HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)
Re-Accredited with A++ Grade by NAAC (3rd Cycle)
Uthamapalayam - 625 533.

DEPARTMENT OF CHEMISTRY

MASTER OF SCIENCE - CHEMISTRY

PART IV-SYLLABUS

Choice Based Credit System – CBCS

(As per TANSCHE)

With

Outcome Based Education (OBE)

(Academic Year 2023 -2025)

Semester - II

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – IV	23PCHSE21	Chemistry in everyday life	4	25	75	100	2

Semester - III

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – IV	23PCHSE31	Industrial Chemistry	4	25	75	100	2
	23PCHSE32	Cosmetic Chemistry					
	23PCHIS31	Internship/ Industrial Activity	-	-	-	-	2

Semester - IV

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – IV	23PCHSE41	Training for Competitive Examinations	4	25	75	100	2

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23PCHSE21	CHEMISTRY IN EVERYDAY LIFE	SEC	2	4	25	75	100

Learning Objectives		
L1	To understand the food pyramid, hygiene and nutrition.	
L2	To explain the food and water chemistry	
L3	To study the types of drugs.	
L4	To learn about the antibiotics and vitamins.	
UNIT	**Contents**	**No. of Hours**
I	**Health:** Definition - Food Pyramid – Health – Hygiene - mal, under and over nutrition, their causes and remedies, sanitation.	12
II	**Food chemistry:** Food - classification and functions - Digestion in mouth, stomach and intestine. Absorption - spoilages, preservation techniques (canning, dehydration, freeze-drying. salting, pickling, pasteurizing, fermenting and carbonating).	12
III	**Water Chemistry:** Characteristics of water, soft water and hard water - removal of hardness - Purification of water by ion exchange and reverse osmosis methods. Water pollution: Sources and effects of water pollution (Domestic, Industrial, Agricultural) - Eutrophication.	12
IV	**Drugs:** Types of drugs-depressant, anticonvulsant, narcotics, antipyretics, antibiotics, antiseptics, analgesics, muscle relaxants and cardiovascular and vasodepressants, steroids (Only Applications).	12
V	**Antibiotics:** Definition - uses of Antibiotics - Ampicillin, streptomycin, tetracycl in, Erythromycin. Vitamins: Classifications of vitamins - vitamins deficiency diseases. (Vitamins A, B1, B2, B3, B6, B12, C, D, E and K).	12
	Total	**60**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Understand mal, under and over nutrition.	K1,K2,K3,K4,K5
2	Acquire the knowledge of Digestion.	K1,K2,K3,K4,K5
3	Design the different methods for the Purification of water.	K1,K2,K3,K4,K5,K6
4	Apply knowledge of different types of drugs.	K1,K2,K3,K4,K5,K6
5	Analyze the basics principles of vitamins and Antibiotics.	K1,K2,K3,K4,K5,K6

Textbooks	
1.	Donald J. Abraham ***Burger Medicinal Chemistry***, Wiley, Publisher. April 2021.
2.	G. R. Chatwal, ***Pharmaceutical chemistry***, Himalaya Publishing House, 2022.
Reference Books	
1.	Singh and VK Kapoor, ***Organic Pharmaceutical Chemistry***, Vallabh Publications,

	1996.
2.	S. Lakshmi, ***Pharmaceutical Chemistry***, S. Chand Publishing, 2010.
Web Resources	
1.	https://handoutset.com/wp-content/uploads/2022/07/Burgers-Medicinal-Chemistry-and-Drug-Discovery-Drug-Discovery-Volume-1-Donald-J.-Abraham.pdf
2.	https://books.google.co.in/books/about/Medicinal_and_Pharmaceutical_Chemistry.html?id=VYklcAAACAAJ&redir_esc=y
3.	https://www.schandpublishing.com/books/tech-professional/medical/a-textbook-pharmaceutical-chemistry/9788121915083/

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10
CO 1	3	3	3	3	2	3	3	3	3	2
CO 2	2	3	3	3	3	2	3	3	3	3
CO 3	3	3	2	3	3	3	3	2	3	3
CO 4	2	3	3	3	3	2	3	3	3	3
CO 5	2	3	2	3	3	2	3	2	3	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23PCHSE31	INDUSTRIAL CHEMISTRY	SEC	2	4	25	75	100

Learning Objectives		
L1	To learn the synthesis of petroleum products.	
L2	To understand natural and artificial fertilizers and disadvantages.	
L3	To study the preparation of soaps and detergents.	
L4	To acquire knowledge about preparation of polymers.	
L5	To explain energy production from nuclear power plants.	
UNIT	**Contents**	**No. of Hours**
I	**Petroleum:** Refining of petroleum - chemicals from petroleum refining - natural gas - LPG - petrol - diesel - air pollution problem due to automobiles - remedial measures to control pollution.	12
II	**Fertilizers and Insecticides:** Classification of fertilizers - natural manures - artificial manures –chemical fertilizers – advantages of artificial fertilizers - bio-fertilizers- insecticides –inorganic insecticides- natural insecticides - organic insecticides- dinitro phenols, DDT, methoxychlor, BHC pesticides -disadvantages.	12
III	**Soaps and detergents:** Preparation of soap and detergents cleansing action of soap and detergents – ingredients of washing and bathing soap – TFM of bathing soap – composition of solid and liquid detergents – function of ingredients in detergents.	12
IV	**Polymers:** Definition - Classification - General methods of preparation, properties and uses of polypropylene, Polyvinyl chloride, Polystyrene, Polyurethanes, polymethyl methacrylate, nylon and terylene. Natural rubber – isoprene unit – vulcanization of rubber – Preparation, properties and uses of Synthetic rubber- Neoprene and styrene-butadiene rubber.	12
V	**Nuclear Chemistry:** Composition of the nucleus – nuclear forces – mass defect – binding energy – nuclear stability. Nuclear fission: Definition – atom bomb. Nuclear fusion: Definition – hydrogen bomb. Application of radioactivity: In medicine, agriculture, industry.	12
	Total	**60**
Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Learn about refining of petroleum and air pollution and its remedies.	K1,K2,K3,K4,K5
2	Understand natural and artificial fertilizers like DDT, BHC, Methoxychlor and their disadvantages.	K1,K2,K3,K4,K5
3	Design the preparation of soap and detergents and understand the cleaning action of soap.	K1,K2,K3,K4,K5,K6

4	Acquire knowledge of natural and artificial polymers.	K1,K2,K3,K4,K5,K6
5	Study about principle of nuclear fission and fusion and energy production from Nuclear Power plants.	K1,K2,K3,K4,K5,K6
Textbooks		
1.	Mohammad Farhat Ali, Bassam M.EI Ali and James Speight, ***Industrial Chemistry***, McGraw – Hill Education 2005, 1st edition New York.	
2.	Maheshwar Sharon and Madhuri Sharon, ***Nuclear Chemistry***, 2st edition.	
Reference Books		
1.	B.K.Sharma, ***Industrial Chemistry***, Goel Publishing House, Meerut (2000).	
2.	K. Bagavathi Sundari, ***Applied Chemistry***, MJP Publishers, Chennai, 2006, 6th Edition.	
3.	R. Gopalan and S.Sundaram, ***Fundamentals of Chemistry***, Sultan Chand & Sons, 1998.	
4.	U.R. Gowariker, N.V. Vishwanathan and J.Shreedhar, ***Polymer science*** by, New Age International Publishers, New Delhi, 1987.	
Web Resources		
1.	https://www.accessengineeringlibrary.com/content/book/9780071410373	
2.	http://nptel.ac.in/course/103/106/103106108/	
3.	https://nptel.ac.in/content/storage2/course/104103071/pdf/model16.pdf	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	3	3	3	3	3	2	2	3
CO 2	3	3	3	3	2	3	3	2	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	2	3	3	3	3	3	3
CO 5	3	2	3	3	3	3	3	3	3	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23PCHSE32	COSMETIC CHEMISTRY	SEC	2	4	25	75	100

Learning Objectives		
L1	Formulation of various types of cosmetics and its significance.	
L2	To understand the role of herbal cosmetics.	
L3	To study the personal beauty treatment and perfumes.	
L4	To get knowledge about good cosmetics and personal hygiene products.	
UNIT	**Contents**	**No. of Hours**
I	**Chemistry of Cosmetics:** History of cosmetics, classification of cosmetics, cosmetic emulsions: cream, cleansers, moisturisers, sun screen, and anti-aging creams - chemical peels and peeling agents.	12
II	**Role of herbs in Cosmetics:** Skin Care - Aloe and turmeric. Hair care -Henna and Amla. Oral care - Neem and Clove - Challenges associated with herbal cosmetics and disadvantages. Oil and dry skin remedies.	12
III	**Perfumes:** Classification - Natural - plant origin - parts of the plant used, chief constituents; animal origin – ambergris from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics –esters – alcohols – aldehydes – ketones.	12
IV	**Beauty Treatments:** Facials - types – advantages – disadvantages; face masks–types; bleach –types – shaping the brows; eyelash tinting; perming - types; hair colouring and dyeing; permanent waving – hair straightening; wax - types – waxing; pedicure, manicure– advantages – disadvantages.	12
V	**Cosmetics and personal Hygiene products:** Characteristic of good cosmetics – demerits of artificial cosmetics – basic composition and preparation of shampoo - face powder – face cream – nail polish – tooth paste - mouth wash.	12
	Total	**60**

Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Learn the chemistry of cosmetic products like moisturisers, sun screen, cleansers, anti-aging creams, etc.,	K1,K2,K3,K4,K5
2	Understand the role of herbs in hair care and oral care.	K1,K2,K3,K4,K5
3	Get knowledge about natural and synthetic perfumes and the chief constituents in them.	K1,K2,K3,K4,K5,K6
4	Know types of facials, hair colouring, methods of manicure and pedicure.	K1,K2,K3,K4,K5,K6
5	Learn the method of preparation of cosmetic products like face cream, face powder and nail polish.	K1,K2,K3,K4,K5,K6
Textbooks		
1.	***Manufacture of perfumes, cosmetics, detergents*** – Gir Raj Prasad (from small industry research institute)	

2.	Thankamma Jacob, (1997) ***Foods, drugs and cosmetics*** – A consumer guide, Macmillan publication, London
Reference Books	
1.	Wilkinson J B E and Moore R J, (1997) ***Harry's cosmeticology***, 7th ed., Chemical Publishers, London.
2.	George Howard, (1987) ***Principles and practice of perfumes and cosmetics***, Stanley Therones, Chettenham.
3.	***Text book of cosmetics*** – Rajesh kumar Nema, Kamal Singh Rathore, Balkrishna Dubey.
4.	Perry Romanowski, ***Beginning cosmetic chemistry***, Allured Pub Corp.2009.
Web Resources	
1.	https://www.khake.com/page75.html
2.	https://www.virtualbeauty.co.nz/ebooks/cosmetic-chemistry-ebook/

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	3	3	2	3	3	3	3	2
CO 2	2	3	3	2	3	2	3	3	3	3
CO 3	3	3	2	3	3	3	3	2	3	3
CO 4	2	3	3	3	3	2	3	3	3	3
CO 5	2	3	2	3	3	2	3	2	3	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23PCHSE41	TRAINING FOR COMPETITIVE EXAMINATIONS	SEC	2	4	25	75	100

Learning Objectives		
L1	To study the isomerism in cyclic and acyclic compounds and understand organic transformation reactions.	
L2	To describe the reactivity of intermediates and mechanism of rearrangement reactions.	
L3	To get knowledge in synthesis, bonding and structural elucidation of organometallic compounds.	
L4	To gain insights into the modern theories of bonding in coordination compounds.	
L5	To learn theories of rate constants and construction of character tables.	
UNIT	**Contents**	**No. of Hours**
I	**Stereochemistry:** Optical isomerism and Geometrical isomerism - asymmetric synthesis - Walden inversion - cis and trans isomerism - R-S-Notations; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction. **Organic transformations and reagents:** Functional group interconversion including oxidations and reductions; common catalysts and reagents (organic, inorganic, organometallic and enzymatic). Chemo, regio and stereoselective transformations.	12
II	**Organic reactive intermediates:** Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzynes and nitrenes. **Rearrangements:** Mechanisms of rearrangements proceedings via carbonium ions (Wagner Meerwin pinacol – pinacolone and Demjanov type) and electrophilic heteroatoms (Baeyer Villiger and Curtius type).	12
III	**Quantum Chemistry:** Plancks' quantum theory, Compton effect, wave particle duality, uncertainty principle, operators: linear and Hermitian, Schrodinger wave equation postulates of quantum mechanics. Application of Schrodinger equation to particle in a box, harmonic, oscillator, rigid rotator and hydrogen atom. **Electrochemistry:** Ion-solvent interaction – Born treatment - Ion – ion interaction: activity co-efficient, Debye-Huckel equation for activity coefficient - limitations. Ion transport: Debye Huckel Onsager equation for conductance – experimental validity.	12
IV	**Co-ordination Chemistry -** Werner's theory - nomenclature and stereo chemistry of co-ordination compounds - stability constants and their determinations - CFT, splitting of d	12

	orbitals, CFSE, Jahn Teller effect, charge transfer spectra – spectrochemical series- Term states for dn ions, Orgel and Tanabe – Sugano diagram, calculation of Dq, B and β parameters.	
V	**Chemical kinetics:** Rate laws - rate constant - order and molecularity of reactions – concept of Arrhenius theory - collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis. **Group theory**: Symmetry elements and symmetry operations, point groups, reducible and irreducible representations - Direct product representation. Orthogonality theorem and its consequences – construction of Character Tale (C_2V, C_3v and C_2h) – Applications.	12
	Total	
Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Predict the isomerism in cyclic and acyclic compounds and understand organic transformation reactions.	K1,K2,K3,K4,K5
2	Learn the reactivity of intermediates and mechanism of rearrangement reactions.	K1,K2,K3,K4,K5
3	Get knowledge in synthesis, bonding and structural elucidation of organometallic compounds.	K1,K2,K3,K4,K5,K6
4	Gain insights into the modern theories of bonding in coordination compounds.	K1,K2,K3,K4,K5,K6
5	Learn theories of rate constants and construction of character tables.	K1,K2,K3,K4,K5,K6
Textbooks		
1.	I.L. Finar, ***Organic Chemistry Vol-2***, 5thedition, Pearson Education Asia, 1975.	
2.	M. K. Jain and S. C. Sharma, ***Modern Organic Chemistry***, Vishal Publishing Co., Jalandhar, Delhi, 2014.	
3.	J E Huheey, EA Keiter, RL Keiter and OK Medhi, ***Inorganic Chemistry – Principles of structure and reactivity***, 4th Edition, Pearson Education Inc., 2006.	
4.	F. A. Cotton, ***Chemical Applications of Group Theory***, John Wiley & Sons, 2003, 2nd edition.	
Reference Books		
1.	I. L. Finar, ***Organic Chemistry Vol-1,*** 6thedition, Pearson Education Asia, 2004.	
2.	Peter Atkins and Tina Overton, ***Shriver and Atkins' Inorganic Chemistry***, 5thEdition, Oxford University Press, 2010.	
3.	Crabtree, Robert H. ***The Organometallic Chemistry of the Transition Metals***. 3rded. New York, NY: John Wiley, 2000.	
4.	R.L. Flurry. Jr, ***Symmetry Group Theory and Chemical applications***, Prentice Hall. Inc, 1980.	
Web Resources		
1.	https://www.organic-chemistry.org/	
2.	https://nptel.ac.in/courses/104101124	
3.	https://archive.nptel.ac.in/courses/104/101/104101100/	
4.	https://shahulhmr.blogspot.com/	

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Level of Correlation between PSO's and CO's

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CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Strong-3 Medium-2 Low-1