CakF4Ew">https://www.youtube.com/watch?v=roF_CakF4Ew</a>
<a href="https://www.youtube.com/watch?v=QVvEue4gMLs">https://www.youtube.com/watch?v=QVvEue4gMLs</a>
<a href="https://www.youtube.com/watch?v=bfEf7YYNCdY">https://www.youtube.com/watch?v=bfEf7YYNCdY</a>
<a href="https://www.youtube.com/watch?v=3a_CPQnSh8o">https://www.youtube.com/watch?v=3a_CPQnSh8o</a>
<a href="https://www.youtube.com/watch?v=d24YJrnhw2E">https://www.youtube.com/watch?v=d24YJrnhw2E</a>
<a href="https://www.youtube.com/watch?v=2D1FkfnX7q8">https://www.youtube.com/watch?v=2D1FkfnX7q8</a>

### 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	Name: Dr.K.Poonkodi	Name: Mr.K.Srinivasan	Name: Dr.R.Manicka Chezhan
Signature:	Signature:	Signature:	Signature:

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>	Master of Chemistry		
<b>Course Code:</b>	22PCY2E3			Major Elective I – Advanced Polymeric Materials	<b>Batch:</b>	2022 – 2024	
					<b>Semester:</b>	II	
<b>Lecture Hrs./Week</b>	3	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	45	<b>Credits:</b>	3
<b>Course Objectives</b>							
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 –Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Dendrimers and hyper branched polymers:</b> 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
<b>Unit II</b>	<b>Polymer nano composites:</b> 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. Polypropylene layered silicate nano composites.	9

<b>Unit III</b>	<b>Biomedical polymers:</b> Synthesis Biomedical polymers for drug delivery Polymers as biomaterials, biomedical applications of synthetic polymers, synthetic polymers for biomedical applications, poly( $\alpha$ -hydroxyesters), poly(lacticacid), poly(anhydrides), poly(phosphazenes), controlled drug delivery, methods of drug delivery.	9
<b>Unit IV</b>	<b>Conducting polymers:</b> 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
<b>Unit V</b>	<b>Engineering plastics:</b> 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
<b>Total Contact Hrs</b>		<b>45</b>

### Pedagogy

Direct Instruction, Flipped Class, Digital Presentation
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### Assessment Methods:

Seminar, Quiz, Assignments, Group Task.
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### Text Book

22PCY2E3

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
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### 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](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 Chezhan  Signature:

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>		Master of Chemistry	
<b>Course Code:</b>	22PCY2N1			*Non Major Elective Chemistry in Day to Day Life		<b>Batch:</b>	2022 - 2024
						<b>Semester:</b>	II
<b>Lecture Hrs./Week</b>	2	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	30	<b>Credits:</b>	2
<b>Course Objective</b>							
* To understand 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Food and Medicines:</b> Medicines - Antacid - Tranquilizers (Psychotherapeutic Drugs) – Analgesics – Antipyretics – Antimicrobials – Antibiotics – Antiseptics – Disinfectants. Chemistry in Food and Cosmetics - Artificial Sweetening Agents - Food Preservatives.	7
<b>Unit II</b>	<b>Fertilizer and Pesticides:</b> 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.	8

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

### Pedagogy

Direct Instruction, Flipped Class, Digital Presentation
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### Assessment Methods:

Seminar, Quiz, Assignments, Group Task.
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### Text Book

22PCY2N1

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, 18 <sup>th</sup> 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, 2 <sup>nd</sup> Edition	2001
2	Jain and Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company, 15 <sup>th</sup> edition	2013

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

<a href="https://www.youtube.com/watch?v=kyjYsKfEz88">https://www.youtube.com/watch?v=kyjYsKfEz88</a>
<a href="https://www.youtube.com/watch?v=2sHILNzTpUU">https://www.youtube.com/watch?v=2sHILNzTpUU</a>
<a href="https://www.youtube.com/watch?v=vppFkXW7Dt8">https://www.youtube.com/watch?v=vppFkXW7Dt8</a>
<a href="https://www.youtube.com/watch?v=e8X6RNfCmVc">https://www.youtube.com/watch?v=e8X6RNfCmVc</a>

**Mapping**

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

H-High; M-Medium; L-Low

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

<b>Programme Code:</b>		M.Sc		<b>Programme Title:</b>			Master of Chemistry		
<b>Course Code:</b>		22PCY207		Inorganic Chemistry Practical –I			<b>Batch:</b>	2022 – 2024	
							<b>Semester:</b>	I & II	
<b>Lecture Hrs/Week</b>	<b>I Sem</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	<b>I</b>	75	<b>Credits:</b>	4
	<b>II Sem</b>	4				<b>II</b>	60		
<b>Course Objectives</b>									
* To equip the students with analytical skills by analyzing the given inorganic salt mixture containing two common cations and two rare cations.									
* To perform systematic qualitative analysis with the strong theoretical back ground.									
* To enable the students to prepare simple complexes by using published reactions.									

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



	Potassium trioxalatoferrate(III), Hexamine cobalt(III)chloride, Chloropentammine chromium(III)chloride, Tetrammine copper(II) Sulphate, Ammonium hexachloro stannate (IV).	
<b>C</b>	<b>Demonstration (NOT FOR ESE EXAMINATION)</b> * UV Spectroscopic analysis of Synthesized compounds.	
	<b>Total Contact Hrs</b>	<b>75 +60Hrs</b>

**Pedagogy:** Demonstration and hands on practical

### Reference Books

22PCY207

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. 2 <sup>nd</sup> Edition	1997
3	Arthur I.Vogel	Macro & Semimicro Qualitative Inorganic Analysis	Orient Long man's Ltd, 1 <sup>st</sup> Edition	1968

### Mapping

PO /PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO										
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.K. Vimaladevi	Name: Dr.K.Poonkodi	Name: Mr.K.Srinivasan	Name: Dr.R.Manicka Chezhan
Signature:	Signature:	Signature:	Signature:

<b>Programme Code:</b>		M.Sc		<b>Programme Title:</b>			Master of Chemistry		
<b>Course Code:</b>		22PCY208		Organic Chemistry Practical –I			<b>Batch:</b>	2022 – 2024	
							<b>Semester:</b>	I & II	
<b>Lecture Hrs./Week</b>	<b>I Sem</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	<b>I</b>	75	<b>Credits:</b>	4
	<b>II Sem</b>	3				<b>II</b>	45		
<b>Course Objective</b>									
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

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

	<p><b>2. Acetylation:</b> Preparation of Acetanilide from Aniline.</p> <p><b>3. Bromination:</b> Preparation of p-Bromoacetanilide from Acetanilide.</p> <p><b>4. Nitration:</b> Preparation of m-dinitrobenzene from Nitrobenzene.</p> <p><b>5. Benzoylation:</b> Preparation of Benzanilide from Aniline.</p> <p><b>6. Oxidation:</b> Preparation of Benzoic acid from Benzaldehyde.</p> <p>7. Preparation of Glucose penta acetate.</p>	
<b>C</b>	<p><b>Demonstration only</b> General methods of separation and purification of organic compounds such as:</p> <ol style="list-style-type: none"> <li>Solvent extraction</li> <li>Soxhlet extraction</li> <li>Fractional crystallization</li> <li>TLC and Column Chromatography</li> <li>Melting point of synthesized compounds</li> </ol>	
<b>D</b>	<p><b>Class work only</b></p> <ol style="list-style-type: none"> <li>Drawing the structures of organic molecules and reaction schemes by ChemDraw, Symyx Draw.</li> <li>Chemsketch. Draw the structures and generate the IR and NMR spectra of the substrates and products of synthesized compounds.</li> <li>Identification of structural pattern of organic compounds (Flavone, Isoflavone and Quinone) by taking UV spectrum (class work only).</li> </ol>	
	<b>Total Contact Hrs</b>	<b>75 +45 Hrs</b>

**Pedagogy:** Demonstration and hands on practical.

### Reference Book

22PCY208

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Gnana prakasam 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

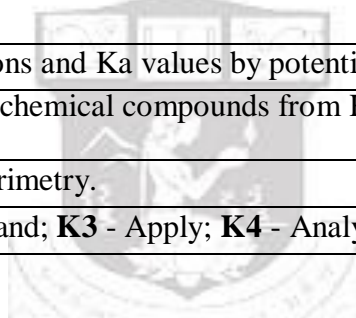
Course Designed by Name and Signature	Head of the Department Name and Signature	Curriculum Development Cell Name and Signature	Controller of the Examination Name and Signature
Name: Dr. V. Prabhu  Signature:	Name: Dr.K.Poonkodi  Signature:	Name: Mr.K.Srinivasan  Signature:	Name: Dr.R.Manicka Chezhan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

<b>Programme Code:</b>		M.Sc		<b>Programme Title:</b>			Master of Chemistry		
<b>Course Code:</b>		22PCY209		Physical Chemistry Practical –I			<b>Batch:</b>	2022 – 2024	
							<b>Semester:</b>	I & II	
<b>Lecture Hrs./Week</b>	<b>I Sem</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	<b>I</b>	75	<b>Credits:</b>	4
	<b>II Sem</b>	3				<b>II</b>	45		
<b>Course Objective</b>									
* To make the students to understand the principle and to carry out the potentiometric titrations.									
* To determine the pH and P <sup>Ka</sup> 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 <sub>f</sub> values by Rast micro method.	K4
CO5	Estimate the metal ions using colorimetry.	K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		



	Content	Hrs
<b>A</b>	<u><b>Non Electrical Experiments</b></u> <b>1. Properties of Matter</b> Simple Eutectic System- determination of unknown compositions. <b>2. Molecular weight determination</b> Determination of Molecular weight by Rast's micro method. <b>3. Partition coefficient</b> Determination of Equilibrium constant for the reaction. $KI + I_2 \leftrightarrow KI_3$	
<b>B</b>	<u><b>Electrical Experiments -Potentiometric Titrations:</b></u> <b>Acid-Base titrations</b> (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 <sup>H</sup> (acidic solutions) 8. Determination of P <sup>Ka</sup> of weak acid 9. P <sup>H</sup> , P <sup>Ka</sup> for Phosphoric acid	

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

**Pedagogy:** Demonstration and hands on practical.

**22PCY209**

### 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
<b>CO1</b>	H	H	H	M	H	H	H	H	-	-
<b>CO2</b>	H	H	M	M	M	H	H	H	M	-
<b>CO3</b>	H	H	H	H	H	M	H	H	M	-
<b>CO4</b>	H	H	H	H	H	M	M	H	H	-
<b>CO5</b>	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	Name: Dr.K.Poonkodi	Name: Mr. K. Srinivasan	Name: Dr. R. Manicka Chezian
Signature:	Signature:	Signature:	Signature:

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>	Master of Chemistry		
<b>Course Code:</b>	22PCY310			Organic Chemistry –III – Natural Products and Organic Reagents	<b>Batch:</b>	2022 – 2024	
					<b>Semester:</b>	III	
<b>Lecture Hrs./Week</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	75	<b>Credits:</b>	5
<b>Course Objective</b>							
* 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
<b>Unit I</b>	<b>Terpenoids</b> Introduction –isolation and classification of terpenoids – isoprene rule, gem-dialkyl rule. Structural elucidation and synthesis of zingiberene, eudesmol, abeitic acid and caryophyllene, $\alpha$ -pinene, $\alpha$ -santonin, Linalool. Biosynthesis of mono and di terpenoids.	15
<b>Unit II</b>	<b>Steroids</b> Introduction- Structural elucidation of cholesterol (synthesis not required), ergosterol, Vitamin-D, Bile acid, testosterone, equilenin and progesterone, Estrogen.	15

<b>Unit III</b>	<p><b>Retrosynthetic analysis, protection and deprotection</b></p> <p>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 acyclic 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-NH<sub>2</sub> and R-COOH.</p>	15
<b>Unit IV</b>	<p><b>Molecular rearrangements</b></p> <p>Introduction- Wagner Meerwein rearrangements, dienonephenol, Wolf, Favorski, Neber rearrangement, Baeyer- Villigerrearrangement, Stevens, Chapman, Benzidine, Fries, Arndt Eister synthesis, Lossen and Wallac rearrangements, Curtius, Hoffmann-Lofller- Freytag, Demjanov, Von-Richter rearrangement, Sommelet-Hauser rearrangement, Smiles rearrangement.</p>	15
<b>Unit V</b>	<p><b>Reagents in organic synthesis</b></p> <p>Gilman's 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 (dicyclohexyl carbodiimide), NBS, PCC, PDC, Wilkinson's catalyst, Tri-n-butyl tin hydride.</p> <p><b>Heterocyclic compounds:</b> Structure, synthesis and reactions of flavones, isoflavones, purines (adenine and guanine) and anthocyanins (cyanin and pelargonin). Structural elucidation of caffeine, Uracil, Cytosine and thymine.</p>	15
<b>Total Contact Hrs</b>		<b>75</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**Text Book****22PCY310**

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, 20 <sup>th</sup> 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 Publishing House, 4 <sup>th</sup> Edition	2010
5	Stuart Warren	Designing Organic Syntheses	John Wiley and sons, 1 <sup>st</sup> Edition.	1994
6	Bansal, R.K	Organic Reaction mechanism	Tata McGraw-Hill, 11 <sup>th</sup> Edition.	2006
7	Bansal, K	Heterocyclic Chemistry	New Age International, New Delhi, 5 <sup>th</sup> Edition.	2012
8	Joule, J.A. and Mills, K	Heterocyclic Chemistry	Blackwell Publishing Company, New York, 4 <sup>th</sup> Edition.	2004
9	Carruthers. W	Some Modern Methods in Organic Synthesis	Cambridge University Press, New York, 3 <sup>rd</sup> Edition.	2009
10	Khan, M.A	Chemistry of Natural products	Omega Publications, New Delhi, 1 <sup>st</sup> Edition.	2011
11	Mackie, R.K., Smith, M.M., and Aitken, R.A.	Guide Book to Organic Synthesis	Longman Scientific and Technical, Singapore, 2 <sup>nd</sup> Edition.	1990

## Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Jerry March	Advanced organic chemistry	4 <sup>th</sup> 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]

<a href="https://youtu.be/sdN9LgeKLAo">https://youtu.be/sdN9LgeKLAo</a>
<a href="https://youtu.be/diksW7rHXms">https://youtu.be/diksW7rHXms</a>
<a href="https://youtu.be/baAaUzf_psy">https://youtu.be/baAaUzf_psy</a>
<a href="https://youtu.be/nm0rkDiobvc">https://youtu.be/nm0rkDiobvc</a>
<a href="https://youtu.be/AYB_E9gdzx0">https://youtu.be/AYB_E9gdzx0</a>
<a href="https://youtu.be/2DyeKE5q8Go">https://youtu.be/2DyeKE5q8Go</a>
<a href="https://youtu.be/pel8P2atSEg">https://youtu.be/pel8P2atSEg</a>

### Mapping

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

H-High; M-Medium; L-Low

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

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>		Master of Chemistry	
<b>Course Code:</b>	22PCY311			Physical Chemistry –III - Classical and Statistical Thermodynamics		<b>Batch:</b>	2022 – 2024
						<b>Semester:</b>	III
<b>Lecture Hrs./Week</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	75	<b>Credits:</b>	4
<b>Course Objective</b>							
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<p><b>Thermodynamics and Non-ideal systems</b></p> <p>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.</p> <p>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.</p>	15

<b>Unit II</b>	<p><b>Third Law of Thermodynamics</b></p> <p>Laws of thermodynamics - need for third law - 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.</p> <p><b>Probability and Ensembles</b></p> <p>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.</p>	15
<b>Unit III</b>	<p><b>Statistical Thermodynamics</b></p> <p>Maxwell - Boltzmann statistics – Fermi-Dirac statistics-Bose-Einstein statistics-thermodynamic probability- Boltzmann expression for entropy - Stirling's approximation - States of maximum thermodynamics probability - thermodynamic probabilities of systems in equilibrium - Lgrangian 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.</p>	15
<b>Unit IV</b>	<p><b>Partition function</b></p> <p>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 - Study of monoatomic and diatomic ideal gas molecule on the basis of partition functions.</p>	15
<b>Unit V</b>	<p><b>Quantum Statistics</b></p> <p>Bose Einstein distribution law- derivation – entropy of boson applications. Derivation of Planck's black body radiation law - Bose Einstein condensation - Heat capacity – Einstein theory and Debye theory - Debye T- cube law - 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.</p>	15
	<b>Total Contact Hrs</b>	<b>75</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**Text Book****22PCY311**

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, 2 <sup>nd</sup> Edition	2009
2	Bajpai, D.N.	Advanced Physical Chemistry	S. Chand Publishing Limited., 1 <sup>st</sup> Edition Reprint	2015
3	Gupta, M.C.	Statistical thermodynamics	Wiley Eastern Limited, 1 <sup>st</sup> Edition	1990
4	Rajaram Kuriacose	Statistical thermodynamics	Shoban lal & Co, 4 <sup>th</sup> edition	2006
5	Samuel Glasstone	Thermodynamics for chemists	East West Press, 2 <sup>nd</sup> Edition	Reprint 2002

**Reference Books**

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

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

<a href="https://www.youtube.com/watch?v=NrtZAJtEH3c&amp;list=PLdBDmcnzLC_ZfA9evETgII7NX6N_45M77">https://www.youtube.com/watch?v=NrtZAJtEH3c&amp;list=PLdBDmcnzLC_ZfA9evETgII7NX6N_45M77</a>
<a href="https://www.youtube.com/watch?v=ogw0iojLBEQ">https://www.youtube.com/watch?v=ogw0iojLBEQ</a>
<a href="https://www.youtube.com/watch?v=UIVJ4JkqjaI">https://www.youtube.com/watch?v=UIVJ4JkqjaI</a>
<a href="https://www.youtube.com/watch?v=1yf2LBUB39g">https://www.youtube.com/watch?v=1yf2LBUB39g</a>
<a href="https://www.youtube.com/watch?time_continue=506&amp;v=Lz0xqu3HvD0">https://www.youtube.com/watch?time_continue=506&amp;v=Lz0xqu3HvD0</a>
<a href="https://nptel.ac.in/courses/115/103/115103113/">https://nptel.ac.in/courses/115/103/115103113/</a>
<a href="https://nptel.ac.in/courses/104/103/104103112/">https://nptel.ac.in/courses/104/103/104103112/</a>

## Mapping

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

H-High; M-Medium; L-Low

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

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>	Master of Chemistry		
<b>Course Code:</b>	22PCY312			Organic Spectroscopy	<b>Batch:</b>	2022 – 2024	
					<b>Semester:</b>	III	
<b>Lecture Hrs./Week</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	75	<b>Credits:</b>	5
<b>Course Objective</b>							
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>UV Visible Spectroscopy</b> Introduction to spectroscopy - Electromagnetic spectrum- 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.	15

<b>Unit II</b>	<p><b>IR Spectroscopy and Raman spectra</b></p> <p>Principles and theory of IR spectra- 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.</p> <p>Raman spectra – introduction – characteristic properties of Raman lines – differences between Raman spectra and IR spectra – mechanism of Raman Effect – Intensity of Raman lines and applications of Raman spectroscopy.</p>	15
<b>Unit III</b>	<p><b>Mass Spectrometry</b></p> <p>Theory - instrumentation - isotopic abundance - determination of molecular weights and formula, ionisation techniques (CI, FD, FAB &amp; 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. LC-MS and GC-MS.</p>	15
<b>Unit IV</b>	<p><b>Nuclear Magnetic Resonance Spectroscopy -<sup>1</sup>H NMR</b></p> <p>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.</p>	15
<b>Unit V</b>	<p><b><sup>13</sup>C NMR and 2D NMR Techniques</b></p> <p>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.</p> <p><b>2D NMR Techniques:</b> Theory - <sup>1</sup>H-<sup>1</sup>H COSY, <sup>1</sup>H-<sup>13</sup>C COSY: HETCOR, Proton detected HETCOR: HMQC, HMBC, NOESY. Solving problems using IR, UV, NMR and mass spectra for simple molecules.</p>	15
	<b>Total Contact Hrs</b>	<b>75</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**Text Book****22PCY312**



S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Sharma. Y. R	Elementary Organic Spectroscopy	S. Chand Publications, 4 <sup>th</sup> Edition	2012
2	Kemp, W.	Organic Spectroscopy	Replica Press Pvt. Ltd., New Delhi, 3 <sup>rd</sup> Edition	2008
3	Kalsi. P.S	Spectroscopy of Organic Compounds	New Age International (P) Ltd, 6 <sup>th</sup> 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, 6 <sup>th</sup> 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, 5 <sup>th</sup> Edition	2011
3	Yadav. M. S	Molecular Spectroscopy	Arise Publishers & Distributors, 1 <sup>st</sup> Edition	2011
4	Kaur. H	Spectroscopy	Pragati Prakashan Publications, 10 <sup>th</sup> Edition	2015
5	Banwell. C.N.	Fundamentals of molecular spectroscopy	Tata McGraw Hill Publishing Company Ltd, 3 <sup>rd</sup> Edition	2004

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

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

### Mapping

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

H-High; M-Medium; L-Low

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

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>		Master of Chemistry	
<b>Course Code:</b>	22PCY3E4			*Major Elective –II - Organometallic Chemistry		<b>Batch:</b>	2022 – 2024
						<b>Semester:</b>	III
<b>Lecture Hrs./Week</b>	3	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	45	<b>Credits:</b>	3
<b>Course Objective</b>							
<ul style="list-style-type: none"> <li>Learn about the development of organometallic chemistry and types of bonds in organometallic complexes</li> <li>Learn about the important organometallic complexes and their applications in various organic transformations as homogeneous/ heterogeneous catalysts</li> <li>Recognition of organometallic chemistry in Noble Prize for chemistry in 2001, 2005 and 2010</li> <li>To apply organometallic chemistry principles to research for new compound synthesis</li> </ul>							

### Course Outcomes (CO)

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

#	Course Outcomes (CO)	Knowledge Level
CO1	Understand the historical development of Organometallic chemistry and uniqueness in various bonding behaviour of organometallic compounds.	K2
CO2	Gaining the knowledge on metal carbonyl compounds, various types of insertion reactions in carbonyl chemistry and their applications	K4,K2
CO3	Organometallic alkyl, alkylidene and alkylidyne, alkene and alkyne chemistry and application of them in insertion, double carbonylation, olefin metathesis, hydrogenation, hydrosilation, oxidation and polymerisation reactions.	K4,K2
CO4	To synthesis and understand metallocenes, half-sandwich complexes, arene complexes and multidecker complexes.	K4
CO5	Inferring the importance of metallocene chemistry and the applications of metallocenes in stereospecific polymerisation of 1-alkenes and fluxional behaviour of $\pi$ -electron systems and importance of organometallic chemistry in catalysis and recognition of Noble prizes 2001, 2005 and 2010.	K6
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Organometallic Chemistry - I</b> Definition of organometallic compound - 18 electron rule - effective atomic number rule - classification of organometallic compounds - the metal carbon bond types - ionic bond – sigma covalent bond - electron deficient bond - delocalised bond - dative bond - metal carbonyl complexes - synthesis - structure and reactions of metal carbonyls - the nature of M- CO bonding-binding mode of CO and IR spectra of metal carbonyls - metal carbonyls-	13

	metal carbonyl anions - metal carbonyl hydrides - metal carbonyl halides - metal carbonyl clusters – Wade’s rule and isolobal relationship - metal nitrosyls - dinitrogen complexes - dioxygen complexes.	
<b>Unit II</b>	<b>Organometallic Chemistry - II</b> Metal alkyl complexes - stability and structure - synthesis by alkylation of metal halides - by oxidative addition - by nucleophilic attack on coordinated ligands - metal alkyl and 18 electron rule - reactivity of metal alkyls - M-C bond cleavage reactions - insertion of CO to M-C bonds - double carbonylation - insertions of alkenes and alkynes - insertions of metals with C-H bonds.	8
<b>Unit III</b>	<b>Organometallic Chemistry - III</b> Alkene complexes - synthesis of alkene complexes by ligand substitution - by reduction and by metal atom synthesis - bonding of alkenes to transition metals - bonding in diene complexes - reactivity of alkene complexes - alkyne complexes - bonding in alkyne complexes - reactivity of alkynes - alkyne complexes in synthesis – cobalt catalysed alkyne cycloaddition	8
<b>Unit IV</b>	<b>Organometallic Chemistry - IV</b> Cyclopentadienyl complexes - metallocenes - synthesis of metallocenes - bonding in metallocenes- reactions of metallocenes - metallocene halides and hydrides - synthesis and structures of allyl complexes -arene complexes - synthesis - structure and reactivity of arene complexes - multidecker complexes.	8
<b>Unit V</b>	<b>Organometallic Chemistry - V</b> Organometallic compounds in homogeneous catalytic reactions - coordinative unsaturation - acid-base behaviour reaction - migration of atoms or groups from metal to ligand - insertion reaction -hydrogenation - hydroformylation and hydrosilation of alkenes - alkene polymerisation and oligomerisation - fluxional molecules.	8
	<b>Total Contact Hrs</b>	<b>45</b>

### Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

### Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

### Text Book

22PCY3E4

S.NO	AUTHOR	TITLE OF THE	PUBLISH	YEAR OF
1	J. E. Huheey, E. A. Keiter and R. L. Keiter	Inorganic Chemistry - Principles of structure and reactivity	Addition Wesley Publishing Co, NY, Fourth Edition	1993
2	Cotton. F. A And Wilkinson.G	Advanced Inorganic Chemistry	Wiley Inter science 6 <sup>th</sup> edition	1999

### Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \	YEAR OF
1	Manfred Bochmann	Organometallics 1,	Oxford science publications, Oxford	1994
2	Manfred Bochmann	Organometallics 2, Complexes with transition	Oxford science publications,	1994

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

<a href="https://www.youtube.com/watch?v=0V8BBxfg0Xg">https://www.youtube.com/watch?v=0V8BBxfg0Xg</a>
<a href="https://www.youtube.com/watch?v=zYSl4OVv8E">https://www.youtube.com/watch?v=zYSl4OVv8E</a>
<a href="https://www.youtube.com/watch?v=plhLipR8yYQ">https://www.youtube.com/watch?v=plhLipR8yYQ</a>
<a href="https://www.youtube.com/watch?v=xzyR8Nxsloc">https://www.youtube.com/watch?v=xzyR8Nxsloc</a>
<a href="https://www.youtube.com/watch?v=CsdaDja4WvM">https://www.youtube.com/watch?v=CsdaDja4WvM</a>
cobalt catalysed alkyne cycloaddition
<a href="https://www.youtube.com/watch?v=HvwsWg8FmqE">https://www.youtube.com/watch?v=HvwsWg8FmqE</a>
<a href="https://www.youtube.com/watch?v=ZjDqdJKdUrk">https://www.youtube.com/watch?v=ZjDqdJKdUrk</a>
<a href="https://www.youtube.com/watch?v=xzyR8Nxsloc">https://www.youtube.com/watch?v=xzyR8Nxsloc</a>

### 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: Dr.K.Poonkodi Mrs.K.Vimaladevi  Signature:	Name: Dr.K.Poonkodi  Signature:	Name: Mr.K.Srinivasan  Signature:	Name: Dr.R.Manicka Chezhan  Signature:

<b>Programme code:</b>	M.Sc.			<b>Programme Title :</b>	Master of Chemistry		
<b>Course Code:</b>	22PCY3E5			*Major Elective –II –Nanoscience and Nanotechnology	<b>Batch :</b>	2022 – 2024	
					<b>Semester:</b>	III	
<b>Lecture Hrs./Week</b>	3	<b>Tutorial Hrs./Sem.</b>	-	<b>Total Hrs./Sem</b>	45	<b>Credits:</b>	3
<b>Course Objective</b>							
* Origin and the basics of nanoscience and technology with relevance to biology and medicine.							
* The various methods available for preparation of nano structured 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Introduction to Nanoscience and Nanotechnology</b>  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

<b>Unit II</b>	<b>Top-down and bottom-up techniques</b> 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
<b>Unit III</b>	<b>Oxide and ferrite nanomaterials; Magnetism and applications</b> Iron oxide – structure and types – ferrites (MFe <sub>2</sub> O <sub>4</sub> ) 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
<b>Unit IV</b>	<b>Gold and silver nanomaterials; Plasmonics</b> 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
<b>Unit V</b>	<b>Quantum dots; polymers; Optical properties and luminescence</b> 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
<b>Total Contact Hrs</b>		<b>45</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**Text Book****22PCY3E5**

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

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



### Mapping

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

H-High; M-Medium; L-Low

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

<b>Programme Code:</b>	M.Sc		<b>Programme Title:</b>	Master of Chemistry			
<b>Course Code:</b>	22PCY3E6		Major Elective –II: Dye Chemistry	<b>Batch:</b>	2022 – 2024		
				<b>Semester:</b>	III		
<b>Lecture Hrs./Week</b>	3	<b>Tutorial Hrs./</b>	-	<b>Total Hrs/Sem</b>	45	<b>Credits:</b>	3
<b>Course Objective</b>							
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

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

	with amines, coupling with phenols. Classification according to the number of azo groups and application – Tautomerism in azo dyes.	
<b>Unit III</b>	Synthesis of specific dyes and uses Orange IV, Diamond Block F, Metanil yellow, Tartrazines Direct Deep Black, Eriochrome Black T, Eriochrome Red B, Cellitron Scarlet B, Congo Red, Malachite green, methylene blue, Safranin – T, Acid Magenta, Cyanin Green G, Alizarin, Benzanthrone, Indigo, Copper phthalocyanine, Sulphur black – T.	9
<b>Unit IV</b>	Synthesis, reactions and applications of xanthene dyes, Cyanine dyes, acridine dyes, Sulphur dyes, Anthraquinone dyes: Anthraquinone mordant dyes, Anthraquinone acid dyes and Anthraquinone disperse dyes.	9
<b>Unit V</b>	Pigments – Introduction - Requirements of organic pigments Types of Pigments – Applications. Fluorescent. Brightening agents – application of dyes in other areas – Leather, paper, medicine, chemical analysis, cosmetics, colouring agents Food and Beverages	9
<b>Total Contact Hrs</b>		<b>45</b>

### Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

### Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

**22PCY3E6**

### 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	Elsevier	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, 14 <sup>th</sup> 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]

<a href="https://nptel.ac.in/courses/116/104/116104044//">https://nptel.ac.in/courses/116/104/116104044//</a>
<a href="https://www.youtube.com/watch?v=2sHILNzTpUU">https://www.youtube.com/watch?v=2sHILNzTpUU</a>
<a href="https://www.youtube.com/watch?v=71VHFku36Jw">https://www.youtube.com/watch?v=71VHFku36Jw</a>

### 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	Name: Dr.K.Poonkodi	Name: Mr.K.Srinivasan	Name: Dr.R.Manicka Chezian
Signature:	Signature:	Signature:	Signature:

<b>Programme Code:</b>	M.Sc		<b>Programme Title:</b>	Master of Chemistry			
<b>Course Code:</b>	22PCY3AL		Applied Chemistry (Optional)	<b>Batch:</b>	2022 – 2024		
				<b>Semester:</b>	III		
<b>Lecture Hrs./Week</b>	-	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	-	<b>Credits:</b>	Grade
<b>Course Objective</b>							
* To understand the chemistry of dairy and leather processing.							
* To acquire knowledge about ceramic products and lubricants.							
* To learn about explosives and rocket fuels.							

### Course Outcomes

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

#	CO Statement	Knowledge Level
CO1	list the properties of milk & predict the quality	K1
CO2	explain the different steps in leather processing and analyze the effluent problems in tanneries	K3
CO3	Use your understanding for the production of manufacturing of ceramic products	K4
CO4	Design and synthesis lubricants with enhanced properties and performance	K4
CO5	Utilize your skills to assess the quality of milk, create leather, and produce the essential raw materials for the ceramics industry.	K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content
<b>Unit I</b>	<b>Dairy Chemistry</b> Composition of Milk, factors affecting the composition of milk, micro flora of raw milk, milk fat/ proteins/sugar flavour and aroma, physical properties, effect of heat, milk processing – clarification, pasteurization, homogenization. Milk products- Cream, Butter, Ice cream and milk powder. Adulteration of milk
<b>Unit II</b>	<b>Leather Chemistry</b> Introduction, Structure of hides and skin, Leather Processing – Process before tanning- flaying and curing (drying, salt curing and brine curing and pickling), Soaking, Liming, Fleshing, Unhairing, Deliming and Bathing. Tanning Processes – Vegetable, Synthetic,

	Chrome and Aldehyde tanning. Tannery effluents and Byproducts – primary and secondary treatments.
<b>Unit III</b>	<b>Ceramic Industries</b> Basic raw materials- Chemical conversions including basic ceramic chemistry, Whitewares, Structural clay products, Refractories – specialized ceramic products, vitreous enamel, kilns.
<b>Unit IV</b>	<b>Lubricants</b> Introduction, functions, requirements, mechanism of lubrication, classification of lubricants, properties of lubricating oil – viscosity, viscosity index, oiliness, flash and fire points, cloud and pour points, carbon residue, aniline point, volatility, corrosion and decomposition stabilities.
<b>Unit V</b>	<b>Explosives and rocket fuels</b> Introduction, characteristics, classification – primary, high and low, requirements of explosives, rocket propellants, characteristics, classification – solid and liquid propellants with examples.

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation
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**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.
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**22PCY3AL****Text Book**

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Durga Nath Dhar	Applied Chemistry –II	Vayu Education of India. 1st Edn.	2010
2	B. Srilakshmi	Food Science	New Age International Publishers. 7th Edn.	2014
3	Jayashree Ghosh	Fundamental Concepts of Applied Chemistry	S. Chand &Co. 1st Edn.	2006
4	M. R. Adams & Maurice O. Moss	Food Microbiology	RSC Publishers, 3rd Edn.	2007

## Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	George T. Austin	Shreve's Chemical Process Industries	McGraw – Hill Book Co, 5st Edn.	1984
2	M..Karunanithi, T.Ramachandran, H.Venkataraman, N. Ayyaswamy	Applied Chemistry	Anuradha Agencies, Reprint	2006

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

<a href="https://www.youtube.com/watch?v=DQ7GmVYD7n0">https://www.youtube.com/watch?v=DQ7GmVYD7n0</a>
<a href="https://www.youtube.com/watch?v=GQngqnmkIDM">https://www.youtube.com/watch?v=GQngqnmkIDM</a>
<a href="https://www.youtube.com/watch?v=9PgjtJPIakY">https://www.youtube.com/watch?v=9PgjtJPIakY</a>
<a href="https://www.youtube.com/watch?v=RTQ_J8yLw9k">https://www.youtube.com/watch?v=RTQ_J8yLw9k</a>
<a href="https://www.youtube.com/watch?v=YFGLs7iAkaw">https://www.youtube.com/watch?v=YFGLs7iAkaw</a>

## 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 Chezhan  Signature:

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>	Master of Chemistry		
<b>Course Code:</b>	22PCY413			Inorganic Chemistry –III: Bioinorganic Chemistry	<b>Batch:</b>	2022 - 2024	
					<b>Semester:</b>	IV	
<b>Lecture Hrs./Week</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/ Sem</b>	75	<b>Credits:</b>	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	Acquire intense knowledge about various biological roles such as metal ion transport and storage, electron- and proton transfer, O <sub>2</sub> transport, hydrolysis, etc. taking place at the active site of metalloproteins.	K4
CO4	Gain knowledge about the medically-important topics such as the toxicity of metal ions, and their uses, Ru and Pt complexes in cancer therapy. This would motivate the students to pursue their research in the field of medicinal chemistry.	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
<b>Unit I</b>	<b>Metals in Biology</b> Metals and Non-metals in biological systems - Essential and trace elements - Role of different metal ions in biological systems - Sodium-Potassium pump – Calcium ATbase pump Ferritin –Hemosiderin- Transferrin- Blue copper proteins - Catecholase - Photosynthesis:Chlorophyll - Photosystem-I (PS-I) & II (PS-II) - Structure-function relationship - in-vivo and in-vitro nitrogen fixation.	15



<b>Unit II</b>	<b>Structure and Function of Various Metalloenzymes</b> Metalloenzymes - Definition - Examples - Active site structure and mechanism of action of- Carboxy peptidase-A and Carbonic anhydrase - Structure and function of Superoxide dismutase(SOD) (Fe-SOD, Mn-SOD, Cu-Zn couple SOD and Ni-SOD), Peroxidase and catalase enzymes - Xanthine oxidase – Nitrogenase, Hydrogenase, Urease.	15
<b>Unit III</b>	<b>Heme and Non-heme Metalloenzymes</b> Phorphyrin system - Structure and functions of Hemoglobin and Myoglobin - Dioxygenbinding, transport and utilization - Hemocyanin - Hemerythrin - Synthetic oxygen carriers -Vitamin B <sub>12</sub> co-enzyme - Non-heme iron-sulphur proteins - Ferridoxins - Rubredoxins – Cytochrome. a,b,c, cytochrome P450, Cytochrome C oxidase,	15
<b>Unit IV</b>	<b>Metals in Medicine</b> 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 polarimetry). 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.	15
<b>Unit V</b>	<b>Drug Discovery and Design</b> Drug discovery and design - Therapeutic index and chemotherapeutic index - Structure - activity relationship - Factors governing drug design - Computer aided drug design - Bleomycin – Doxorubicin - Cancer chemotherapy - Bioinorganic chemistry of platinum and ruthenium anticancer drugs - Mechanism of action of cisplatin - Clinical trials and their significance - Applications of Coordination complexes in medicine.	15
	<b>Total Contact Hrs</b>	<b>75</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**Text Book****22PCY413**

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Gurdeep Raj	Advanced Inorganic Chemistry	Geol Publishing House, 12 <sup>th</sup> Edition	2014
2	Madan. R.D	Advanced Inorganic Chemistry 85	S. Chand & company, New Delhi, 3 <sup>rd</sup> 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, 2 <sup>nd</sup> 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, 4 <sup>th</sup> 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]

<a href="https://www.youtube.com/watch?v=6fRxAjMdMvE&amp;list=PLRlh4Ip2fLusw2XTKlgOS9c5sGHCDlqW">https://www.youtube.com/watch?v=6fRxAjMdMvE&amp;list=PLRlh4Ip2fLusw2XTKlgOS9c5sGHCDlqW</a>
<a href="https://www.youtube.com/watch?v=OgqPPFg4t6s">https://www.youtube.com/watch?v=OgqPPFg4t6s</a>
<a href="https://www.youtube.com/watch?v=k7Bf9p4-Kzo">https://www.youtube.com/watch?v=k7Bf9p4-Kzo</a>
<a href="https://www.youtube.com/watch?v=vnVMS_Dp0dU">https://www.youtube.com/watch?v=vnVMS_Dp0dU</a>
<a href="https://www.youtube.com/watch?v=HkgsP0Jlc_o">https://www.youtube.com/watch?v=HkgsP0Jlc_o</a>
<a href="https://www.youtube.com/watch?v=darVtuigUJA">https://www.youtube.com/watch?v=darVtuigUJA</a>
<a href="https://www.youtube.com/watch?v=xzyR8Nsxloc">https://www.youtube.com/watch?v=xzyR8Nsxloc</a>

### Mapping

PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO										
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



<b>Programme Code:</b>	M.Sc		<b>Programme Title:</b>	Master of Chemistry			
<b>Course Code:</b>	22PCY414		Instrumental Methods of Chemical Analysis	<b>Batch:</b>	2022 – 2024		
				<b>Semester:</b>	IV		
<b>Lecture Hrs./Week</b>	5	<b>Tutorial</b>	-	<b>Total Hrs/ Sem</b>	75	<b>Credits:</b>	4
<b>Course Objective</b>							
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Errors in Chemical Analysis</b> Treatment of analytical data- Accuracy and precision. Absolute and relative errors. Classification and minimization of errors. Significant figures. Statistical treatment- mean and standard deviation, variance, confidence limits, student-t and f tests. Detection of gross errors, rejection of a result-Q test. Least square method, linear regression; covariance and correlation coefficient.	15

<p><b>Unit II</b></p>	<p><b>Chromatographic methods</b></p> <p>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.</p> <p>Gas chromatography - basic instrumental set up - carriers, columns, detectors and comparative study of TCD, FID, ECD and NPD.</p> <p><b>Self-study: Thin layer chromatography and size exclusion chromatography.</b></p>	<p>15</p>
<p><b>Unit III</b></p>	<p><b>Thermal analysis</b></p> <p>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.</p> <p><b>Photoelectron Spectroscopy</b></p> <p>ESCA (XPS): principle, chemical shifts - description of ESCA spectrometer, X-ray sources, samples, analysis, detectors and recording devices, applications.</p> <p>Auger electron spectroscopy (AES) and UV photo electron spectroscopy (UPS) - principles, applications and instrumentation.</p>	<p>15</p>
<p><b>Unit IV</b></p>	<p><b>Electron spin resonance</b></p> <p>Theory - derivative curves - 'g' values, Kramer's degeneracy - zero field splitting - hyperfine splitting - isotropic and anisotropic systems - identification of free radicals (CH<sub>3</sub> and C<sub>6</sub>H<sub>5</sub> radicals, Copper - Iron complex) - applications.</p> <p><b>Mossbauer spectroscopy</b></p> <p>Principle and theory- Doppler Effect, Isomer shift - quadruple interactions - magnetic interactions.</p> <p><b>NQR spectroscopy</b></p> <p>Theory and Principle of NQR spectroscopy-Nature of electric field gradient, Energy levels and selection rules, Interaction of electric quadrupole with</p>	<p>15</p>

	electromagnetic radiation, nuclear orientations, the asymmetry parameter, quadrupole transitions in spherical, axially symmetric fields and not axially symmetric fields. Applications of NQR spectra. <b>Self-study: Mossbauer spectroscopy – applications.</b>	
<b>Unit V</b>	<b>Polarimetry</b> 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. <b>Molecular fluorescence and phosphorescence</b> Principles and Applications of Fluorometers -Phosphorometers. <b>Self-study: Fluorescence and phosphorescence–applications.</b>	15
	<b>Total Contact Hrs</b>	<b>75</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation
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**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.
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**22PCY414****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, 18 <sup>th</sup> 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. 7 <sup>th</sup> Edition	2002
3	Drago, R.S	Physical methods in Inorganic chemistry	W. B. Saunders Company. 1 <sup>st</sup> Edition	1992
4	S.M. Khopkar	Basic Concepts of Analytical Chemistry	New Age International Publishers, 3 <sup>rd</sup> Edn	2008

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

<a href="https://www.youtube.com/watch?v=OypCNBPmGBY">https://www.youtube.com/watch?v=OypCNBPmGBY</a>
<a href="https://www.youtube.com/watch?v=a3FOOSOchlo">https://www.youtube.com/watch?v=a3FOOSOchlo</a>
<a href="https://www.youtube.com/watch?v=XMtmSz_9umk">https://www.youtube.com/watch?v=XMtmSz_9umk</a>
<a href="https://www.youtube.com/watch?v=ryo8Kd2Wgks">https://www.youtube.com/watch?v=ryo8Kd2Wgks</a>
<a href="https://www.youtube.com/watch?v=5FczhvJrYNE">https://www.youtube.com/watch?v=5FczhvJrYNE</a>
<a href="https://www.youtube.com/watch?v=DgA3-UnpSuI">https://www.youtube.com/watch?v=DgA3-UnpSuI</a>
<a href="https://www.youtube.com/watch?v=9zimhww51WI">https://www.youtube.com/watch?v=9zimhww51WI</a>
<a href="https://www.youtube.com/watch?v=s7zsl9yFOsg">https://www.youtube.com/watch?v=s7zsl9yFOsg</a>
<a href="https://www.youtube.com/watch?v=a81cDH26f7A">https://www.youtube.com/watch?v=a81cDH26f7A</a>
<a href="https://www.youtube.com/watch?v=r55anTcoWvE">https://www.youtube.com/watch?v=r55anTcoWvE</a>
<a href="https://www.youtube.com/watch?v=X3AHbeZhKhU">https://www.youtube.com/watch?v=X3AHbeZhKhU</a>

### 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	Name: Dr.K.Poonkodi	Name: Mr.K.Srinivasan	Name: Dr.R.Manicka Chezhan
Signature:	Signature:	Signature:	Signature:

<b>Programme Code:</b>	M.Sc.,		<b>Programme Title:</b>		Master of Chemistry		
<b>Course Code:</b>	22PCY4E7		*Major Elective –III Phytochemical Techniques and Health Chemistry		<b>Batch:</b>	2022 – 2024	
					<b>Semester:</b>	IV	
<b>Lecture Hrs./Week</b>	3	<b>Tutorial Hrs./Sem.</b>	-	<b>Total Hrs/ Sem</b>	45	<b>Credits:</b>	3

### Course Objective

- \* 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

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

#	CO Statement	Knowledge Level
CO1	Understanding on necessity and role of carbohydrates and vitamins for humans.	K2
CO2	Remember the phytochemical techniques -extraction, separation and purification.	K5
CO3	Implement the basic values and analyze the functions of food, food pyramid and hygiene food system.	K5
CO4	Evaluate the mechanism for biological function of carbohydrates and vitamins.	K4
CO5	Analyze the mechanism and causes of common diseases.	K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
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<b>Unit I</b>	<b>Extraction strategies of drugs/natural products</b> 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.	10
<b>Unit II</b>	<b>Separation Techniques of drugs/natural products</b> Separation Techniques – Simple crystallization - experimental aspects – solvents for crystallization - Special methods – Flavanoids - pigment extraction - GC-MS - LC-MS- identification of phytochemicals by NIST Library.	9
<b>Unit III</b>	<b>Purification Techniques of drugs/natural products</b> Purification Techniques – Preliminary methods of identification of extracts – colour tests – TLC and fluorescent characteristics, proximate methods. Theory of melting and freezing – melting point and vapour pressure - <i>in vitro</i> Biological assays- antibacterial, antifungal, antioxidant and anticancer activities.	10
<b>Unit IV</b>	<b>Health</b> Definition: - Food - Food Pyramid, Health, Hygiene, mal, under and over nutrition, their causes and remedies, sanitation. Carbohydrates: Classification, biological functions, Vitamins: Classification, biological functions.	8
<b>Unit V</b>	<b>Common diseases</b> 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
<b>Total Contact Hrs</b>		<b>45</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**22PCY4E7****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, 3 <sup>rd</sup> edition,	Springer publication.	2008
2	Ahluwalia & Madhu Chopra. V.K	Medicinal Chemistry	Ane Books India	2008
3	Ashutosh kar	Medicinal Chemistry, 5 <sup>th</sup> 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 Mido Y	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, 4 <sup>th</sup> Indian Edition	Oxford Publishers.	2009
2	Krishnaswamy. N. R	Chemistry of Natural Products, 2 <sup>nd</sup> Edition	A Unified Approach Unified Press.	2010
3	Krishnaswamy. N. R	Chemistry of Natural Products A Laboratory Handbook, 1 <sup>st</sup> Edition	University press India Pvt. Ltd.	2003

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

<a href="https://www.youtube.com/watch?v=jcgGjSLBA4Q">https://www.youtube.com/watch?v=jcgGjSLBA4Q</a>
<a href="https://www.youtube.com/watch?v=I1lkq5RW2L0">https://www.youtube.com/watch?v=I1lkq5RW2L0</a>
<a href="https://www.youtube.com/watch?v=9KX0dWPxgYM">https://www.youtube.com/watch?v=9KX0dWPxgYM</a>
<a href="https://www.youtube.com/watch?v=krIgKr3IC7s">https://www.youtube.com/watch?v=krIgKr3IC7s</a>
<a href="https://www.youtube.com/watch?v=fuNmvM5BvDM">https://www.youtube.com/watch?v=fuNmvM5BvDM</a>

## Mapping

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

H-High; M-Medium; L-Low

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

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>	Master of Chemistry		
<b>Course Code:</b>	22PCY4E8			Major Elective III – Computational Chemistry	<b>Batch:</b>	2022 – 2024	
					<b>Semester:</b>	IV	
<b>Lecture Hrs./Week</b>	3	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	45	<b>Credits:</b>	3
<b>Course Objectives</b>							
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	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

<b>Unit II</b>	<p><b>Chemdraw Software</b></p> <p>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.</p>	5
<b>Unit III</b>	<p><b>Origin Software</b></p> <p>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.</p>	5
<b>Unit IV</b>	<p><b>Computational Chemistry</b></p> <p>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.</p> <p>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.</p>	18
<b>Unit V</b>	<p><b>Computational Chemistry Calculations</b></p> <p>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.</p>	9
<b>Total Contact Hrs</b>		<b>45</b>

**Softwares**

Molecular Mechanics:

1. **Arguslab** available from [www.arguslab.com/](http://www.arguslab.com/)
2. **Tinker** available from [www.dasher.wustl.edu/ffe/](http://www.dasher.wustl.edu/ffe/)  
Ab initio, semiempirical and dft:

1. **Firefly / PC GAMESS** available from <http://classic.chem.msu.su/gran/games/>
2. **WINGAMESS** available from [http://www.msg.ameslab.gov/games/Graphical User Interface \(GUI\):](http://www.msg.ameslab.gov/games/Graphical%20User%20Interface%20(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](http://avogadro.openmolecules.net/wiki/Get_Avogadr)

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

22PCY4E8

**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, 2 <sup>nd</sup> 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, 2 <sup>nd</sup> Edn.,	2008
2	Cramer. C.J	Essentials of Computational Chemistry: Theories and Models	John Wiley & Sons, 2 <sup>nd</sup> 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]

<a href="https://www.youtube.com/watch?v=c0y5KJXH6zw">https://www.youtube.com/watch?v=c0y5KJXH6zw</a>
<a href="https://www.youtube.com/watch?v=c0y5KJXH6zw">https://www.youtube.com/watch?v=c0y5KJXH6zw</a>
<a href="http://www.digimat.in/nptel/courses/video/104101095/L12.html">http://www.digimat.in/nptel/courses/video/104101095/L12.html</a>
<a href="https://youtu.be/zVIZxHKP1e0">https://youtu.be/zVIZxHKP1e0</a>
<a href="https://youtu.be/nKYrzrwaRmc">https://youtu.be/nKYrzrwaRmc</a>
<a href="https://youtu.be/HCpjAViYbAI">https://youtu.be/HCpjAViYbAI</a>

## 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 Chezhan  Signature:

<b>Programme Code:</b>	M.Sc			<b>Programme Title:</b>	Master of Chemistry		
<b>Course Code:</b>	22PCY4E9			*Major Elective –III - Green Chemistry	<b>Batch:</b>	2022 - 2024	
					<b>Semester:</b>	IV	
<b>Lecture Hrs./Week</b>	3	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	45	<b>Credits:</b>	3
<b>Course Objective</b>							
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Green Chemistry</b> 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
<b>Unit II</b>	<b>Green reagents</b> Dimethyl carbamate, polymer supported reagents, green catalysts - acidic, basic, oxidation and polymer supported catalysts.	9



	<b>Microwave Induced Green Synthesis</b> Introduction- microwave assisted reactions in water – Hoffmann elimination, hydrolysis, oxidation, inorganic solvents- esterification, chalcone synthesis, Diel’s Alder reaction, decarboxylation and Fries rearrangement.	
<b>Unit III</b>	<b>Ultrasound Assisted Green Synthesis</b> Introduction- esterification, saponification, oxidation, reduction, hydroboration, coupling reaction, Diels Alder reaction, Cannizaro reaction, Strecker synthesis, Reformatsky reactions. <b>Ionic liquids</b> Introduction, applications in organic synthesis - Diels Alder reaction, advantages & disadvantages of ionic liquids.	9
<b>Unit IV</b>	<b>Phase transfer catalysts</b> 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
<b>Unit V</b>	<b>Crown ethers:</b> 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 <sub>4</sub> oxidation.	9
<b>Total Contact Hrs</b>		<b>45</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**22PCY4E9****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, 2 <sup>nd</sup> 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 4 <sup>th</sup> Edn.	2012

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

<a href="https://www.youtube.com/watch?v=E2ohFKSYhg0">https://www.youtube.com/watch?v=E2ohFKSYhg0</a>
<a href="https://www.youtube.com/watch?v=7VHII7Sk7NY">https://www.youtube.com/watch?v=7VHII7Sk7NY</a>
<a href="https://www.youtube.com/watch?v=wjFc_Tj20oA">https://www.youtube.com/watch?v=wjFc_Tj20oA</a>
<a href="https://www.youtube.com/watch?v=5mBv_bJ7v8Q">https://www.youtube.com/watch?v=5mBv_bJ7v8Q</a>
<a href="https://www.youtube.com/watch?v=3oIQGJ4xdmg">https://www.youtube.com/watch?v=3oIQGJ4xdmg</a>

## 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 Chezhan  Signature:

<b>Programme Code:</b>		M.Sc		<b>Programme Title:</b>			Master of Chemistry		
<b>Course Code:</b>		22PCY415		<b>Inorganic Chemistry Practical –II</b>			<b>Batch:</b>	2022 - 2024	
							<b>Semester:</b>	III & IV	
<b>Lecture Hrs./Week</b>	<b>III Sem</b>	4	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	<b>III</b>	60	<b>Credits:</b>	4
	<b>IV Sem</b>	5				<b>IV</b>	75		
<b>Course Objective</b>									
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content
<b>A</b>	<b>Titrimetry</b> Complexometric titrations using EDTA - Estimations of Magnesium, Calcium & Zinc.
<b>B</b>	<b>Estimation of metal ions in a mixture</b> 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



<b>Programme Code:</b>		M.Sc		<b>Programme Title:</b>			Master of Chemistry		
<b>Course Code:</b>		22PCY416		Organic Chemistry Practical –II			<b>Batch:</b>	2021 – 2023	
							<b>Semester:</b>	III & IV	
<b>Lecture Hrs./Week</b>	<b>III Sem</b>	4	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	<b>III</b>	60	<b>Credits:</b>	4
	<b>IV Sem</b>	5				<b>IV</b>	75		
<b>Course Objective</b>									
* To estimate organic compounds quantitatively.									
* To learn and practice the methods of preparation of some organic compounds.									
* To understand some chromatographic techniques.									

### 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.	K4
CO3	Estimate certain natural products and separate the compounds using chromatographic technique.	K5
CO4	Test the different types of chemical constituents in plant extracts.	K4
CO5	Furnish the pupil to estimate the adulteration level in the oil.	K4
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content
<b>A</b>	<b>Quantitative estimations:</b> 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>B</b>	<b>Two stage preparations:</b> 1. Benzanilide from benzophenone. 2. Acetyl salicylic acid from methyl salicylate.

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

**Pedagogy:** Demonstration and hands on Experience

### Reference Books

22PCY416

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/ 2 <sup>nd</sup> Edition	2011

### Mapping

PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<del>CO</del>										
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
<b>Name and Signature</b>	<b>Name and Signature</b>	<b>Name and Signature</b>	<b>Name and Signature</b>
Name: Mrs.R.Mini	Name: Dr.K.Poonkodi	Name: Mr .K. Srinivasan	Name: Dr. R. Manicka Chezhan
Signature:	Signature:	Signature:	Signature:

<b>Programme code:</b>		M.Sc.		<b>Programme Title :</b>			Master of Chemistry	
<b>Course Code:</b>		22PCY417		Physical Chemistry Practical –II			<b>Batch :</b>	2022-2024
<b>Lecture Hrs/Week:</b>		<b>III Sem</b>	4	<b>Tutorial :</b>	-	<b>Total Hrs/Sem:</b>	<b>III</b>	60
		<b>IV Sem</b>	5				<b>IV</b>	75
<b>Course Objective</b>								
* 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	Acquire 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 conductometrically and evaluate the amount of oxalic acid adsorbed using charcoal as adsorbent.	K6
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

	Content	Hrs
<b>A</b>	<b>Electrical Conductance measurements</b> <ol style="list-style-type: none"> <li>Determination of hydrolysis constant of aniline hydrochloride</li> <li>Verification of Debye-Huckel Onsager equation</li> <li>Ostwald's dilution law</li> <li>Verification of Kohlrausch's law</li> <li>Solubility Product of sparingly soluble salt</li> <li>Determination of metal to ligand ratio of complexes by Job's method using UV-visible Spectrophotometer.</li> <li>Determination of solubility of a sparingly soluble salt.</li> </ol>	
<b>B</b>	<b>Conductometric Titrations: Acid-Base titrations</b> <ol style="list-style-type: none"> <li>Strong Base Vs Weak Acid, Strong Acid vs Strong Base</li> <li>Strong Base Vs Mixture of (weak and strong) Acids</li> </ol>	
<b>C</b>	<b>Precipitation titrations</b> <ol style="list-style-type: none"> <li>AgNO<sub>3</sub> Vs mixture of halides (KCl &amp; KI)</li> <li>BaCl<sub>2</sub> Vs MgSO<sub>4</sub></li> <li>Buffer Vs Strong acid.</li> </ol>	

<b>D</b>	<b>Chemical Kinetics</b> 13. Acid hydrolysis of an ester - Relative strength of acids 14. Reaction kinetics of KI and K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> 15. Iodination of acetone	
<b>E</b>	<b>Adsorption</b> 16. Adsorption of oxalic acid on charcoal 17. Study of adsorption of acetic acid on activated carbon	
<b>Total Contact Hrs</b>		<b>75+60 Hrs</b>

**Pedagogy:** Demonstration and hands on practicals

### Reference Books

**22PCY417**

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

CO \ PO/PSO	PO								PSO	
	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	Name: Dr.K.Poonkodi	Name: Mr.K.Srinivasan	Name: Dr.R.Manicka Chezian
Signature:	Signature:	Signature:	Signature:



<b>Programme code:</b>	M.Sc.		<b>Programme Title :</b>		Master of Chemistry	
<b>Course Code:</b>	22PCY4P1		Project Work & Viva-Voce		<b>Batch</b>	2022-2024
					<b>Semester</b>	IV
<b>Lecture Hrs/Week:</b>	-	<b>Tutorial</b>	-	<b>Total Hrs/Sem</b>	-	<b>Credits:</b>
						5
<b>Course Objective</b>						
* 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
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

### 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
<b>I</b>	Selection of the field of study, Topic & Literature collection	<b>50</b>
<b>II</b>	Research Design and Data Collection	
<b>III</b>	Analysis & Conclusion, Preparation of rough draft	
<b>IV</b>	Paper Presentation in National / International Conference (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

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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	Name: Dr.K.Poonkodi	Name: Mr.K.Srinivasan	Name: Dr.R.Manicka Chezhan
Signature:	Signature:	Signature:	Signature:



**VALUE ADDED  
COURSES**

<b>Programme code:</b>	M.Sc.	<b>Programme Title :</b>		Master of Chemistry	
<b>Course Code:</b>	22PCY2VA	Value added course Entrepreneurial Ventures in Chemistry		<b>Batch</b>	2022-2024
				<b>Semester</b>	II / IV
<b>Lecture Hrs/Week:</b>	2	<b>Total Hrs/Sem</b>	30	<b>Credits:</b>	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.
- \* Hands on experience for manufacturing industries.

Units	Content	Hrs
Unit I	<b>Cleaning agents:</b> Soaps and detergents: Types (cationic and anionic), physical and chemical characteristics, advantages and disadvantages. Examples of Commercially available cleaning agents (shampoo, hand wash, face-wash)	6
Unit II	<b>Disinfectants</b> Introduction, types, physical and chemical properties, classification (acids, alcohols, aldehydes, alkalis, halogens, phenols) <b>Sanitizers</b> Sanitizers-Introduction, types, raw material used in making professional hand sanitizer with properties, WHO recommendations for hand sanitizers.	6
Unit III	<b>Cosmetics</b> Oils, fats, and waxes - Introduction, physical and chemical properties, their use in cosmetics, Preservatives-Introduction, properties, types and their significance. <b>Transition to Greener approach</b> Importance and Principles of Green Chemistry, bio-enzymes as disinfectants, green cosmetics-make up, shampoo, face pack, face mask, lipsticks.	12
	<b>Practicals</b> 1. Preparation of Soaps. 2. Preparation of liquid detergent using animal fat. 3. Preparation of Hand-Sanitizers. 4. Preparation of Disinfectants. 5. Preparation of cleaning agents using bio-enzymes.	6
	<b>Total Contact Hrs</b>	<b>30</b>

### Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

### Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

22PCYV01

### Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \EDITION	YEAR OF PUBLICATION
1	Takeo Mitsui	New Cosmetic Science	Elsevier Science Ltd	1997
2	Sargin C.B	Cosmetic Science and Technology	Wiley India Pvt Ltd; Second edition	2008

3	Linda D.Rhein, Anthony O'Lenick.	Surfactants in personal care products and decorative cosmetics	CRC Press, Third edition	<b>2020</b>
4	B.P. Sen	Handbook on Synthetic detergents	Das Gupta & Company (P) Ltd 1st edition	<b>2004</b>

## Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Kuo-Yann Lai	Liquid Detergents	CRC Press 2 <sup>nd</sup> Edition	<b>2020</b>
2	Mylene Stedmen	Soap-Making Manual A Practical Handbook on the Raw Materials, Their Manipulation, Analysis and Control in the Modern Soap Plant(E-Book)	Dhanpat Rai Publishing Company. 15 <sup>th</sup> edition	<b>2018</b>

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	Name: Dr.K.Poonkodi	Name: Mr.K.Srinivasan	Name: Dr.R.Manicka Chezhan
Signature:	Signature:	Signature:	Signature:

<b>Programme code:</b>	M.Sc.	<b>Programme Title :</b>		Master of Chemistry	
<b>Course Code:</b>	22PCY4VA	<b>Value added course</b> Analytical techniques		<b>Batch</b>	2022-2024
				<b>Semester</b>	II / IV
<b>Lecture Hrs/Week:</b>	2	<b>Total Hrs/Sem</b>	30	<b>Credits:</b>	2
<b>Scope</b>					
* This course will train participants with the knowledge and skills required for success in the practical operation of Volumetric analysis					
* This course is designed to expertise regulations governing Analytical techniques for using various industries.					

#### Course Objectives

Upon completion, the participant should be able to:

- \* To enable the students to attain knowledge on various chromatographic techniques.
- \* To gain knowledge in Volumetric Analysis and Chromatographic techniques.

#### Employability

- \* Graduates will be qualified to work in Chromatographic techniques 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 apply the various analytical techniques for industrial purposes.

#### Course Outcomes

- \* Classify chromatographic techniques and to assess the separation techniques of a chemical compound.
- \* Comprehend the basic principle, instrumentation and applications of various chromatographic techniques.
- \* Analyze the various methods involved in analytical techniques.
- \* Apply the various chromatographic techniques to separate the compounds in the field of research.



Units	Content	Hrs
Unit I	<p><b>Volumetric analysis</b></p> <p>Types of titrations: Acid base, Complexometric, Precipitation, Redox, Theories of Indicators: common indicators used in Acid base, Complexometric, Precipitation and Redox titrations. Concentration: Molarity, Molality, Normality, including exercises on how to prepare different concentrations of various solutes. Standardisation of Volumetric solutions, using primary standards. Calculations in volumetric Analysis</p>	7
Unit II	<p><b>Chromatographic techniques</b></p> <p>Adsorption chromatography, Partition chromatography, Paper Chromatography, Thin Layer Chromatography (Qualitative and Quantitative), Gas Chromatography (Qualitative and Quantitative), High Performance Liquid Chromatography (Qualitative and Quantitative).</p>	8
Unit III	<p><b>Practicals</b></p> <p>I. TLC Plate preparation, application of sample and development of plates for either one of the following: vitamins composition, a crude plant extract and a synthetic reaction mixture. Paper Chromatography – Separation of various colours of inks used in ball point pens.</p> <p>II. Recording of UV and visible spectrum for organic molecules and finding out of <math>\lambda_{max}</math>.</p> <p>III. Soil and water analysis</p> <ol style="list-style-type: none"> <li>1. Collection of water samples (Field work)</li> <li>2. Determination of total hardness of water</li> <li>3. Determination of alkalinity of water</li> <li>4. Determination of pH of water</li> <li>5. Determination of conductivity of water</li> <li>6. Collection of soil samples from fields and study of soil sampling tools. (Field work)</li> <li>7. Soil sample preparation</li> <li>8. Determination of bulk density of soil</li> <li>9. Determination of pH of soil</li> <li>10. Determination of conductivity of soil</li> </ol>	15
<b>Total Contact Hrs</b>		<b>30</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation

**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.

**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, 18 <sup>th</sup> Edition	2011

### 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. 7 <sup>th</sup> Edition	2002
3	Drago, R.S	Physical methods in Inorganic chemistry	W. B. Saunders Company. 1 <sup>st</sup> Edition	1992
4	S.M. Khopkar	Basic Concepts of Analytical Chemistry	New Age International Publishers, 3 <sup>rd</sup> Edn	2008

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  Signature:	Name: Dr.K.Poonkodi  Signature:	Name: Mr.K.Srinivasan  Signature:	Name: Dr.R.Muthukumaran  Signature:



<b>Programme code:</b>	M.Sc.			<b>Programme Title :</b>	MSc Chemistry
<b>Course Code:</b>	<b>CERTIFICATE COURSE-I</b>			<b>Batch</b>	2022-2024
<b>22PCYCFC01</b>	Fundamentals of Pharmaceutical Chemistry			<b>Semester:</b>	III
				<b>Credits:</b>	2
<b>Lecture Hrs/Week</b>	2	<b>Tutorial</b>	-	<b>Total Hrs/Sem:</b>	40
<b>Course Objectives:</b>					
* 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, sulphadruugs, 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 the important terminologies used in pharmaceutical chemistry, naming of drugs and mechanism of drug action.	K2
CO2	Learn about medicinal plants and medicinally important compounds.	K4
CO3	Recognize the importance of Blood, receptor and drug design.	K5
CO4	Analyze the Antipyretics, Antihypertensive, hypotensive and antineoplastic drugs.	K4
CO5	Explain receptors and drug design	K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate</b>		

Units	Content	Hrs
<b>Unit I</b>	<b>Introduction to Pharmaceutical Chemistry</b> Introduction Important terminologies used in pharmaceutical chemistry – pharmacology – drug – pharmacophore – antimetabolites – mutation – Gram's 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

<b>Unit II</b>	<b>Medicinal Plants</b> 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-estimationofbilirubin in serum– estimation of urea in serum and estimation of inorganic chlorides in blood serum.	8
<b>Unit III</b>	<b>Clinical Chemistry</b> 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
<b>Unit IV</b>	<b>Analgesics and Antipyretics</b> Analgesics and Antipyretics Introduction to pharmaceutical chemistry analgesics – Morphine analogues and its modification – Codeine – Synthetic narcotic analgesics – Pethidines and methadones – Narcotic antagonists – Nalorphine – Antipyretic analgesics – pyrazoles – salicylic acid – paraaminophenol derivatives – Aspirin and salol hypnotics and sedatives – Barbiturates –Benzodiazepines.	8
<b>Unit V</b>	<b>Receptors and Drug Design</b> 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
<b>Total Contact Hrs</b>		<b>40</b>

**Pedagogy**

Direct Instruction, Flipped Class, Digital Presentation
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**Assessment Methods:**

Seminar, Quiz, Assignments, Group Task.
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22PCYCFC01

### 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 Chezian  Signature: