M.Sc., CHEMISTRY

CHOICE BASED CREDIT SYSTEM- LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS – LOCF)

(For the candidate admitted in the academic year 2023-2024)

SYLLABUS

PROGRAMME CODE : 2PSCHE

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE, (AUTONOMOUS).

(Affiliated to Bharathidasan University, Tiruchirappalli)

(Accredited by NAAC / An ISO 9001:2015 Certified Institution)

SUNDARAKKOTTAI- MANNARGUDI –614016.

TAMILNADU, INDIA.

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(For the candidates admitted in the academic year 2023-2024)

CHOICE BASED CREDIT SYSTEM

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Our College has moved to CBCS and implemented the grading system.

OUTCOME-BASED EDUCATION (OBE)
LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications are awarded on the basis of demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected of graduates of a programme of study. Learning outcomes specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. The expected learning outcomes are used as reference points that would help to formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes which in turn will help in curriculum planning and development, and in the design, delivery and review of academic programmes. They provide general guidance for articulating the essential learnings associated with programmes of study and courses with in a programme, maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility and provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing student learning levels, and periodic review of programmes and academic standards.

Some important aspects of the Outcome Based Education

Course: is defined as a theory, practical or theory cum practical subject studied in a semester.

Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.

Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs): PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC): A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE): Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

Generic Elective Courses: An elective course chosen generally from an **unrelated discipline/subject,** with an intention to seek exposure is called a Generic Elective. Generic Elective courses are designed for the students of other disciplines. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Non Major Elective (NME): A student shall choose at least two Non-major Elective Courses (NME) from outside his/her department.

Skill Enhancement Courses (SECs): These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge**.**

Field Study/Industrial Visit/Case Study: It has to be completed during the fifth semester of the degree programme. Credit for this course will be entered in the fifth semester's marks statement.

Internship: Students must complete internship during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. Credit for internship will be entered in the fifth semester's mark statement.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTELetc.

Postgraduate Programme:

Programme Pattern: The Post Graduate degree programme consists of **FIVE** vital components. They are as follows:

Part –A	:	Core Course (Theory, Practicals) Core Industry Module, Core Project
Part-B (i)	:	Elective courses
Part-B (ii)	:	Non Major Elective, Skill Enhancement course, Professional Competency course
Part-B (iii)	:	Internship
Part –C	:	Extension activity

EXAMINATION

Continuous Internal Assessment (CIA):

PG - Distribution of CIA Marks

Passing Minimum: 50 %

Assignments – 3 = 30%

Test - 2 = 50%

Seminar = 10 %

Attendance = 10 %

Question Paper Pattern

Part A: includes two subsections

Part A 1 (10X1=10 marks)

One word question/ Fill in the blanks/ /True or False/ Multiple Choice QuestionsTwo Questions from Each unit

Part A 2(5X2=10 marks)

Match the following

Short Answers

One question from Each unit

Total Marks - 20

Part B: (5X5=25 marks)

Paragraph Answers

Either/ or type, One Question from each unit

Part C: (10X3=30)

Essay Type Answers
Answer 3 out of 5 Questions
One Question from each unit

Part A: K1 Level
Part B: K2, K3 and K4 Level
Part C: K5 and K6 Level

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S.No.	Level	Parameter	Description
1	K1	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/ Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis/Creating	The learner creates a new product or point of view

WEIGHTAGE of K –LEVELS IN QUESTION PAPER

(Cognitive Level) K-LEVELS →	Lower Order Thinking			Higher Order Thinking			Total
	K1	K2	K3	K4	K5	K6	
END SEMESTER EXAMINATIONS (ESE)	20	25			30		**75**
Continuous Internal Assessment (CIA)	20	25			30		**75**

QUESTION PATTERN FOR END SEMESTER EXAMINATION/ Continuous Internal Assessment

PART		MARKS
PART –A I. (No choice ,One Mark) **TWO** questions from each unit **II.** (No choice, Two Mark) **ONE** question from each unit	(10x1=10) (5x2=10)	**20**
PART –B (Either/ or type,5-Marks) **ONE** question from each unit	(5x5=25)	**25**
PART –C (3 out of 5) (10Marks) **ONE** question from each unit	(3x10=30)	**30**
	Total	**75**

BLUE PRINT OF QUESTION PAPER FOR END SEMESTER EXAMINATION							
DURATION: 3.00 Hours.							**Max Mark :75**
K-LEVELS / **PART**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**Total Marks**
PART –A (One Mark, No choice) (10x1=10)	10						**10**
(2-Marks,Nochoice) (5x2=10)	10						**10**
PART –B (5-Marks)(Either/or type) (5x5=25)		5	10	10			**25**
PART –C (10 Marks)(3 out of 5) (3x10=30) Courses having only **K5,K6** levels, K5 level- 3 Questions, K6 level- 2 Questions **(One K6 level question is compulsory)**					20	10	**30**
Total	**20**	**05**	**10**	**10**	20	10	**75**

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

Grade Point Average (GPA) will be calculated from the first semester onwards for all semester. From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) , respectively. These two are calculated by the following formulae:

$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{I=1}^{n} C_i}$	$WAM(\text{Weighted Average Marks}) = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{I=1}^{n} C_i}$
Where, C_i is the Credit earned for the Course$i$ G_i is the Grade Point obtained by the student for the Course$i$ M_i is the marks obtained for the course$i$ and n is the number of Courses **Passed** in that semester.	

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

i. The classification of final results shall be based on the CGPA, as indicated in Table-2.

ii. For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99 and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good', and 'Above Average' respectively.

iii. Absence from an examination shall not be taken an attempt.

Table- 1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	**10**	**O**
80 and above and below 90	**9**	**A+**
70 and above and below 80	**8**	**A**
60 and above and below 70	**7**	**B+**
50 and above and below 60	**6**	**B**
Below50	**NA**	**RA**

NA- Not Applicable, RA- Reappearance

The candidates performance in every current semester is indicated by **Semester Grade Point Average (SGPA)** and from the second semester onwards, the continuous performance including previous semester/s is indicated by **Cumulative Grade Point Average (CGPA)**

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	**O**	**Outstanding**
8.00 to 8.99	A+	**Excellent**
7.00 to 7.99	**A**	**Very Good**
6.00 to 6.99	**B+**	**Good**
5.00 to 5.99	**B**	**Above Average**

***** The candidates who have passed in the first appearance and within the prescribed duration of the PG Programme are eligible. If the candidate's Grade is O/A+ with more than one attempt, the performance is fixed as "Very Good"

Vision

To Empower the women students by providing excellent theoretical, practical and research skills in Chemistry to meet the global needs.

Mission

- Providing quality education in the principles, theory and practice of Chemistry.
- Making the students to cope up with the requirements of industry and service sectors.
- Excelling in teaching, research, knowledge transfer and to serve the social, cultural and economic needs of the nation.

PROGRAMME OUTCOMES FOR M.Sc.,DEGREE PROGRAMMES

PO.No	Programme Outcomes (*Upon completion of the M.Sc.,Degree Programme, the Post graduate will be able to)*
PO-1	**Disciplinary Knowledge**: demonstrate in-depth knowledge and understanding of theories, policies, and practices in one or more disciplines that form a part of a Post Graduate program of study in Master of Science.
PO-2	**Critical Thinking and Problem Solving**: apply analytic thought to a body of knowledge, analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence, identify relevant assumptions or implications, formulate coherent arguments, critically evaluate practices, policies and theories by following scientific approach to knowledge development: solve problems and extrapolate the same to real life situation
PO-3	**Information/digital literacy and Communication Skills:** use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources, and use appropriate software for analysis of data: communicate thoughts and ideas analytically and effectively in writing and orally using appropriate media, and present complex information in a clear and concise manner to different groups.
PO-4	**Research-related skills:** conduct independent inquiry in a chosen scientific discipline, demonstrate sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; plan, execute and report the results of an experiment or investigation.
PO-5	**Scientific reasoning and Reflective Thinking:** analyse, interpret and draw conclusions from quantitative/qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective; critically and sensibly evaluate life experiences, with self awareness and reflexivity of both self and society.
PO-6	**Multidisciplinary Approach, Innovation and Entrepreneurship:** propose novel ideas of interdisciplinary approach in providing better solutions and new ideas for the sustainable developments; identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.
PO-7	**Moral and ethical awareness/reasoning:** embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work, demonstrate the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights, appreciate environmental and sustainability issues, and adopt objective, unbiased and truthful actions in all aspects of work.
PO-8	**Self directed Learning:** work independently, identify appropriate resources required for a project, and manage a project till completion.
PO-9	**Lifelong Learning:** engage in continuous learning for professional growth and development, acquire knowledge and skills, adapt to changing environment and to changing trades and demands of work place through knowledge/skill development/reskilling.
PO-10	**Multicultural Competence, Social Interaction and Effective Citizenship:** understand the values and beliefs of multiple cultures, global perspectives, engage and interact respectfully with diverse groups and elicit views of others, mediate disagreements and help reach conclusions in group settings, and demonstrate empathetic social concern and equity centred national development

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO No.	Program Specific Outcomes **(M.Sc., Chemistry)**
PSO1	**Placement:** To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions
PSO2	**Entrepreneur:** To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations
PSO3	**Research and Development:** Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.
PSO4	**Contribution to Business World:** To produce employable, ethical and innovative professionals to sustain in the dynamic business world.
PSO5	**Contribution to the Society:** To contribute to the development of the society by collaborating with stakeholders for mutual benefit

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M.Sc., CHEMISTRY

COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM – LEARNINIG OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(Applicable to the candidates admitted form the academic year 2023-2024)

ELIGIBILITY: Candidates who have passed Bachelor level Examination in Chemistry

Sem	Part	Course	Course Code	Title of the Paper	Ins. Hours / Week	Ins. Hours/Week				Credit	Exam Hours	Marks		Total
						L	T	P	S			CIA	ESE	
I	Part A	Core Course –I	P23CH101	Organic Reaction Mechanism-I	6	4	1	-	1	5	3	25	75	100
		Core Course –II	P23CH102	Structure and Bonding in Inorganic Compounds	6	4	1	-	1	5	3	25	75	100
		Core Practical– I	P23CH103P	Organic Chemistry Practical	6	-	-	6	-	3	6	25	75	100
	Part B (i)	Elective Course –I	P23CHE11A/ P23CHE11B/ P23CHE11C	Pharmaceutical Chemistry /Nanomaterials and Nanotechnology/ Analytical Chemistry	5	5	-	-	-	3	3	25	75	100
		Elective Course -II	P23CHE12A/ P23CHE12B/ P23CHE12C	Electrochemistry/ Molecular Spectroscopy/ Catalysis	5	4	1	-	-	3	3	25	75	100
	Part B (ii)	Non Major Elective-I			2	2	-	-	-	2	3	25	75	100
				TOTAL	**30**	**19**	**03**	**06**	**02**	**21**	-	-	-	**600**
II	Part A	Core Course –III	P23CH204	Organic Reaction Mechanism-II	6	4	1	-	1	5	3	25	75	100
		Core Course-IV	P23CH205	Physical Chemistry-I	6	4	1	-	1	5	3	25	75	100
		Core Practical– II	P23CH206P	Inorganic Chemistry Practical	6	-	-	6	-	3	6	25	75	100
	Part B (i)	Elective Course – III	P23CHE23A/ P23CHE23B/ P23CHE23C	Medicinal Chemistry/ Green Chemistry/ Supramolecular Chemistry	5	5	-	-	-	3	3	25	75	100
		Elective Course -IV	P23CHE24A/ P23CHE24B/ P23CHE24C	Bio-Inorganic Chemistry/ Material Science/ Solid State Chemistry	5	4	1	-	-	3	3	25	75	100
	Part B (ii)	Non Major Elective-II			2	2	-	-	-	2	3	25	75	100

	Part B(iii)	Internship/Industrial Activity			-	-	-	-	-	-	-	-		
	TOTAL				**30**	**19**	**03**	**06**	**02**	**21**	-	-	-	**600**
Sem	**Part**	**Course**	**Course Code**	**Title of the Paper**	**Ins. Hours / Week**	**Ins. Hours/Week**				**Credit**	**Exam Hours**	**Marks**		**Total**
						L	**T**	**P**	**S**			**CIA**	**ESE**	
III	Part A	Core Course –V	P23CH307	Organic Synthesis and Photochemistry	6	4	1	-	1	5	3	25	75	100
		Core Course –VI	P23CH308	Coordination Chemistry	6	4	1	-	1	5	3	25	75	100
		Core Practical-III	P23CH309P	Physical Chemistry Practical	6	-	-	6	-	3	6	25	75	100
		Core Industry Module	P23CHI31	Industrial Chemistry	5	4	1	-	-	3	3	25	75	100
	Part B (i)	Elective Course–V	P23CHE35A/ P23CHE35B /P23CHE35C	Pharmacognosy and Phytochemistry /Biomolecules and Heterocyclic Compounds/ Computational Chemistry	5	4	1	-	-	3	3	25	75	100
	Part (ii)	Skill Enhancement Course	P23SECH31	Preparation of Consumer Products	2	2	-	-	-	2	3	25	75	100
	Part B (iii)	Internship/Industrial Activity			-	-	-	-	-	2	-	-	-	-
		TOTAL			**30**	**18**	**04**	**06**	**02**	**23**	**-**	**-**	-	**600**
IV	Part A	Core Course –VII	P23CH410	Research Methodology	5	4	1	-	-	5	3	25	75	100
		Core Course-VIII	P23CH411	Physical Chemistry-II	5	4	1	-	-	5	3	25	75	100
		Core Practical– IV	P23CH412P	Analytical Instrumentation Technique Practicals	6	-	-	6	-	3	6	25	75	100
		Core Project	P23CHPW	Project with Viva Voce	8	-	2	6	-	7	3	25	75	100
	Part B (i)	Elective Course – VI Industry/ Enterpreneurship	P23CHE46A/ P23CHE46B/ P23CHE46C	Chemistry of Natural Products /Polymer Chemistry/ Food Chemistry	4	3	1	-	-	3	3	25	75	100
	Part B (ii)	Professional Competency Course	P23PCCH41	Chemistry for Competitive Examinations	2	2	-	-	-	2	3	25	75	100
	Part C	Extension Activity			-	-	-	-	-	1	-	-	--	
			TOTAL		**30**	**13**	**05**	**12**	**-**	**26**	-	-	-	**600**
			GRAND TOTAL		**120**	**69**	**15**	**30**	**06**	**91**				**2400**
		Extra Credit	MOOC/SWAYAM/NPTEL		-	-	-	-	-	**2**	-	-	-	-
			Value added Courses		-	-	-	-	-	**2**	-	-	-	-

L-Lecture T-Tutorial P-Practical S-Seminar

CREDIT DISTRIBUTION FOR M.Sc., CHEMISTRY

S.No	Course Details	Credit
Part A	Core Course [8 Courses X 5 Credits]	40
	Core Practical [4 Courses X 3 Credits]	12
	Project Work with Viva Voce	07
	Core Industry Module	03
Part B (i)	Elective Course [6 Courses X 3 Credits]	18
Part B (ii)	Non Major Elective[2 Courses X 2 Credits]	04
	Skill Enhancement Course [1 Courses X 2 Credits]	02
	Professional Competency Course [1 Courses X 2 Credits]	02
Part B (iii)	Internship	02
Part C	Extension Activity	01
	Total Credit	**91**

Part A component and Part B (i) will be taken into account for CGPA calculation for the postgraduate programme and the other components of Part B and Part C have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the PG degree.

NON MAJOR ELECTIVE (NME) OFFERED BY THE DEPARTMENT

Semester	Part	Course	Course Code	Title of the Paper
I	Part B (ii)	NME-I	P23NMECH11	Cosmetic Chemistry
II		NME-II	P23NMECH22	Chemistry in everyday life

EXTRA CREDIT COURSE – VALUE ADDED COURSE BY THE DEPARTMENT

Semester	Name of the Course	Course Code	Title of the Paper
III	Value Added Course – II (VAC)	P23CHVA32	Forensic Chemistry

SEMESTER-III

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(For the Candidates admitted in the academic year 2023-2024)
DEPARTMENT OF CHEMISTRY
M.Sc., CHEMISTRY

SEMESTER: III - CC-V- Organic Synthesis and Photochemistry

Ins. Hrs. /Week: 6 **Course Credit: 5** **Course Code: P23CH307**

UNIT-I: PLANNING AN ORGANIC SYNTHESIS AND CONTROL ELEMENTS (18 HOURS)

Preliminary Planning – knowns and unknowns of the synthetic system studied, analysis of the complex and interrelated carbon framework into simple rational precursors, retrosynthetic analysis, alternate synthetic routes, key intermediates that would be formed, available starting materials and resulting yield of alternative methods. Linear Vs convergent synthesis. synthesis based on umpolung concepts of Seeback, regiospecific control elements. Use of protective groups, activating groups and bridging elements. Examples on retrosynthetic approach, calculation of yield, advantages of convergent synthesis, synthesis of stereochemistry-controlled products.

UNIT-II: ORGANIC SYNTHETIC METHODOLOGY (18 HOURS)

Retrosynthetic analysis; Alternate synthetic routes. Synthesis of organic mono and bifunctional compounds via disconnection approach. Key intermediates, available starting materials and resulting yields of alternative methods. Convergent and divergent synthesis, Synthesis based on umpolung concepts of Seebach. Protection of hydroxyl, carboxyl, carbonyl, thiol and amino groups. Illustration of protection and deprotection in synthesis. Control elements: Regiospecific control elements. Use of protective groups, activating groups, and bridging elements. Stereospecific control elements. Functional group alterations and transposition.

UNIT-III: PERICYCLIC REACTIONS (18 HOURS)

Woodward Hoffmann rules; The Mobius and Huckel concept, FMO, PMO method and correlation diagrams. Cycloaddition and retrocycloaddition reactions; [2+2], [2+4], [4+4, Cationic, anionic, and 1,3-dipolar cycloadditions. Cheletropic reactions. ; Electrocyclization and ring opening reactions of conjugated dienes and trienes. Sigmatropic rearrangements: (1,3), (1,5), (3,3) and (5,5)-carbon migrations, degenerate rearrangements. Ionic sigmatropic rearrangements. Group transfer reactions. Regioselectivity, stereoselectivity and periselectivity in pericyclic reactions.

UNIT-IV: ORGANIC PHOTOCHEMISTRY-I (18 HOURS)

Photochemical excitation: Experimental techniques; electronic transitions; Jablonskii diagrams; intersystem crossings; energy transfer processes; Stern Volmer equation.

Reactions of electronically excited ketones; $\pi \rightarrow \pi^*$ triplets; Norrish type-I and type-II cleavage reactions; photo reductions; Paterno-Buchi reactions.

UNIT-V: ORGANIC PHOTOCHEMISTRY-II (18 HOURS)

Photochemistry of α,β-unsaturated ketones; cis-trans isomerisation. Photon energy transfer reactions, Photo cycloadditions, Photochemistry of aromatic compounds; photochemical rearrangements; photo-stationery state; di-π-methane rearrangement; Reaction of conjugated cyclohexadienone to 3,4-diphenyl phenols; Barton's reactions.

TOTAL LECTURE HOURS : 90

COURSE OUTCOMES:

Students will be able to

1. Recall the basic principles of organic chemistry and to understand the various reactions organic compounds with reaction mechanisms.
2. Understand the versatility of various special reagents and to correlate their reactivity with various reaction conditions.
3. Implement the synthetic strategies in the preparation of various organic compounds.
4. Predict the suitability of reaction conditions in the preparation of tailor-made organic compounds.
5. Design and synthesize novel organic compounds with the methodologies learnt during the course.

TEXT BOOKS:

1. F. A. Carey and Sundberg, Advanced Organic Chemistry, 5thed, Tata McGraw-Hill, New York, 2003.
2. J. March and M. Smith, Advanced Organic Chemistry, 5th ed., John-Wiley and sons, 2007.
3. R. E. Ireland, Organic synthesis, Prentice Hall India, Goel publishing house, 1990.
4. Clayden, Greeves, Warren, Organic Chemistry, Oxford University Press, Second Edition, 2016.
5. M. B. Smith, Organic Synthesis 3rd edn, McGraw Hill International Edition, 2011.

REFERENCE BOOKS:

1. Gill and Wills, Pericyclic Reactions, Chapman Hall, London, 1974.
2. J.A. Joule, G.F. Smith, Heterocyclic Chemistry, Garden City Press, Great Britain, 2004.
3. W. Caruthers, Some Modern Methods of Organic Synthesis 4thedn, Cambridge University Press, Cambridge, 2007.
4. H. O. House. Modern Synthetic reactions, W.A. Benjamin Inc, 1972.
5. Jagdamba Singh and Jaya Singh, Photochemistry and Pericyclic Reactions, New Age International Publishers, New Delhi, 2012.

E RESOURCES:

1. https://rushim.ru/books/praktikum/Monson.pdf
2. www.oreilly.com
3. www.spinger.com
4. www.elsevier.com
5. www.sciencedirect.com

SEMESTER: III – CC - VI-: Coordination Chemistry

Ins. Hrs. /Week: 6 **Course Credit:5** **Course code: P23CH308**

UNIT-I: MODERN THEORIES OF COORDINATION COMPOUNDS (18 HOURS)

Crystal field theory - splitting of d orbitals in octahedral, tetrahedral and square planar symmetries - measurement of 10Dq - factors affecting 10Dq - spectrochemical series - crystal field stabilisation energy for high spin and low spin complexes- evidences for crystal field splitting - site selections in spinels and antispinels - Jahn Teller distortions and its consequences. Molecular Orbital Theory and energy level diagrams concept of Weak and strong fields, Sigma and pi bonding in octahedral, square planar and tetrahedral complexes.

UNIT-II: SPECTRAL CHARACTERISTICS OF COMPLEXES (18 HOURS)

Term states for d ions - characteristics of d-d transitions - charge transfer spectra - selection rules for electronic spectra - Orgel correlation diagrams - Sugano-Tanabe energy level diagrams - nephelauxetic series - Racha parameter and calculation of inter-electronic repulsion parameter.

UNIT-III: STABILITY AND MAGNETIC PROPERTY OF THE COMPLEXES (18 HOURS)

Stability of complexes: Factors affecting stability of complexes, Thermodynamic aspects of complex formation, Stepwise and overall formation constants, Stability correlations, statistical factors and chelate effect, Determination of stability constant and composition of the complexes: Formation curves and Bjerrum's half method, Potentiometric method, Spectrophotometric method, Ion exchange method, Polorographic method and Continuous variation method (Job's method) Magnetic property of complexes: Spin-orbit coupling, effect of spin-orbit coupling on magnetic moments, quenching of orbital magnetic moments.

UNIT-IV: KINETICS AND MECHANISMS OF SUBSTITUTION REACTIONS OF OCTAHEDRAL AND SQUARE PLANAR COMPLEXES (18 HOURS)

Inert and Labile complexes; Associative, Dissociative and SNCB mechanistic pathways for substitution reactions; acid and base hydrolysis of octahedral complexes; Classification of metal ions based on the rate of water replacement reaction and their correlation to Crystal Field Activation Energy; Substitution reactions in square planar complexes: Trans effect, theories of trans effect and applications of trans effect in synthesis of square planar compounds; Kurnakov test.

UNIT-V: ELECTRON TRANSFER REACTIONS IN OCTAHEDRAL COMPLEXES (18 HOURS)

Outer sphere electron transfer reactions and Marcus-Hush theory; inner sphere electron transfer reactions; nature of the bridging ligand in inner sphere electron transfer reactions. Photo-redox, photo-substitution and photo-isomerisation reactions in complexes and their applications.

TOTAL LECTURE HOURS:90

COURSE OUTCOMES :

Students will be able to:

1. Understand and comprehend various theories of coordination compounds.
2. Understand the spectroscopic and magnetic properties of coordination complexes.
3. Explain the stability of complexes and various experimental methods to determine the stability of complexes.
4. Predict the electronic transitions in a complex based on correlation diagrams and UV-visible spectral details.
5. Comprehend the kinetics and mechanism of substitution reactions in octahedral and square planar complexes.

TEXT BOOKS:

1. J E Huheey, EA Keiter, RL Keiter and OK Medhi, Inorganic Chemistry – Principles of structure and reactivity, 4th Edition, Pearson Education Inc., 2006
2. G L Meissler and D ATarr, Inorganic Chemistry, 3rd Edition, Pearson Education Inc., 2008
3. D. Bannerjea, Co-ordination Chemistry, TATA Mcgraw Hill, 1993.
4. B. N. Figgis, Introduction to Ligand Fields, Wiley Eastern Ltd, 1976.

5. F. A. Cotton, G. Wilkinson.; C. A. Murillo; M. Bochmann, Advanced Inorganic Chemistry, 6th ed.; Wiley Inter-science: New York, 1988.

REFERENCE BOOKS:

1. Keith F. Purcell and John C. Kotz, Inorganic Chemistry, Saunders Publications, USA, 1977.
2. Peter Atkins and Tina Overton, Shriver and Atkins' Inorganic Chemistry, 5th Edition, Oxford University Press, 2010.
3. Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson, P. L. Guas, John Wiley, 2002, 3rd edn.
4. Concepts and Models of Inorganic Chemistry, B. Douglas, D. McDaniel, J. Alexander, John Wiley, 1994, 3rd edn.
5. Inorganic Chemistry, D. F. Shriver, P. W. Atkins, W. H. Freeman and Co, London, 2010.

E RESOURCES:

1. https://ocw.mit.edu/courses/5-04-principles-of-inorganic-chemistry-ii-fall-2008/pages/syllabus/
2. www.scribd.com
3. www.icobo.com
4. www.topfreebooks
5. www.sciencedirect.com

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2023-2024)

DEPARTMENT OF CHEMISTRY

M.Sc., CHEMISTRY

SEMESTER: III – CP-III-: Physical Chemistry Practical

Ins. Hrs. /Week: 6 **Course Credit: 3** **Course Code: P23CH309P**

UNIT-I: CONDUCTIVITY EXPERIMENTS (30 HOURS)

1. Determination of equivalent conductance of a strong electrolyte & the verification of DHO equation.
2. Verification of Ostwald's Dilution Law & Determination of pKa of a weak acid.
3. Verification of Kohlrausch's Law for weak electrolytes.
4. Determination of solubility of a sparingly soluble salt.
5. Acid-base titration (strong acid and weak acid vs NaOH).
6. Precipitation titrations (mixture of halides only).

UNIT-II: KINETICS (30 HOURS)

1. Study the kinetics of acid hydrolysis of an ester, determine the temperature coefficient and also the activation energy of the reaction.

2. Study the kinetics of the reaction between acetone and iodine in acidic medium by half-life method and determine the order with respect to iodine and acetone.

UNIT-III: PHASE DIAGRAM (30 HOURS)

Construction of phase diagram for a simple binary system

1. Naphthalene-phenanthrene

2. Benzophenone- diphenyl amine

ADSORPTION

Adsorption of oxalic acid on charcoal & determination of surface area (Freundlich isotherm only).

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)

TOTAL HOURS: 90

Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved

(To be discussed during the Tutorial hours)

Skills acquired from this course:

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

SCHEME OF EVALUATION:

Execution of experiment	- 35 marks
Presentation of data	- 15 marks
Processing the data, graph and calculation	- 05 marks
Results	- 10 marks
UE	- 65 marks
Viva voce	- 10 marks
Total Marks: IA	- 25 marks

RESULTS:

Less than 5%	- 20 marks
5-7%	- 15 marks
7-8 %	- 10 marks
8-10 %	- 8 marks
Above 10 %	- 6 marks

COURSE OUTCOMES:

Students will be able to:

1. Recall the principles associated with various physical chemistry experiments.
2. Scientifically plan and perform all the experiments.
3. Observe and record systematically the readings in all the experiments.
4. Calculate and process the experimentally measured values and compare with graphical data.
5. Interpret the experimental data scientifically to improve students' efficiency for societal developments.

TEXT BOOKS:

1. B. Viswanathan and P.S.Raghavan, Practical Physical Chemistry, Viva Books, New Delhi, 2009.
2. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co. Pvt., 1996.
3. V.D. Athawale and Parul Mathur, Experimental Physical Chemistry, New Age International (P) Ltd., New Delhi, 2008.
4. E.G. Lewers, Computational Chemistry: Introduction to the Theory and Applications of Molecular and Quantum Mechanics, 2nd Ed., Springer, New York, 2011.
5. G.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in Physical Chemistry, 8th edition, McGraw Hill, 2005.

REFERENCE BOOKS:

1. J. B. Yadav, Advanced Practical Physical Chemistry, Goel Publishing House, 2001.
2. G.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in Physical Chemistry, 8th edition, McGraw Hill, 2009.
3. J. N. Gurthu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 1987.
4. Shailendra K Sinha, Physical Chemistry: A laboratory Manual, Narosa Publishing House Pvt, Ltd., New Delhi, 2014.
5. F. Jensen, Introduction to Computational Chemistry, 3rd Ed., Wiley-Blackwell.

E RESOURCES:

1. https://web.iitd.ac.in/~nkurur/2015-16/Isem/cmp511/lab_handout_new.pdf
2. www.wiley,com
3. online.library.wiley.com
4. pubs.acs.org
5. www.topfreebooks

SEMESTER: III – Core Industry Module: Industrial Chemistry

Ins. Hrs. /Week:5 **Course Credit: 3** **Course code: P23CHI31**

UNIT I: BASIC IDEAS AND INDUSTRIAL WASTES (15 HOURS)

Basics idea about unit operation – flow chart – chemical conversion – batch versus continuous processing – chemical process selection – design – chemical process control. Types of industrial wastes – treatment of wastes or effluent with organic impurities – treatment of wastes or effluent with inorganic impurities – treatment of some important chemical wastes.

UNIT II: PETROLEUM AND PETROCHEMICALS (15 HOURS)

Petroleum and Petrochemicals Introduction – saturated hydrocarbons from natural gas – uses of saturated hydrocarbons – unsaturated hydrocarbons – acetylene, ethylene, propylene, butylene – aromatic hydrocarbons – toluene and xylene. Preparation of rectified spirit from beat – methylated spirit – preparation of absolute alcohol from rectified spirit – petrochemicals in India.

UNIT III: SILICATE INDUSTRIES (15 HOURS)

Glass: Glassy state and its properties, classification (silicate and non silicate glasses). Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.

Ceramics: Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, super conducting and semi conducting oxides, fullerenes carbon nanotubes and carbon fiber.

Cements : Manufacture of Cement Introduction – types of cement – high alumina cement, water proof cement, slag cement, acid resisting cement, white cement, coloured cement, Pozzolana cement. Setting of cement – properties of cement – testing of cement – uses of cement – concrete – cement industries in India.

UNIT IV: PULP AND PAPER INDUSTRY (15 HOURS)

Pulp and Paper and Manufacture of Paper Introduction – manufacture of pulp – types of pulp – sulphate or craft pulp, soda pulp, Rag pulp – beating, refining, filling, sizing and colouring. Calendaring – uses – paper industries in India.

UNIT V: SOAPS, DETERGENTS AND PERFUMES (15 HOURS)

Soaps and Detergents Introduction – types of soaps – hard and soft soaps – manufacture of soap (hot and continuous process only) – cleansing action of soap – detergents – surface active agents – biodegradability of surfactants, amphoteric detergents.

Perfumes: Introduction – production of natural perfumes – flower perfumes – jasmine, rose and lily – production of synthetic perfumes – muscone and nitro-musks.

TOTAL LECTURE HOURS: 75

COURSE OUTCOME:

Students will be able to :

1. Learn the basic principle and significance of Industry and industrial wastes
2. Learn the significance of petroleum and petrochemials.
3. Learn the manufacturing methods and properties of cement.
4. Learn the manufacturing methods and properties of Pulp industry.
5. Learn the preparation, properties and significance of soaps, detergents and Perfumes.

TEXT BOOKS:

1. James R. Couper, W. Roy Penney, James R. Fair, Stanley M. Walas,Chemical Process .Equipment - Selection and Design**,** 2nd Edition**,** Gulf Professional Publishing, 2005.
2. John A. Tyrell, Fundamentals of Industrial Chemistry,Wiley, 2014.
3. Kent J.A, Riegel's Handbook of Industrial Chemistry Paperback, 9th Edition January 1, 1997, Kindle book.
4. O.P. Vermani, A.K. Narula, Industrial Chemistry, Galgotia publications Pvt. Ltd., New Delhi, 2008.
5. B. K. Sharma, Industrial Chemistry; 5th Ed., Goel Publishing House, New Delhi, 1997

REFERENCES

1. B. K. Sharma, Industrial Chemistry; 8th Ed., Goel Publishing House, New Delhi, 1997. (Unit–I, II, III, IV and V)
2. R. N. Shreve, and J. A. Brink Jr. Chemical Process Industries; 4th Ed., McGraw Hill, Toronto, 1977. (Unit–I, II, III, IV and V)
3. C. S. Brain, Production and Properties of Industrial Chemicals; Reinhold, New York, 1989. (Unit–I)
4. A Book of Industrial Chemistry- Mark Anthony Benovenuto.
5. A Book of Industrial Chemistry- A.V. Nagawade.

E- RESOURCES

1. www.merriam.webster.com
2. www.degruyter.com
3. primoa.library,unsw,edu,an
4. pubs.acs.org
5. ceng,tu,edu,iq
6. www.unibo,it

SEMESTER: III - EC-V (A): Pharmacognosy and Phytochemistry

Ins. Hrs. /Week: 5 **Course Credit: 3** **Course code: P23CHE35A**

UNIT-I: PHARMACOGNOSY AND STANDARDIZATION OF HERBAL DRUGS (15 HOURS)

Introduction, definition, development classification and Source of Drugs: Biological, mineral, marine,and plant tissue cultures. Study of pharmacognostic of a crude drug. Biosynthesis: Shikimic acid pathway and acetate pathway. Systematic analysis of Crude drugs. Standardization of Herbal drugs. WHO guidelines, Sampling of crude drug, Methods of drug evaluation. Determination of foreign matter, moisture Ash value. Phytochemical investigations-General chemical tests.

UNIT-II: EXTRACTION TECHNIQUES (15 HOURS)

General methods of extraction, types – maceration, Decoction, percolation, Immersion and soxhlet extraction. Advanced techniques- counter current, steam distillation, supercritical gases, sonication, Micro waves assisted extraction. Factors affecting the choice of extraction process.

UNIT-III: DRUGS CONTAINING TERPENOIDS AND VOLATILE OILS (15 HOURS)

Terpenoids: Classification, Isoprene rule, Isolation and separation techniques, General properties Camphor, Menthol, Eucalyptol. Volatile Oils or Essential Oils: Method of Preparations, Classifications of Volatile oils, Camphor oil, Geranium oil, Citral- Structure uses. Pentacyclic triterpenoids: amyrines; taraxasterol: Structure and pharmacological applications.

UNIT-IV: DRUGS CONTAINING ALKALOIDS (15 HOURS)

Occurrence, function of alkaloids in plants, pharmaceutical applications. Isolation, Preliminary Qualitative tests and general properties. General methods of structural elucidation. Morphine, Reserpine, papaverine - chemical properties, structure and uses. papaverine - structure, chemical properties and uses.

UNIT-V: PLANT GLYCOSIDES AND MARINE DRUGS (15 HOURS)

Glycosides: Basic ring system, classification, isolation, properties, qualitative analysis. Pharmacological activity of Senna glycosides, Cardiac glycosides-Digoxin, digitoxin, Steroidal saponins glycosides- Diosgenin, hecogenin. Plant pigments: Occurrence and general methods of structure determination, isolation and synthesis of quercetin and cyanidin chloride. Marine drugs -Selected Drug Molecules: Cardiovascular active substances, Cytotoxic compounds, antimicrobial compounds, antibiotic compounds, Anti-inflammatory agents. Marine toxins.

TOTAL LECTURE HOURS: 75

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)
Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved
(To be discussed during the Tutorial hours)

Skills acquired from this course:
Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

COURSE OUTCOMES :

Students will be able to:

1. Recall the sources of natural medicines and analysis of crude drugs.
2. Understand the methods of evaluation based on various parameters.
3. Analyze the isolated drugs
4. Apply various techniques to discover new alternative medicines.
5. Evaluate the isolated drugs for various pharmacological activities

TEXT BOOKS:

1. Gurdeep R Chatwal (2016), Organic chemistry of Natural products, Volume I & II, 5th edition, Himalaya publishing House.
2. S.V.Bhat, B.A. Nagasampagi, M.Sivakumar (2014), Chemistry of Natural Products,
3. Revised edition, Narosa Publishers.
4. A Text Book of Pharmacognosy and Phytochemistry, Gokalale and Kokate.
5. A Text Book of Pharmacognosy, Niroli Prakashan.
6. Popular Pharmocognosy Books- Trease & Evans' Pharmacognosy William Charles Evans BPharm BSc PhD DSc FIBiol FLS FRPharmS. Trease & Evans'

REFERENCE BOOKS:

1. Jeffrey B. Harborne (2012), Phytochemical methods: A Guide to Modern Techniques of Plant Analysis, 4th edition, Indian reprint, Springer.
2. Ashutoshkar (2007), Pharmacognosy and Pharmacobiotechnology, 2 nd edition, New age international (P) limited, New Delhi.
3. A text book of Pharmacognosy and Phytochemistry-Ashutosh kar.
4. A text book of Pharmacognosy and Phytochemistry Edition. 2nd ; Publisher. CBS PUBLISHERS AND DISTRIBUTORS PVT LTD ; Publication date. 30 July 2020.
5. Text Book of Pharmacognosy And Phytochemistry – I B. Pharma IVth SEM (M. K. GUPTA) · Pages: 232pages · Edition: III

E RESOURCES:

1. https://ocw.mit.edu/courses/3-091-introduction-to-pharmacognsy-chemistry-fall-2018/video_galleries/lecture-videos/
2. www.merriam.webster.com
3. www.degruyter.com
4. primoa.library,unsw,edu,an
5. pubs.acs.org

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2023-2024)
DEPARTMENT OF CHEMISTRY
M.Sc., CHEMISTRY

SEMESTER: III – EC-V (B) – Biomolecules and Heterocyclic Compounds

Ins. Hrs. /Week: 5 **Course Credit: 3** **Course code: P23CHE35B**

UNIT-I: CHEMISTRY AND METABOLISM OF CARBOHYDRATES (15 HOURS)

Definition, classification and biological role of carbohydrates. Monosaccharides: Linear and ring structures (Haworth formula) of ribose, glucose, fructose and mannose (structure determination not required), physical and chemical properties of glucose and fructose. Disaccharides: Ring structures (Haworth formula) –occurrence, physical and chemical properties of maltose, lactose and sucrose. Polysaccharides: Starch, glycogen and cellulose – structure and properties, glycolysis of carbohydrates.

UNIT-II: STEROIDS AND HORMONES (15 HOURS)

Steroids-Introduction, occurrence, nomenclature, configuration of substituents. Diels' hydrocarbon, stereochemistry, classification, Diels' hydrocarbon, biological importance, colour reactions of sterols, cholesterol-occurrence, tests, physiological activity, biosynthesis of cholesterol from squalene. Hormones-Introduction, classification, functions of sex hormones-androgens and estrogens, adrenocortical hormones-cortisone and cortisol structure and functions of non-steroidal hormones-adrenaline and thyroxin.

UNIT-III: PROTEINS AND NUCLEIC ACIDS (15 HOURS)

Separation and purification of proteins – dialysis, gel filtration and electrophoresis. Catabolism of amino acids - transamination, oxidative deamination and decarboxylation. Biosynthesis of proteins: Role of nucleic acids. Amino acid metabolism and ureacycle. Structure, methods for the synthesis of nucleosides - direct combination, formation of heterocyclic base and nucleoside modification, conversion of nucleoside to nucleotides. Primary and secondary structure of RNA and DNA, Watson-Crick model, solid phase synthesis of oligonucleotides.

UNIT-IV: HETEROCYCLIC COMPOUNDS - I (15 HOURS)

Benzofused five membered rings: Indole, isoindole, benzofuran and benzothiophene, Preparation and properties. Benzofused six membered rings: Quinoline and isoquinoline: Preparation by ring closure reactions, Reactions: Mechanism of electrophilic and nucleophilic substitutions, oxidation and reduction reactions.

UNIT-V: HETEROCYCLIC COMPOUNDS - II (15 HOURS)

Heterocyclic compounds with two or more heteroatom: Pyrazole, Imidazole, Oxazole, Thiazole, Tetrazole – Preparation and Properties.

TOTAL LECTURE HOURS : 75

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)
Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved
(To be discussed during the Tutorial hours)

Skills acquired from this course:
Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

COURSE OUTCOMES :

Students will be able to:

1. Understand the basic concepts of biomolecules and natural products.
2. Integrate and assess the different methods of preparation of structurally different biomolecules and natural products.
3. Illustrate the applications of biomolecules and their functions in the metabolism of living organisms.
4. Analyse and rationalise the structure and synthesis of heterocyclic compounds.
5. Develop the structure of biologically important heterocyclic compounds by different methods.

TEXT BOOKS:

1. T. K Lindhorst, Essentials of Carbohydrate Chemistry and Biochemistry, Wiley VCH, North America,2007.
2. L. Finar, Organic Chemistry Vol-2, 5th edition, Pearson Education Asia, 1975.
3. V. K. Ahluwalia and M. Goyal, Textbook of Heterocyclic compounds, Narosa Publishing, New Delhi,2000.
4. M. K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publishing Co., Jalandhar, Delhi, 2014.
5. V. K. Ahluwalia, Steroids and Hormones, Ane books pub., New Delhi,2009.

REFERENCE BOOKS:

1. I. L. Finar, Organic Chemistry Vol-1, 6thedition, Pearson Education Asia,2004.
2. Pelletier, Chemistry of Alkaloids, Van Nostrand Reinhold Co,2000.

Shoppe, Chemistry of the steroids, Butterworthes,1994.

3.I. A. Khan, and A. Khanum. Role of Biotechnology in medicinal & aromatic plants, Vol 1 and Vol 10,Ukkaz Publications, Hyderabad,2004.

4. .V. K. Ahluwalia and M. Goyal, Textbook of Heterocyclic compounds, Narosa Publishing, New Delhi,2000.
5. M. K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publishing Co., Jalandhar,

Delhi, 2015

E RESOURCES:

1. https://www.organic-chemistry.org/
2. https://www.studyorgo.com/summary.php
3. https://www.clutchprep.com/organic-chemistry
4. www.oreilly.com
5. www.spinger.com

SEMESTER: III - EC-V (C): Computational Chemistry

Ins. Hrs. /Week: 5 **Course Credit: 3** **Course code: P23CHE35C**

UNIT – I - MANY ELECTRON ATOMS (12 HOURS)

Electron correlation, addition of angular momentum, Clebesch-Gordanseries, total angular momentum and spin-orbit interaction.

UNIT – II - AB INITIO METHODS (12 HOURS)

Review of molecular structure calculations, Hartree-Fock SCF method formolecules, Roothaan-Hartree-Fock method, selection of basis sets.

UNIT – III - ELECTRON CORRELATION (12 HOURS)

Configuration Interaction, Multi-Configuration Self- Consistent Field, Multi-Reference Configuration Interaction, Many-Body Perturbation Theory,Coupled Cluster, Basis sets.

UNIT – IV - ASIS SETS (12 HOURS)

Classification: Slater type and Gaussian type basis sets, minimal basis set, Pople style basis sets .HartreeFock limit. Post Hartree-Fock methods - i

UNIT – V - DFT AND FORCE FIELDS METHOD (12 HOURS)

Energy as a functional of charge density, Kohn-Shamequations. Molecular mechanics methods, minimization methods, QSAR.

TOTAL LECTURE HOURS: 60

COURSE OUTCOMES :

Students will be able to:

1. Learn the techniques of molecular quantum chemistry and apply them to study chemical and biochemical problems.
2. Review of molecular structure calculations.
3. Analyze the Electron Correlation **.**
4. Apply Asis Sets.
5. Evaluate the DFT And Force Fields Method.

TEXT BOOKS:

1. Introduction to Computational Chemistry, F. Jensen, 2nd edition, Wiley-Blackwell (2006).
2. Molecular Quantum Mechanics, P. W. Atkins and R. S. Friedman, 3rd edition, OxfordUniversity Press, Oxford (1997).
3. Quantum Chemistry, H. Eyring, J. Walter and G.E. Kimball, (1944) John Wiley, New York.
4. Quantum Chemistry, I.N. Levine, 5th edition (2000), Pearson Educ., Inc., New Delhi.
5. Modern Quantum Chemistry: Introduction to Advanced Electronic Structure, A. Szabo and N.S. Ostlund, (1982), Dover, New York. -

REFERENCE BOOKS:

1. Computer Simulation of Liquids" by M P Allen and D J Tildesley
2. Introduction to the theory and Applications of Molecular and Quantum Mechanics , Third Edition Springer.
3. A Handbook of Computational Chemistry – Springer.
4. Computational Quantum Chemistry - By Joseph J W McDouall
5. Fronteirs in Computational Chemistry – Bentham Books.

E RESOURCES:

1. https://www.schrodinger.com/materials-science/use-cases/computational-chemistry/
2. https://onlinelibrary.wiley.com/page/journal/1096987x/homepage/other_resources.ht
3. https://www.sciencedirect.com/topics/chemistry/electron-correlation
4. https://link.springer.com/10.1007/978-94-007-0711-5_9
5. https://wires.onlinelibrary.wiley.com/doi/10.1002/wcms.1215

SEMESTER: III – Skill Enhancement Course - Preparation of Consumer Products

Ins. Hrs. /Week: 2 **Course Credit: 2** **Course Code**:**P23SECH31**

UNIT I : COSMETICS **(5 HOURS)**

Cosmetics- introduction and classification.Face powder- requirements and ingredients of a face powder. Face cream- (cold and vanishing) - ingredients, formulation and uses. Lipstick- requirement of a lipstick and common ingredients of a lipstick.Mascara – requirements and Formulation

UNIT II : PERFUMES AND FLAVORING AGENTS **(5 HOURS)**

Perfumes - Requirements, composition, formulation and blending. Classification of perfumery materials. Composition and characteristics of flavoring agents.Food additives- classification and uses.food colours

UNIT III :SHAMPOOS AND DYES **(5 HOURS)**

Shampoos- requisites, formulation and ingredients.Dandruff curing shampoos- preparation only.Hair dyes – requirements, vegetable colorings, metal salts and oxidations.Hair restorers and hair straighteners.

UNIT IV : DENTIFRICE **(5 HOURS)**

Basic dentifrice ingredients. Formulation and requisites of tooth powder and tooth paste.
Mouth wash – ingredients and their functions.

UNIT V : SOAPS AND DETERGENTS **(5 HOURS)**

Soaps - definition, different raw materials in soap manufacture-hot and cold process.Varieties of soap and their uses (brief study- manufacture not necessary) Detergents- introduction. Cleansing action of soap. Distinction between soaps and detergents.

COURSE OUTCOMES :

Students will be able to:

1. Understand the basic concepts of Cosmetics.
2. Illustrate the perfumes and flavouring agents.
3. Understand the preparation of shampoos and dyes.
4. Learn the basic principles of Dentifrice.
5. Understand the preparation of Soaps and Detergents.

TEXT BOOKS:

1. Text book of applied chemistry ,Thangamma Jacob, Macmillan, 1987 home science and allied science Edition.
2. Modern technology of perfumes, NIIR Board of technologies.flavors and essential oils
3. Modern technology of cosmetics ,NIIR Board of technologies.
4. Industrial chemistry , B.K. Sharma, Goel publishing house.
5. Analysis of one.Minute potentially available fluoride from dentifrice.

REFERENCE BOOKS:

1. Dr.Kashmiri, M. khamkar, vaishali, M. Gokhale, Applied science 2018 Technical Publications.
2. Cosmetic Science Dr. AIJAZ shellah, Dr.subnash, V.Deshmane, Do.Kallash, R.Biyani, Dr.Md. Rageeb md Usman 2019 S.Vikas and Company (PV).
3. Natural hair dye oct.2017 Dinalanier.
4. Making your own shampod july 2021 Emily D Monter.
5. Analysis of one.Minute potentially available fluoride from dentifrice.

E-RESOURCES:

1. https://doi.org/10.3108/beej.14.1
2. https://doi.org/10.1152/advan.00007.2017
3. https://www.jstor.org/stable/40555946
4. www.elsevier.com
5. www.sciencedirect.com

SEMESTER-IV

SEMESTER: IV – CC- VII-: Research Methodology

Ins. Hrs. /Week: 5 **Course Credit: 5** **Course code: P23CH410**

UNIT-I: RESEARCH ETHICS (18 HOURS)

Philosophy- Definition, nature, scope. Ethics-Definition, moral Philosophy, nature of moral judgements and reactions. Ethics with respect to science and research. Scientific misconducts- falsification, fabrication and plagiarism- use of plagiarism software-Turnitin, Urkund and other opensource software tools. Redundant publications- duplicate and overlapping publications. Publication Ethics- Definition and importance. Publication misconduct- Definition, concept, problems that lead to unethical behavior, types, violation of publication ethics, authorship and contributor ship. Software tool to identify predatory publications developed by SPPU. Subject specific ethical issues- authorships, conflicts of interest.

UNIT- II: RESEARCH DESIGN, DATA COLLECTION AND INTERPRETATION (15 HOURS)

Research design; sampling techniques, categories of research design, Design of experiments, sample selection, Data collection – mapping and scaling, techniques and tools and documentation, presentation, Data analysis – Qualitative and quantitative and interpretation of data.

UNIT- III: COMPUTER APPLICATION AND STATISTICS (15 HOURS)

Computer application: MS office, excel, power point, graphics (Origin), statistical software (SPSS), CHEMDRAW, Full Prof *etc*.Statistics: Standard deviation/error; Correlation coefficient, Regression equation, types of correlation, , test of significance, chi-square test, analysis of variance.

UNIT-IV: FORMULATION OF SCIENTIFIC COMMUNICATION (13 HOURS)

Outline preparation, drafting title, sub titles, tables, illustrations; Formatting tables- title, body footnotes; figures & graphs- structure, title and legends, Journal- Definition-Various names of journal- Impact factor, citation sindices, plagiarism.

UNIT- V: SCIENTIFIC WRITING (14 HOURS)

Forms of scientific writing- Article, notes, reports, review article, monographs, dissertations, popular science articles- Search Method through-Science Direct, SCI finder, Chem port, bibliographies, Project proposal writing- Convention of thesis writing.

TOTAL LECTURE HOURS: 75

COURSE OUTCOME:

The students will be able to

1. Demonstrate the concept of public health research
2. Apply and analyse the various quantitative research methods
3. Appraise and practice the various qualitative research methods
4. Develop operational research designs with n intent to improve the public health practices
5. Practice ethical approaches in research so as to uphold the principle of maximum benefit and minimum risk to human kind in the research process
6. Design and implement research programs
7. Develop an insight into the process of research which helps in designing an appropriate and feasible study for the Dissertation.

TEXT BOOKS:

1. Research Methodology - Methods & Techniques, CR Kothri CR (1990), Vishva Prakashan, New Delhi.
2. Research Methodology & Statistical Techniques, S Gupta (1999) Deep & Deep Publications, New Delhi.
3. Research methodology for biological sciences, N Gurumani (2007), MJP Publishers, Chennai.
4. Research Methodology (Methods, Approaches and Techniques), Dr. Baidyanath Mishra, Ashok Kumar Mishra, & Sujata Misra Varanasi.
5. Research Methodology, Ranjith Singh(2021)

REFERENCE BOOKS:

1. Introduction to Biostatistics, L Forthofer (1995), Academic Press, New York.
2. Biostatistical Analysis, JH Zar (2006), Prentice-Hall.
3. Research Design: Qualitative, Quantitative & Mixed Method Approaches. John W.Creswell (2009), Sage Publication, USA.
4. Experimental Design & Data Analysis for Biologists. PQ Gerry & JK Michael (2002),Cambridge

University Press.

5. Choosing and Using Statistics: A Biologists Guide, D Calvin (2003), BlackwellPublisher.

E-RESOURCES:

1. https://www.researchgate.net/publication/321964409_Research_Methodology
2. https://www.scribbr.com/dissertation/methodology/
3. https://gradcoach.com/what-is-research-methodology/
4. https://www.euacademic.org/BookUpload/9.pdf
5. . http://ihmgwalior.net/pdf/research_methodology.pdf

SEMESTER: IV – VIII-: Physical Chemistry-II

Ins. Hrs. /Week: 5 **Course Credit: 5** **Course code: P23CH411**

UNIT-I: QUANTUM MECHANICS (15 HOURS)

Wave particle duality, Uncertainty principle, Particle wave and Schrodinger wave equation, wave function, properties of wave function. Properties of wave function, Normalized, Orthogonal, orthonormal, Eigen values, Eigen functions, Hermitian properties of operators. Introduction to quantum mechanics- black body radiation, photoelectric effect, hydrogen spectrum. Need for quantum mechanics, Postulates of Quantum Mechanics, Schrodinger wave equation, Time independent and time dependent.

UNIT-II: QUANTUM MODELS (15 HOURS)

Particle in a box-1D, two dimensional and three-dimensional, degeneracy, application to linear conjugated molecular system, free particles, ring systems. Harmonic Oscillator-wave equation and solution, anharmonicity, force constant and its significance. Rigid Rotor-wave equation and solution, calculation of rotational constants and bond length of diatomic molecules.

UNIT-III: APPLICATIONS TO HYDROGEN AND POLY ELECTRON ATOMS (15 HOURS)

Hydrogen atom and hydrogen like ions, Hamiltonian-wave equation and solutions, radial and angular functions, representation of radial distribution functions. Approximation methods – variation methods: trial wave function, variation integral and application to particle in 1D box. Perturbation method - first order applications. Hatrefock self-consistent field method, Hohenberg-Kohn theorem and Kohn-Sham equation, Helium atom-electron spin, paulis exclusion principle and Slater determination.

UNIT-IV: GROUP THEORY (15 HOURS)

Groups, sub groups, symmetry elements, operations, classification-axial and non-axial. Dihedral point groups- C_n, C_{nh}, D_n, D_{nh}, D_{nd}, Td and Oh. Matrix representation and classes of symmetry operations, reducible irreducible and direct product representation. The Great

orthogonality theorem – irreducible representation and reduction formula, construction of character table for C_{2v}, C_{2h}, C_{3v} and D_{2h} point groups.

UNIT-V: APPLICATIONS OF QUANTUM AND GROUP THEORY (15 HOURS)

Hydrogen Molecule-Molecular orbital theory and Heitler London (VB) treatment, Energy level diagram, Hydrogen molecule ion; Use of linear variation function and LCAO methods. Electronic conjugated system:Huckel method to Ethylene butadiene, cyclopropenyl, cyclo butadiene and Benzene. Applications of group theory to molecular vibrations, electronic spectra of ethylene.

TOTAL LECTURE HOURS : 75

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved

(To be discussed during the Tutorial hours)

Skills acquired from this course:

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

COURSE OUTCOMES :

Students will be able to:

1. Discuss the characteristics of wave functions and symmetry functions.
2. Classify the symmetry operation and wave equations.
3. Apply the concept of quantum mechanics and group theory to predict the electronic structure.
4. Specify the appropriate irreducible representations for theoretical applications.
5. Develop skills in evaluating the energies of molecular spectra.

TEXT BOOKS:

1. R.K. Prasad, Quantum Chemistry, New Age International Publishers, New Delhi, 2010, 4th revised edition.
2. F. A. Cotton, Chemical Applications of Group Theory, John Wiley & Sons, 2003, 2nd edition.
3. A. Vincent, Molecular Symmetry and Group Theory. A Programmed Introduction to Chemical Applications, John and Willy & Sons Ltd., 2013, 2nd Edition.

4. T. Engel & Philip Reid, Quantum Chemistry and Spectroscopy, Pearson, New Delhi, 2018, 4th edition.
5. G. K. Vemulapalli, Physical Chemistry, Prentice Hall of India Pvt. Ltd. 2001. 6. D.A. McQuarrie, Quantum Chemistry, Viva Books PW. Ltd, 2013, 2nd edition.

REFERENCE BOOKS:

1. N. Levine, Quantum Chemistry, Allyn& Bacon Inc, 1983, 4th edition.
2. D.A. McQuarrie and J. D. Simon, Physical Chemistry, A Molecular Approach, Viva Books Pvt. Ltd, New Delhi, 2012.
3. R. P. Rastogi & V. K. Srivastava, An Introduction to Quantum Mechanics of Chemical Systems, Oxford & IBH Publishing Co., New Delhi, 1999.
4. R.L. Flurry. Jr, Symmetry Group Theory and Chemical applications, Prentice Hall. Inc, 1980
5. J. M. Hollas, Symmetry in Molecules, Chapman and Hall, London, 2011, Reprint.

E RESOURCES:

1. https://nptel.ac.in/courses/104101124
2. https://ipc.iisc.ac.in/~kls/teaching.html
3. www.kobo.com
4. www.springer.com
5. www.elsevier.com

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
SEMESTER: IV – CP-IV-: Analytical Instrumentation Technique Practicals

Ins. Hrs. /Week: 6 Course Credit: 3 Course code: P23CH412P

UNIT-I: (70 HOURS)

1. Determination of the equivalent conductance of a weak acid at different concentrations and verifying Ostwald dilution law. Calculation of the dissociation constant of the acid.
2. Determination of the equivalent conductance of a strong electrolyte at different concentrations and examining the validity of the Onsager's theory as limiting law at high dilutions.
3. Conductometric titration of a mixture of HCl and CH_3COOH Vs NaOH.
4. Conductometric titration of NH_4Cl Vs NaOH.
5. Conductometric titration of CH_3COONa Vs HCl.
6. Potentiometric titration of a mixture of HCl and CH_3COOH Vs NaOH
7. Determination of pK_a of weak acid by EMF method.
8. Potentiometric titration of FAS Vs $K_2Cr_2O_7$
9. Potentiometric titration of KI Vs $KMnO_4$.
10. Potentiometric titration of a mixture of Chloride and Iodide Vs $AgNO_3$.
11. Determination of the pH of buffer solution by EMF method using Quinhydrone and Calomel electrode.
12. Study of the inversion of cane sugar in the presence of acid by Polarimetric method.

UNIT-II: (20 HOURS)

1. Separation of (a) mixture of Azo dyes by TLC (b) mixture of metal ions by Paper chromatography

TOTAL HOURS: 90

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved

(To be discussed during the Tutorial hours)

Skills acquired from this course:

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

SCHEME OF EVALUATION:

Execution of experiment	- 35 marks
Presentation of data	- 15 marks
Processing the data, graph and calculation	- 05 marks
Results	- 10 marks
UE	- 65 marks
Viva voce	- 10 marks
Total Marks: IA	- 25 marks

RESULTS:

Less than 5%	- 20 marks
5-7%	- 15 marks
7-8 %	- 10 marks
8-10 %	- 8 marks
Above 10 %	- 6 marks

Course Outcomes :

Students will be able to:

1. Recall the principles associated with various inorganic organic and physical chemistry experiments
2. Scientifically plan and perform all the experiments
3. Observe and record systematically the readings in all the experiments
4. Calculate and process the experimentally measured values and compare with graphical data.
5. Interpret the experimental data scientifically to improve students efficiency for societal developments.

TEXT BOOKS:

1. Vogel's Text book of Practical Organic Chemistry, 5th Ed, ELBS/Longman, England, 2003.

2. G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, *Vogel's Textbook of Quantitative Chemical Analysis*; 6th ed., ELBS, 1989.

3. J. D. Woollins, *Inorganic Experiments*; VCH: Weinheim, 1995.

4. B. Viswanathan and P.S.Raghavan, Practical Physical Chemistry, Viva Books, New Delhi, 2009.

5. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co. Pvt., 1996.

REFERENCE BOOKS:

1. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry – Labmanual, S. Viswanathan Co. Pvt. Ltd, 2009.
2. J. N. Gurtu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 2011.
3. J. B. Yadav, Advanced Practical Physical Chemistry, Goel Publishing House, 2001.
4. G.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in Physical Chemistry, 8th edition, McGraw Hill, 2009.
5. J. N. Gurthu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 1987.

E RESOURCES:

1. https://bit.ly/3QESF7t
2. https://bit.ly/3QANOnX
3. www.buecher.com
4. Onlinelibrary.wiley.com
5. www.rachidscience.com

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

SEMESTER: IV - EC-VI -A : Chemistry of Natural Products

Ins. Hrs. /Week: 4 **Course Credit: 3** **Course code: P23CHE46A**

UNIT-I: ALKALOIDS (12 HOURS)

Introduction, occurrence, classification, isolation and functions of alkaloids. Classification, general methods of structural elucidation. Chemical methods of structure determination of Coniine, Piperine, Nicotine, Papaverine. Atropine, Quinine, Belladine, Cocaine, Heptaphylline, Papaverine and Morphine.

UNIT-II: TERPENOIDS AND CAROTENOIDS (12 HOURS)

Terpenoids: Introduction, occurrence, Isoprene rule, classification. General methods of determining structure.. Structure determination of Camphor, Abietic acid, Cadinene, Squalene, Zingiberine. **Carotenoids:** Introduction, geometrical isomerism, Structure, functions and synthesis of β-carotene and vitamin-A.

UNIT-III: ANTHOCYANINES AND FLAVONES (12 HOURS)

Anthocyanines: Introduction to anthocyanines. Structure and general methods of synthesis of anthocyanines. Cyanidine chloride: structure and determination. Flavones: Biological importance of flavones. Structure and determination of flavone and flavonoids. Quercetin: Structure determination and importance.

UNIT-IV: PURINES AND STEROIDS (12 HOURS)

Purines: Introduction, occurrence and isolation of purines. Classification and spectral properties of steroids. biological importance, Structure and synthesis of Uric acid and Caffeine. Steroids: Steroids-Introduction, occurrence, nomenclature, configuration of substituents, Diels' hydrocarbon, stereochemistry, classification, Diels' hydrocarbon, biological importance, colour reactions of sterols, cholesterol-occurrence, tests, physiological activity, biosynthesis of cholesterol from squalene.

UNIT-V: NATURAL DYES **(12 HOURS)**

Occurrence, classification, isolation, purification, properties, colour and constitution. Structural determination and synthesis of indigoitin and alizarin**.**

TOTAL LECTURE HOURS: 60

Extended Professional Component (is a part of internal component only, Not to be included in the examination question paper)

Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved

(To be discussed during the Tutorial hours)

Skills acquired from this course:

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Course Outcomes

Students will be able to:

1. Understand the biological importance of chemistry of natural products.
2. Scientifically plan and perform the isolation and characterization of synthesized natural products.
3. Elucidate the structure of alkaloids, terpenoids, carotenoids, falvanoids and anthocyanins.
4. Determine the structure of phytochemical constituents by chemical and physical methods.
5. Interpret the experimental data scientifically to improve biological activity of active components.

TEXT BOOKS:

1. G. K. Chatwal, Organic Chemistry on Natural Products, Vol. 1, Himalaya Publishing House, Mumbai, 2009.
2. G. K. Chatwal, Organic Chemistry on Natural Products, Vol. 2, Himalaya Publishing House, Mumbai,2009.
3. O. P. Agarwal, Chemistry of Organic Natural Products, Vol. 1, Goel Publishing House, Meerut,1997.
4. O. P. Agarwal, Chemistry of Organic Natural Products, Vol. 2, Goel Publishing House, Meerut,1997.
5. I. L. Finar, Organic Chemistry Vol-2, 5thedition, Pearson Education Asia, 1975.

REFERENCE BOOKS

1. I. L. Finar, Organic Chemistry Vol-1, 6th edition, Pearson Education Asia,2004.
2. Pelletier, Chemistry of Alkaloids, Van Nostrand Reinhold Co,2000.
3. Shoppe, Chemistry of the steroids, Butterworthes,1994.
4. A. Khan, and A. Khanum. Role of Biotechnology in medicinal & aromatic plants, Vol 1 and Vol 10, Ukkaz Publications, Hyderabad,2004.
5. G. K. Chatwal, Organic Chemistry on Natural Products, Vol. 6, Himalaya Publishing House, Mumbai,2009.

E RESOURCES:

1. https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic
2. www.springer.com
3. www.chemistryabc.com
4. www.pdfdrive.com
5. www.technicalsymposium.com

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

SEMESTER: IV – EC-VI-(B)-: Polymer Chemistry

Ins. Hrs. /Week: 4 **Course Credit: 3** **Course code: P23CHE46B**

UNIT-I: CHARACTERIZATION, MOLECULAR WEIGHT AND ITS DETERMINATION (12 HOURS)

Primary and secondary bond forces in polymers; cohesive energy, molecular structure, chemical tests, thermal methods, Tg, molecular distribution, stability. Determination of Molecular mass of polymers: Number Average molecular mass (M_n) and Weight average molecular mass (M_w) of polymers. Molecular weight determination of high polymers by physical and methods.

UNIT-II: MECHANISM ANDKINETICS OF POLYMERIZATION (12 HOURS)

Chain growth polymerization: Cationic, anionic, free radical polymerization, Stereo regular polymers: Ziegler Natta polymerization. Reaction kinetics. Step growth polymerization, Degree of polymerization.

UNIT-III: TECHNIQUES OF POLYMERIZATION AND POLYMER DEGRADATION (12 HOURS)

Bulk, Solution, Emulsion, Suspension, solid, interfacial and gas phase polymerization. Types of Polymer Degradation, Thermal degradation, mechanical degradation, photodegradation, Photo stabilizers, Solid and gas phase polymerization.

UNIT-IV: INDUSTRIAL POLYMERS (12 HOURS)

Preparation of fibre forming polymers, elastomeric material. Thermoplastics: Polyethylene, Polypropylene, polystyrene, Polyacrylonitrile, Poly Vinyl Chloride, Poly tetrafluoro ethylene, nylon and polyester. Thermosetting Plastics: Phenol formaldehyde and expoxide resin. Elastomers: Natural rubber and synthetic rubber - Buna - N, Buna-S and neoprene. Conducting

Polymers: Elementary ideas; examples: poly sulphur nitriles, polyphenylene, poly pyrrole and poly acetylene. Polymethylmethacrylate, polyimides, polyamides, polyurethanes, polyureas, polyethylene and polypropylene glycols.

UNIT-V: POLYMER PROCESSING (12 HOURS)

Compounding: Polymer Additives: Fillers, Plasticizers, antioxidants, thermal stabilizers, fire retardants and colourants. Processing Techniques: Calendaring, die casting, compression moulding, injection moulding, blow moulding and reinforcing. Film casting, Thermofoaming, Foaming. Catalysis and catalysts – Polymerization catalysis, catalyst support, clay compounds, basic catalyst, auto-exhaust catalysis, vanadium, heterogeneous catalysis and active centres.

TOTAL LECTURE HOURS: 60

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)
Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved
(To be discussed during the Tutorial hours)

Skills acquired from this course:
Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

COURSE OUTCOMES :

Students will be able to:

1. Understand the bonding in polymers.
2. Scientifically plan and perform the various polymerization reactions.
3. Observe and record the processing of polymers.
4. Calculate the molecular weight by physical and chemical methods.
5. Interpret the experimental data scientifically to improve the quality of synthetic polymers.

TEXT BOOKS:

1. V.R. Gowariker, *Polymer Science*, Wiley Eastern, 1995.

2. G.S. Misra, *Introductory Polymer Chemistry*, New Age International (Pvt) Limited, 1996.

3. M.S. Bhatnagar, A Text Book of Polymers, vol-I & II, S.Chand & Company, New Delhi, 2004.

4. A Introduction of Polymer Chemistry - David M. Teegarden.

5. Properties of Polymer Chemistry -James E.Mark

REFERENCE BOOKS:

1. F. N. Billmeyer, *Textbook of Polymer Science*, Wiley Interscience, 1971.

2. A. Kumar and S. K. Gupta, *Fundamentals and Polymer Science and Engineering*, Tata McGraw-Hill, 197

3. Principles of polymer chemistry by Paul J. Flory 2.

4. A Textbook of Polymer Chemistry Basic concepts, processing and applications, condensation polymers ; Author, MS Bhatnagar.

5. M.S. Bhatnagar, A Text Book of Polymers, vol-I & II, S.Chand & Company, New Delhi, 2004.

E RESOURCES:

1. https://sites.google.com/site/chemistryebookscollection02/home/polymer-chemistry/or

2. www.freebookcentre.net

3. www.spinger.com

4. www.buecher.com

5. www.rachidscience.com

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

SEMESTER: IV - EC-VI (C): Food Chemistry

Ins. Hrs. /Week: 4 Course Credit: 3 Course code: P23CHE46C

UNIT I: NUTRIENTS–I (15 HOURS)

Protein–functions, sources, deficiency diseases, daily allowances. Carbohydrates – functions, sources, deficiency diseases, daily allowances.

Fats and oils–functions, sources, deficiency diseases, daily allowances, disorders due to excess of fat.

UNIT -II: NUTRIENTS–II (15 HOURS)

Vitamins – H2O soluble and fat soluble vitamins – sources, functions, deficiency and disorders of taking excess of vitamins. H2O–functions, sources, deficiency diseases

UNIT - III: FOOD PREPARATION (15 HOURS)

Food preparation-Effect of cooking and heat processing on the nutritive value of foods. Food faddism and faulty food habits. Cooking methods: Moist heat methods and dry heat methods–merits and demerits.

Preparation of Essence, Hand wash, Disinfectants and Antiseptic agents.

UNIT - IV: FOOD PRESERVATION (15 HOURS)

Food preservation: Importance of food preservation, causes of food spoilage. Principles of food preservation. Home scale methods of food preservation.

Methods of food preservation: Low temperature, high temperature, preservatives, osmotic pressure, dehydration, irradiation–merits and demerits.

UNIT - V: FOOD ADULTERATION (15 HOURS)

Food Adulteration–Types, international, Metallic, incidental adulteration and their ill effects. Simple physical and chemical tests for detection of food adulterants, consumer protection.

TOTAL LECTURE HOURS: 75

COURSE OUTCOME

Student should able to,

1. Discuss the functions, sources, deficiency diseases and daily allowances of major nutrients
2. Understand various kinds of Vitamins, Sources, functions and deficiency symptoms
3. Illustrate the food preservative.
4. Describe the different types of food adulteration.
5. Analyse the food adulterants.

TEXT BOOK(S)

1. Belitz. W. Grosch, P.Schieberle,2009, Food Chemistry, 4th Edition Oxford University Press, New York,..
2. Deman. J.M.(et al), 2018, Principles of Food Chemistry. University of Guelph. Guelph, Ontario.
3. Hamilton. R.J, 1998, Lipid Analysis in Oils and Fats.University Liverpool UK
4. Srilakshmi. B, 2003, Food Sceince, Third Edition, New Age international publishers.New Delhi.
5. Swaminathan. Dr. M, 2008, Handbook of food and Nutrition 'Reprint, published by The Bangalore printing and publishing co. ltd. New Delhi.

REFERENCE BOOK(S)

1. Lakshmi, 2000. Food Science, Second Edition, New Age international publishers.New Delhi.
2. Sumathi. R. Mudambi,1983. 'Fundamentals of food and Nutrition', Second edition, Wiley Eastern Limited.New Delhi.
3. Swaminathan.M. Dr.1987. Food Science Chemistry and Experimental foods, second enlarged edition, Published by Bangalore press.
4. Swaminathan. M. Dr. 'Advanced test Book on Food and Nutrition Volume I and II second edition, The printing and publishing co. ltd .Bangalore.
5. Swaminathan .M.2021. Dr.'Advanced test Book on Food and Nutrition Volume III second edition, The printing and publishing co. ltd. Bangalore

E RESOURCES

1. https://www.bing.com/aclick
2. https://medical-dictionary.thefreedictionary.com/nutrient
3. https://nios.ac.in/media/documents/srsec321newe/321-e-lesson-8.pdf
4. http://www.eagri.org/eagri50/ambe101/pdf/lec23.pdf
5. http://ijsit.com/admin/ijsit_files/food%20adulteration_1.2.4.pdf

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
SEMESTER: IV – Professional Competency Course – Chemistry for Competitive Examinations

Ins. Hrs. /Week: 2 **Course Credit: 2** **Course code: P23PCCH41**

UNIT I : INORGANIC CHEMISTRY (9 HOURS)

Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules (VSEPR Theory). Concepts of acids and bases, Hard-Soft acid base concept, Non-aqueous solvents - Main group elements and their compounds -Transition elements and coordination compounds - Inner transition elements - Organometallic compounds. Bioinorganic chemistry - Characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-vis, NQR, MS, electron spectroscopy and microscopic techniques - Nuclear chemistry - Solid state - Polymer chemistry .

UNIT II : PHYSICAL CHEMISTRY -I (9 HOURS)

Basic principles of quantum mechanics - Approximate methods of quantum mechanics - Atomic structure and spectroscopy- term symbols- many-electron systems and antisymmetry principle. Chemical bonding in diatomics; elementary concepts of MO and VB theories. Huckel theory for selection rules. Electrochemistry- Chemical kinetics -Colloids and surfaces.

UNIT III : PHYSICAL CHEMISTRY –II (9 HOURS)

Molecular spectroscopy: Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities – selection rules. Chemical thermodynamics - Statistical thermodynamics - Boltzmann distribution; kinetic theory of gases; partition functions and their relation to thermodynamic quantities – calculations for model systems.

UNIT III : ORGANIC CHEMISTRY (9 HOURS)

IUPAC nomenclature of organic molecules including regio- and stereoisomers - Principles of stereochemistry - Organic reactive intermediates- Organic transformations and reagents-Concepts in organic synthesis - Asymmetric synthesis - Pericyclic reactions – Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S).- Chemistry of natural products - Structure determination of organic compounds by IR, UV-Vis, ^{1}H & ^{13}C NMR and Mass spectroscopic techniques.

UNIT V : INTERDISCIPLINARY TOPICS (9 HOURS)

Data analysis - Mean and standard deviation - absolute and relative errors- linear regression- covariance and correlation coefficient. Analytical Chemistry **-** Separation, spectroscopic, electro- and thermoanalytical methods- Chemistry in nanoscience and technology - Catalysis and green chemistry - Medicinal chemistry- Supramolecular chemistry - Environmental chemistry.

COURSE OUTCOME:

Students will be able to:

1. Understand the Chemical periodicity and Organometallic compounds.
2. Observe the basic principles of quantum mechanics, Electrochemistry and Chemical Kinetics.
3. Interpret the molecular spectroscopy,Chemical and Statistical thermodynamics.
4. Recall the basic principles of organic chemistry and to understand the various reactions organic compounds with reaction mechanisms.
5. Illustrate the Chemistry of Nanoscience and technology, Medicinal Chemistry, Supramolecular Chemistry and Environmental Chemistry.

TEXT BOOKS:

1. D. Bannerjea, Co-ordination Chemistry, TATA Mcgraw Hill, 1993.
2. R.K. Prasad, Quantum Chemistry, New Age International Publishers, New Delhi, 2010, 4th revised edition.
3. A. Vincent, Molecular Symmetry and Group Theory. A Programmed Introduction to Chemical Applications, John and Willy & Sons Ltd., 2013, 2nd Edition.
4. F. A. Carey and Sundberg, Advanced Organic Chemistry, 5thed, Tata McGraw-Hill, New York, 2003.
5. A. Kumar and S. K. Gupta, *Fundamentals and Polymer Science and Engineering*, Tata McGraw-Hill, 1970.
6. TRB Objective Chemistry – Dr.A.Gubendran.

REFERENCE BOOKS:

1. R.L. Flurry. Jr, Symmetry Group Theory and Chemical applications, Prentice Hall. Inc, 1980
2. F. A. Cotton, Chemical Applications of Group Theory, John Wiley & Sons, 2003, 2nd edition.
3. B. N. Figgis, Introduction to Ligand Fields, Wiley Eastern Ltd, 1976.
4. J. March and M. Smith, Advanced Organic Chemistry, 5th ed., John-Wiley and sons, 2007.
5. A. Kumar and S. K. Gupta, *Fundamentals and Polymer Science and Engineering*, Tata McGraw-Hill,

E RESOURCES:

1. https://sites.google.com/site/chemistryebookscollection02/home/polymer-chemistry/or
2. www.freebookcentre.net
3. www.spinger.com
4. www.buecher.com
5. www.rachidscience.com