

**CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
NATIONALLY ACCREDITED WITH “A” GRADE BY NAAC
TIRUCHIRAPPALLI**

PG AND RESEARCH DEPARTMENT OF CHEMISTRY



**B.Sc., Chemistry
Syllabus
2022-2023 and Onwards**

**CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
PG DEPARTMENT OF CHEMISTRY**

VISION

- To progress into a centre of superiority in Chemistry that will blend state-of-the-art practices in professional teaching in a communally enriching way, with the holistic progress of the students as its prime emphasis.

MISSION

- To produce graduates committed to integrity, professionalism and lifelong learning by widening their knowledge horizons in range and depth.
- To awaken the young minds and discover talents to achieve personal academic potential by creating an environment that promotes frequent interactions, independent thought, innovations, modern technologies and increased opportunities.
- To enhance the quality through basic and applied research frameworks, and encourage the students to take part in entrance and competitive examinations for higher studies and career.
- To enhance services to the community and build partnerships with the industry.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	LEARNING ENVIRONMENT To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	ACADEMIC EXCELLENCE To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	EMPLOYABILITY To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	GREEN SUSTAINABILITY To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

**PROGRAMME OUTCOMES FOR B.Sc., Mathematics, B.Sc., Physics,
B.Sc., Chemistry PROGRAMME**

PO No.	Programme Outcome On completion of B.Sc., Mathematics, B.Sc., Physics, B.Sc. Chemistry Programme, the students will be able to
PO1	Domain knowledge: Analyze, design and develop solutions by applying firm fundamental concepts of basic sciences and expertise in discipline.
PO2	Problem solving: Ability to think rationally, analyse and solve problems adequately with practical knowledge to assess the environmental issues
PO3	Creative thinking and Team Work: Develop prudent decision-making skills and mobility to work in teams to solve multifaceted problems.
PO4	Employability: Self-study acclimatize them to observe effective interactive practices for practical learning enabling them to be a successful science graduate.
PO5	Life Long Learning: Assure consistent improvement in the performance and arouse interest to pursue higher studies in premium institutions.



CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
PG AND RESEARCH DEPARTMENT OF CHEMISTRY
B.Sc. CHEMISTRY

(For the Candidates admitted from the Academic year 2022 -2023 and onwards)

Semester	Part	Course	Course Title	Course Code	Inst.Hrs./ Week	Credits	Exam			Total
							Hrs.	Marks		
								Int.	Ext .	
I	I	Language Course-I(LC)	Ikkala Illakkiyam	22ULT1	6	3	3	25	75	100
			Hindi Literature & Grammar – I	22ULH1						
			History of Popular Tales Literature and Sanskrit Story	22ULS1						
			Basic French – I	22ULF1						
	II	English Language Course-I (ELC)	Functional English for Effective Communication–I	22UE1	6	3	3	25	75	100
	III	Core Course-I (CC)	General Chemistry	22UCH1CC1	5	5	3	25	75	100
		Core Practical-I (CP)	General Chemistry(P)	22UCH1CC1P	3	3	3	40	60	100
		First Allied Course-I(AC)	Calculus and Fourier Series	22UCH1AC1A	4	3	3	25	75	100
			Biochemistry– I	22UCH1AC1B						
		First Allied Course - II (AC)	Algebra, Analytical Geometry of 3D &Trigonometry	22UCH1AC2A	4	3	3	25	75	100
			Biochemistry(P)	22UCH1AC2BP				40	60	
	IV	Ability Enhancement Compulsory Course - I (AECC)	UGC Jeevan Kaushal – Universal Human Values	22UGVE	2	2	-	100	-	100
	Total				30	22				700
II	I	Language Course-II(LC)	Idaikala Illakiyamum Puthinamum	22ULT2	5	3	3	25	75	100
			Hindi Literature &Grammar – II	22ULH2						
			Poetry Textual Grammar and Alankara	22ULS2						
			Basic French – II	22ULF2						
	II	English Language Course-II (ELC)	Functional English for Effective Communication– II	22UE2	6	3	3	25	75	100
	III	Core Course-II (CC)	Inorganic and Physical Chemistry	22UCH2CC2	5	5	3	25	75	100

IV		Core Practical-II (CP)	Preparation and Analysis of Industrial Compounds (P)	22UCH2CC2P	3	3	3	40	60	100
		Core Course-III (CC)	Material Science	22UCH2CC3	3	3	3	25	75	100
		First Allied Course-III (AC)	ODE, Laplace Transforms and Statistics	22UCH2AC3A	4	3	3	25	75	100
			Biochemistry– II	22UCH2AC3B						
		Ability Enhancement Compulsory Course - II (AECC)	Environmental Studies	22UGEVS	2	2	-	100	-	100
		Ability Enhancement Compulsory Course - III (AECC)	Innovation and Entrepreneurship	22UGIE	2	1	-	100	-	100
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
	Total				30	23				800
III	I	Language Course-III (LC)	Kappiyamum Nadagamum	22ULT3	5	3	3	25	75	100
			Hindi Literature & Grammar – III	22ULH3						
			Prose Textual Grammar and Vakyarchana	22ULS3						
			Intermediate French– I	22ULF3						
	II	English Language Course-III (ELC)	Learning Grammar through Literature – I	22UE3	6	3	3	25	75	100
	III	Core Course-IV (CC)	Organic and Analytical Chemistry	22UCH3CC4	6	6	3	25	75	100
		Core Practical-III(CP)	Analysis and Preparation of Organic Compounds (P)	22UCH3CC3P	3	3	3	40	60	100
		Second Allied Course-I(AC)	Physics – I	22UCH3AC4	4	3	3	25	75	100
		Second Allied Course-II(AP)	Physics-I (P)	22UCH3AC5P	4	3	3	40	60	100
	IV	Generic Elective Course - I (GEC)	Chemistry in Everyday life	22UCH3GEC1	2	2	3	25	75	100
			Basic Tamil-I	22ULC3BT1						
			Special Tamil-I	22ULC3ST1						
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
	Total				30	23				700
	15DaysINTERNSHIPduringSemester Holidays									
IV	I	Language Course- IV (LC)	Pandaiya Illakiyamum	22ULT4	6	3	3	25	75	100
			Urainadaiyum							
			Hindi Literature and Functional Hindi	22ULH4						
			Drama, History of Drama Literature	22ULS4						
			Intermediate French– II	22ULF4						

	II	English Language Course - IV (ELC)	Learning Grammar through Literature–II	22UE4	6	3	3	25	75	100
		Core Course-V(CC)	Inorganic and Organic Chemistry	22UCH4CC5	6	6	3	25	75	100
	III	Core Practical-IV(CP)	Inorganic Qualitative Analysis (P)	22UCH4CC4P	4	4	3	40	60	100
		Second Allied Course - III (AC)	Physics – II	22UCH4AC6	4	3	3	25	75	100
		Internship	Internship	22UCH4INT	-	2	-	-	-	100
	IV	Generic Elective Course- II (GEC)	Food Adulterants and Health Care	22UCH4GEC2	2	2	3	25	75	100
			Basic Tamil-II	22ULC4BT2						
			Special Tamil-II	22ULC4ST2						
		Skill Enhancement Course - I (SEC)	Chemistry of Consumer Products (P)	22UCH4SEC1P	2	2	3	40	60	100
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
	Total				30	25				800
V	III	Core Course-VI(CC)	Inorganic Chemistry–I	22UCH5CC6	6	6	3	25	75	100
		Core Practical-V(CP)	Physical Chemistry(P)	22UCH5CC5P	3	3	3	40	60	100
		Core Course-VII(CC)	Organic Chemistry– I	22UCH5CC7	6	6	3	25	75	100
		Core Course-VIII(CC)	Physical Chemistry–I	22UCH5CC8	6	6	3	25	75	100
		Discipline Specific Elective - I (DSE)	A. Nuclear and Industrial Chemistry	22UCH5DSE1A	5	4	3	25	75	100
			B. Basics of Nanoscience and Nanotechnology	22UCH5DSE1B						
			C. Polymer Chemistry	22UCH5DSE1C						
	IV	Ability Enhancement Compulsory Course-IV(AECC)	UGC Jeevan Kaushal- Professional Skills	22UGPS	2	2	-	100	-	100
		Skill Enhancement Course - II (SEC)	Water Analysis (P)	22UCH5SEC2P	2	2	3	40	60	100
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
	Total				30	29				700
		Core Course-IX(CC)	Organic Chemistry– II	22UCH6CC9	5	5	3	25	75	100
VI	III	Core Course-X (CC)	Physical Chemistry–II	22UCH6CC10	6	5	3	25	75	100
		Core Course-XI	Cyber Security	22UGCS	5	4	3	25	75	100

	(CC)								
	Core Practical-VI (CP)	Gravimetric Analysis and Physical Parameter (P)	22UCH6CC6P	4	4	4	40	60	100
	Discipline Specific Elective - II (DSE)	A. Analytical Techniques(P)	22UCH6DSE2AP	4	4	3	40	60	100
		B. Cosmetic Chemistry (P)	22UCH6DSE2BP						
		C. Analysis of Herbal Products (P)	22UCH6DSE2CP						
	Project	Project Work	22UCH6PW	5	4	-	-	100	100
	V	Gender Studies	22UGGS	1	1	-	100	-	100
		Extension activity	22UGEA	0	1	0	-	-	-
	Total			30	28				700
	Grand Total			180	150				4400

Courses & Credits for UG Science Programmes

Part	Course	No. of Courses	Credits	Total Credits
I	Tamil/Other Language	4	12	12
II	English	4	12	12
III	Core (Theory & Practical)	17	77	109
	Project Work	1	4	
	Internship	1	2	
	First Allied	3	9	
	Second Allied	3	9	
	DSE	2	8	
IV	GEC	2	4	15
	SEC	2	4	
	AECC-I-Universal Human Values	1	2	
	AECC-II-Environmental Studies	1	2	
	AECC-III-Innovation and Entrepreneurship	1	1	
	AECC-IV Professional Skills	1	2	
V	Gender Studies	1	1	02
	Extension Activities	–	1	
		44		150

*For BSc Mathematics & BCA

The Internal and external marks for theory and practical papers are as follows:

Subject	Internal Marks	External Marks
Theory	25	75
Practical	40	60

For Theory:

- The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
- The passing minimum for End Semester Examination shall be 40% out of 75 marks (i.e. 30 marks)

For Practical:

- The passing minimum for CIA shall be 40% out of 40 marks (i.e. 16 marks)
- The passing minimum for End Semester Examination shall be 40% out of 60 marks (i.e. 24 marks)

Internal Component (Theory)

Component	Marks
Library	05
Assignment &Seminar	10
CIA-I	05
CIA-II	05
Total	25

Internal Component (Practical)

Component	Marks
Observation	05
Record	10
Continual performance	10
Model	15
Total	40

Question Paper Pattern

Answer all the questions

PART A (20X1=20)

Answer all the questions

PART B (5X5=25)

Answer any three questions

PART C (3X10=30)

Semester I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH1CC1	GENERAL CHEMISTRY	CORE	5	5

Course Objectives

- The course reviews the structure of the atom, which is a necessary pre-requisite in understanding the nature of chemical bonding in compounds.
- It discusses the periodicity in properties with reference to the s and p block, which is necessary in understanding their group chemistry.
- It provides basic knowledge about ionic, covalent, metallic bonding and reactive intermediates.
- To understand the crystal structures of ionic compounds and the theoretical aspects of volumetric and qualitative inorganic analysis

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recognize and report the fundamental principles of various field of chemistry	K1&K2
CO2	Illustrate the knowledge on atomic structure, bonding, isomerism, reaction intermediates, solid state and analytical techniques.	K3
CO3	Examine the reaction intermediates, solid state and analytical techniques.	K3
CO4	Categorize the quantum numbers, elements, hybridization, stability of intermediates, crystal structure, titrations and acid radicals.	K4
CO5	Interpret the periodic properties, geometry of molecules and electronic displacement Effects	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	1	2	2	3	3	1	1	2
CO3	3	2	2	3	3	3	3	2	2	3
CO4	3	1	2	3	2	3	3	2	1	2
CO5	3	1	2	3	2	3	3	2	1	2

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Atomic Structure and Periodic Properties: Atomic orbitals, quantum, numbers - Principal, azimuthal, magnetic and spin quantum numbers and their significance. Principles governing the occupancy of electrons in various quantum levels-Pauli's exclusion- principle, Hund's rule, Aufbau Principle, (n+1) rule, stability of half-filled and fully filled orbitals. - Classification as s, p, d & f block elements - variation of periodic properties along period and group - Electronegativity scale - Pauling's scale, Allred and Rochow's scale - Mulliken's scale -variation of metallic characters - Factors influencing the periodic properties.	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
II	Chemical Bonding-I: Chemical Bond- definition - types of chemical bond - Illustration. Intermolecular forces - dipole - dipole interaction, induced dipole-induced dipole interaction. Hybridisation - Bond length - Bond energy- Bond angle - factors influencing BL, BE and BA. VB Theory - sp, sp ² , sp ³ hybridisation - geometry of NH ₃ , H ₂ O, ClF ₃ , IF ₃ . VSEPR theory - Molecular Orbital Theory - Homonuclear (H ₂ , He ₂ , O ₂ , O ₂ ⁺ , O ₂ ⁻ , N ₂ , F ₂) and Heteronuclear molecules (CO, NO, HF).	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
III	Basics of Organic Compounds: IUPAC nomenclature of compounds- classification – isomerism - types - structural and stereo isomerism - cleavage of bonds: homolytic and heterolytic cleavages – Inductive- electromeric – mesomeric (resonance)- hyperconjugation and steric effects. Reaction intermediates- carbocation, carbanion, free radicals, carbenes and nitrenes – generation- properties - structure and stability.	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
IV	Structure of Solids: Crystal Structure - open and closed packed structures – covalent network- ionic and molecular structure - packing of ions in ccp and hcp - radius ratio - coordination number in ionic crystals - crystal structures-sodium chloride, zinc blende, wurtzite, rutile, cesium chloride, fluorite (unit cell diagrams). Crystal defects - Schottky and Frenkel defects.	15	CO1, CO2, CO3	K1, K2, K3, K4
V	Analytical Methods-I: Storage and handling of chemicals - handling of acids, ethers, toxic and poisonous chemicals and first aid procedure - Volumetric analysis - methods of expressing	15	CO1, CO2, CO3	K1, K2, K3, K4

	concentration - Primary and Secondary standards- Different types of titrations – Acid - Base Titrations, Titrimetric method, Iodimetry method - Iodometry Method, Complexometric Titration and Precipitation Titration. Qualitative Inorganic Analysis - Dry Test - Flame Test - Interfering acid radicals - Eliminating of Interfering acid radicals.			
VI	Self-Study for Enrichment (Not to be included for External Examination) Electronic configuration of polyelectronic atoms, Calculation of screening constant and effective nuclear charge - Lewis electron dot structure - Oxidation State and valency of element - Comparison of reactive intermediates based on their stability - Difference between ionic and covalent crystals - Do and Don't in the Science Lab	-	CO1, CO2 ,CO3	K1, K2,K3, K4

Text Books

1. Puri, B. R., Sharma, L. R. & Kalia, K. K. (2018). Principles of Inorganic Chemistry. 33rd edition. Shoban Lal Nagin Chand & Co., New Delhi.
2. Madan, R.D. (2019). Modern Inorganic Chemistry. 3rd edition. S. Chand & Company Ltd.
3. Bahl, B. S. & Arun Bahl (2021). Text book of Organic Chemistry, 22nd revised edition. S. Chand & Company Ltd.
4. Puri, B. R., Sharma, L. R. & Pathania, M. S. (2022). Principles of Physical Chemistry. 48th edition. Shoban Lal Nagin Chand & Co, New Delhi.
5. Gopalan, R., Subramanian, P. S. & Rengarajan, K. (2003). Elements of Analytical Chemistry. 2nd edition. Sultan Chand & Sons,

Reference Books

1. Soni, P. L. & Mohan Katyal. (2017). Text book of Inorganic Chemistry. 25th revised edition. Sultan Chand & Sons.
2. Vogel, A. I. (2000). Text Book of Quantitative Inorganic analysis including Elementary Instrumental Analysis. The English Language Book Society.

Web References

1. <https://www.thoughtco.com/definition-of-quantum-number-604629>
2. https://www.chemie-biologie.uni-siegen.de/ac/lehre/part1_solid_state.pdf
3. <https://testbook.com/learn/chemistry-vsepr-theory/>

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designers

1. Dr. P. Pungayee Alias Amirtham
2. Ms. A. Sharmila

Semester I	Internal Marks: 40		External Marks: 60	
COURSECODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
22UCH1CC1P	GENERAL CHEMISTRY(P)	CORE	3	3

Course Objectives

- To learn the techniques of titrimetric analyses.
- To know the estimation of several cations and anions and to know the estimation of total hardness of water.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statements On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall the basic principles of volumetric analysis and estimation	K1
CO2	Demonstrate the experimental methods of volumetric analysis	K2
CO3	Estimate the chlorine content in bleaching powder and copper in brass	K3
CO4	Determine the hardness of water	K3
CO5	Determine saponification value of oil	K3

Mapping of CO with PO and PSO

CO	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	-	2	3	3	2
CO2	2	2	2	3	2	3	3	3	3	2
CO3	2	3	3	1	2	2	3	3	2	1
CO4	2	3	3	1	2	2	3	3	2	2
CO5	2	3	3	1	2	2	3	3	2	2

“1”–Slight(Low) Correlation

“3”–Substantial(High) Correlation

“2”–Moderate(Medium)Correlation

“-”indicates there is no correlation.

Syllabus

I Titrimetric Quantitative Analysis

1. Estimation of HCl using NaOH as link and standard oxalic acid solution
2. Estimation of Na_2CO_3 using HCl as link and standard Na_2CO_3 solution
3. Estimation of oxalic acid using KMnO_4 as link and standard oxalic acid solution
4. Estimation of Iron(II) sulphate using KMnO_4 as link and standard Mohr's salt solution
5. Estimation of KMnO_4 using thio as link and standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
6. Estimation of copper(II) sulphate using $\text{K}_2\text{Cr}_2\text{O}_7$ solution
7. Estimation of Mg(II) by EDTA solution
8. Estimation of Ca(II) by EDTA solution
9. Estimation of chloride ion

II. Applied Experiments

1. Estimation of total hardness of water
2. Estimation of bleaching powder
3. Estimation of saponification value of an oil
4. Estimation of copper in brass

Text Books

1. Venkateswaran, V. & Veeraswamy, R. & Kuandaivelu. (1997). Basic Principles of Practical Chemistry. 2nd edition. New Delhi, Sultan Chand & Sons.
2. Bassett, J. (1985). Text Book of Quantitative Inorganic Analysis. 4th edition. ELBS Longman.

Reference Book

1. Vogel A. I. (2000) Text book of quantitative inorganic analysis. The English language book Society.

Web References

1. <https://www.youtube.com/watch?v=wh6-cYjNNiA>
2. <https://chemlab.truman.edu/files/2015/07/edta.pdf>
3. <https://www.slideshare.net/mithilfaldesai/estimation-of-feii-ions-by-titrating-against-k2-cr2o7-using-internal-indicator>
4. <https://byjus.com/chemistry/titration-of-oxalic-acid-with-kmno4/>
5. <http://www.titrations.info/EDTA-titration-calcium>
6. <https://www.youtube.com/watch?v=qmVQs6Q7tso>

Pedagogy

Demonstration and Practical sessions

Course Designer

➤ Dr. C. Rajarajeswari

FIRST ALLIED COURSE-I (AC)
CALCULUS AND FOURIER SERIES

(For B.Sc Physics & Chemistry)
(2022-2023 and Onwards)

Semester I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UPH1AC1/ 22UCH1AC1A	CALCULUS AND FOURIER SERIES	ALLIED	4	3

Course Objective

- Explore the students with mathematical methods formatted for their major concepts and train them in basic Integrations.
- Analyze mathematical statements and expressions.
- Evaluate the fundamental concepts of Differentiation and Integration.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Explain the concepts of Calculus and Fourier series	K1,K2
CO2	Classify the problem models in the respective area.	K3
CO3	Solve various types of problems in the corresponding stream.	K3
CO4	Identify the properties of solutions in the core area.	K3
CO5	Discover the applications of Calculus and Fourier series.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	2	2	2	2
CO2	3	2	2	2	2	3	2	2	2	2
CO3	3	2	2	2	2	3	2	2	2	2
CO4	3	2	2	2	2	3	2	2	2	2
CO5	3	2	2	2	2	3	2	2	2	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Successive Differentiation: <p>The n^{th} derivative – Standard results – Method of splitting the fractional expressions into partial fractions - Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the n^{th} derivative of a product (proof not needed) – A complete formal proof by induction (proof not needed) - Curvature- Circle, radius and center of curvature - Cartesian formula for the radius of curvature – Simple problems in all these.</p>	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Evaluation of integrals: <p>Integration of Rational algebraic functions– Rule (a)– Rule (b) Integration of the form $\int \frac{lx+m}{ax^2+bx+c} dx$ – Rule (c)- Integration of Irrational functions : Integration of the form $\int \frac{px+q}{\sqrt{ax^2+bx+c}} dx$ – Integration of the form $\int \frac{dx}{(x+p)\sqrt{ax^2+bx+c}}$ - Integration of the form $\int \frac{dx}{a+b \cos x}$.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Reduction Formula: <p>Properties of definite integrals –Reduction formula (when n is a positive integer) for 1] $\int e^{ax} x^n dx$ 2] $\int x^n \cos ax dx$ 3] $\int \sin^n x dx$ 4] $\int_0^{\frac{\pi}{2}} \sin^n x \cos^m x dx$ (without proof) and illustrations.</p>	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Double and Triple Integrals: <p>Definition of the double integral-Evaluation of Double integral (Problems Only)-Change of order and evaluation of the double integral (Problems only).</p>	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Fourier Series: <p>Definition of Fourier Series – Finding the Fourier</p>	10	CO1, CO2, CO3,	K1, K2, K3,

	Coefficients for a given periodic function with period 2π - Even and Odd functions–Half range Fourier series.		CO4, CO5	K4
VI	Self-Study for Enrichment : (Not to be included for External examination) Radius of curvature when the curve is in Polar co-ordinates - (i) $\int \frac{dx}{ax^2 + bx + c}$ (ii) $\int \frac{dx}{\sqrt{ax^2 + bx + c}}$ - (1) $\int \cos^n x dx$ (2) $\int_0^{\frac{\pi}{2}} \cos^n x dx$ -Triple Integrals in simple cases(Problems Only)- Development in cosine series - Development in sine series.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume I*. S. Viswanathan Pvt Limited.
2. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume II*. S. Viswanathan Pvt Limited.
3. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume III*. S. Viswanathan Pvt Limited.

UNIT–I Chapter 3:Sections 1.1 to 1.6,2.1,2.2[1]

Chapter 10:Sections 2.1 to 2.3 [1]

UNIT-II Chapter 1:Sections 7.1,7.3,7.4,8(CASE II, CASE V), 9 [2]

UNIT-III Chapter 1:Sections 11,13.1 to 13.5 [2]

UNIT-IV Chapter 5:Sections 2.1,2.2,4 [2]

UNIT-V Chapter 6:Sections 1 to 4[3]

Reference Books

1. Sankarappan, S. Arulmozhi, G. (2006). Vector Calculus, Fourier series and Fourier Transforms. Vijay Nicole Imprints Private Limited.
2. Vittal, P.R.(2014). Allied Mathematics. Margham Publications.
3. Singaravelu, A.(2003). Differential Calculus and Trigonometry. R Publication.

Web Links

1. <https://www.youtube.com/watch?v=tBtF3Lr-VLk&t=64s>
2. <https://www.youtube.com/watch?v=Z4oSGuAZrZM>
3. https://www.youtube.com/watch?v=w6llnAOX_f8
4. <https://www.youtube.com/watch?v=LMci8o0ERNE>
5. <https://www.youtube.com/watch?v=GAwOGCyWy0>
6. <https://www.youtube.com/watch?v=9X3ggehCFII>

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designers

1. Dr. P. Saranya
2. Ms. L. Mahalakshmi
3. Ms. P. Geethanjali

Semester I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
22UCH1AC1B	BIOCHEMISTRY-I	ALLIED	4	3

Course Objectives

- To describe the chemistry of carbohydrates, proteins and lipids.
- To understand the importance of biomolecules in living organisms.
- To gain knowledge about the diseases occurring due to alterations in the levels of biomolecules.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall the basic concepts and understand the structure, functions of the biomolecules in living organisms	K1&K2
CO2	Describe the functions of the biomolecules in living organisms	K2
CO3	Apply the concepts to illustrate the role of biomolecules in various metabolic pathways	K3
CO4	Analyze the results of routine biochemical analysis using theoretical Concepts	K4
CO5	Evaluate the dimensions of diseases associated with the metabolic Disorders	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	2	2	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	2	3	3
CO5	3	3	3	2	3	3	3	2	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Carbohydrates: Definition of carbohydrate - Digestion and absorption of Glucose - Fate of glucose after absorption (preliminary idea). Intermediary metabolism of carbohydrates -glycogenesis, glycogenolysis, glycolysis, gluconeogenesis. Regulation of blood sugar - normal range - Hypoglycaemia and Hyperglycaemia - glucose tolerance tests - Diabetic Mellitus - Types and symptoms - glycosuria.	13	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
II	Proteins: Proteins - Definition - Peptide bond formation - classification of proteins based on its physical properties - structure of proteins: primary structure - secondary structure - tertiary structure - denaturation. Absorption- metabolic pool - general pathway of protein metabolism- in born errors of amino acid metabolism - Phenylketonuria, Alkaptonuria (Black urine syndrome) and albinism.	13	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
III	Lipids: Definition – lipids - oxidation of fatty acids - β -oxidation cycle of saturated fatty acids. Ketogenesis, Ketosis – Ketolysis - role of liver in fat metabolism - Cholesterol – absorption - factors influencing absorption. Lipid profile – cholesterol – Triglycerides- lipoproteins - HDL and LDL. Fatty liver - Inborn errors of lipid metabolism.	12	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
IV	Enzymes: Definition- classification- examples - Glucose oxidase - mechanism of enzyme action- Factors influencing enzyme action. Digestive enzymes and their action - salivary digestion - gastric digestion - pancreatic and intestinal digestion- Thyroxine - agents interfering with the synthesis of thyroid hormone - Diseases associated with abnormal metabolism of thyroxine.	12	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
V	Blood and Bile Pigments: Blood - functions of plasma proteins - blood groups and Rh factor - coagulation of blood mechanism. Haemoglobin - structure and properties of Hb – metabolism -Bile pigments - examples - Types of Jaundice (preliminary idea).	10	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
VI	Self-Study for Enrichment be included for External Examination) Structure and classification of carbohydrates - Categories of amino acids - Types and functions of lipids - Properties and uses of enzymes - Properties and examples of bile pigments.	-	CO1	K1, K2

Text Books

1. Ambika, S. (2012). Fundamentals of Biochemistry for Medical Students. (7th ed.). Ippincott Williams & Wilkins.
2. Fatima, D., Nallasingam, K., Narayanan, L. M., Arumugam, N., Meyyan, R. P., & Prasanna Kumar, S. (2019). Biochemistry. (7th ed.). Saras Publication.
3. Jain, J. L., Jain, S., & Jain, N. (2016). Fundamentals of Biochemistry. (Revised ed.). S Chand & Co Ltd.

Reference Books

1. Annie Ragland, & Arumugam, N. (2015). Biochemistry and Biophysics. (3rd ed.). Saras Publication.
2. Nelson, D. L., & Cox. M. M. (2017). Lehninger Principles of Biochemistry. (7th ed.). WH Freeman.
3. Voet, D., Pratt, C. W., & Voet, J. G. (2012). Principles of Biochemistry. (4th ed.). John Wiley & Sons.
4. Berg, J. M., Stryer, L., Tymoczko, J., & Gatto, G. (2019). Biochemistry. (9th ed.). WH Freeman.
5. Mathews, C. K., Van Holde, K. E., & Ahern, K. G. (2000). Biochemistry. (3rd ed.). Pearson.

Web References

1. https://www.biologie.ens.fr/~mthomas/L3/intro_biologie/2-sucres-lipides-acides-nucleiques.pdf
2. <https://bio.libretexts.org/@go/page/1861>
3. <https://bio.libretexts.org/@go/page/16827>
4. <https://bio.libretexts.org/@go/page/16101>
5. <https://bio.libretexts.org/@go/page/16828>

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designer

1. Dr. S. Saranya

FIRST ALLIED COURSE-II (AC)
ALGEBRA, ANALYTICAL GEOMETRY OF 3D & TRIGONOMETRY

(For B.Sc Physics & Chemistry)
 (2022-2023 and Onwards)

Semester I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UPH1AC2/ 22UCH1AC2A	ALGEBRA, ANALYTICAL GEOMETRY OF 3D & TRIGONOMETRYs	ALLIED	4	3

Course Objective

- Analyze the mathematical methods formatted for their major concepts.
- Evaluate the problems in Algebra and Trigonometry.
- Explain the basics of Three-Dimensional geometry.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Explain various notions in Algebra, Analytical Geometry of 3D & Trigonometry.	K1, K2
CO2	Identify the problem models.	K3
CO3	Apply the concepts of Algebra, Analytical Geometry of 3D & Trigonometry.	K3
CO4	Solve the given problems in the respective stream.	K3
CO5	Analyze the applications of the core area.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	2	3	2	2	2	2
CO2	2	2	2	3	2	3	2	2	2	2
CO3	2	2	2	3	2	3	2	2	2	2
CO4	2	2	2	3	2	3	2	2	2	2
CO5	2	2	2	3	2	3	2	2	2	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Series Expansion: Application of Binomial Theorem to summation of series – Approximate values – Summation of series by Exponential series - Summation of series by Logarithmic series (Formulae only).	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
II	Matrices: Matrix-Special types of Matrices –Scalar multiplication of a matrix-Equality of matrices-Addition of matrices-Subtraction of matrices- Symmetric matrix-Skew symmetric matrix-Hermitian and Skew Hermitian matrix –Multiplication of matrix – Inverse matrix-Inner product-Solution of simultaneous equations-Rank of a matrix-Elementary transformation of a matrix-A system of m homogeneous linear equations in n unknowns-Linear dependence and independence of vectors-System of non-homogeneous linear equations - Eigen values and Eigenvectors.(Applications only)	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
III	Three Dimensional Geometry: The Sphere – Definition- The equation of a sphere when the center and radius are given-The equation of a sphere to find its center and radius- The length of the Tangent Plane from a point to the sphere – The Plane Section of a sphere – Equation of a circle on a sphere – Intersection of two spheres in a circle.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
IV	Expansion of Trigonometric functions: Expansions of $\cos n\theta$ and $\sin n\theta$ - Expansion of $\tan(A + B + C + \dots)$ (omitting examples on formation of equations) –Powers of sines and cosines of θ in terms of functions of multiples of θ – Expansions of $\cos^n \theta$ when n is a positive integer – Expansions of $\sin^n \theta$ when n is a positive integer – Expansions of $\sin \theta$ and $\cos \theta$ in a series of ascending powers of θ - The expansions of $\sin \theta$ and $\cos \theta$ to find the limits of certain expressions.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.

V	Hyperbolic functions: Hyperbolic functions – Relation between hyperbolic functions – Relations between hyperbolic functions and circular functions - Inverse hyperbolic functions.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
VI	Self-Study for Enrichment : (Not to be included for External examination) Series which can be summed up by the Logarithmic series - Simple applications of Matrices- The equation of the tangent plane to the sphere at a point. (Only problems) - Expansion of $\tan\theta$ in terms of powers of θ - Separation of real and imaginary parts of $\tanh(x+iy)$.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.

Text Books

1. Manichavasagam Pillai, T.K. Natarajan, T. & Ganapathy, K.S. (2015). *Algebra, Volume I.S.* Viswanathan Pvt Limited.
2. Manichavasagam Pillai, T.K. (2015). *Algebra, Volume II.* S. Viswanathan Pvt Limited.
3. Manichavasagam Pillai, T.K. & Natarajan, T. (2016). *A Text book of Analytical Geometry Part-II 3D.* New Gamma Publishers.
4. Manichavasagam Pillai, T.K. & Narayanan, S. (2013). *Trigonometry.* S. Viswanathan Pvt Limited.

UNIT-I Chapter 3: Sections 10, 14 [1]

Chapter 4: Sections 3, 7, 9 [1]

UNIT-II Chapter 2: Sections 1 to 16 [2]

UNIT-III Chapter 4: Sections 1-5, 6, 1, 7, 8 [3]

UNIT-IV Chapter 3: Sections 1 to 4, 4.1, 5, 5.1 [4]

UNIT-V Chapter 4: Sections 1, 2, 2.1 to 2.3 [4]

Reference Books

1. Arumugam, S. Issac, A. (2017). *Analytical Geometry 3D and Vector calculus.* New Gamma Publishing house.
2. Pandey, H.D. Khan, M.Q. & Gupta, B.N. (2011). *A Text Book of Analytical Geometry and Vector Analysis.* Wisdom Press.
3. Singaravelu, A. (2003). *Differential Calculus and Trigonometry.* R Publication.

Web Links

1. <https://www.youtube.com/watch?v=JayFh5EJHcU>
2. <https://www.youtube.com/watch?v=h5urBuE4Xhg>
3. <https://www.youtube.com/watch?v=59z6eBynJuw>
4. <https://www.youtube.com/watch?v=9DvPyJb2N9g>
5. <https://www.youtube.com/watch?v=HOk2XLeFPDk>
6. <https://www.youtube.com/watch?v=G1C1Z5aTZSO>

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designers

1. Dr. P. Saranya
2. Dr. L. Mahalakshmi
3. Ms. P. Geethanjali

Semester I	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH1AC2BP	BIOCHEMISTRY(P)	ALLIED	4	3

Course Objective

- To expertise the student for analysis of any biological sample for identification of its chemical composition

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Identify and classify the given compounds of carbohydrates, amino acids and lipids based on the characteristic reactions	K1&K2
CO2	Analysis of the compounds	K2
CO3	Prepare and isolate the biomolecules present in food products	K3
CO4	Estimate the amount of carbohydrate and protein present in the given solution	K4
CO5	Assess the quality and quantity of biomolecules by analytical methods	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

Syllabus

I QUALITATIVE ANALYSIS

(i) Preparation

1. Preparation of buffers (acidic, neutral and alkaline) and determination of pH.
2. Preparation of osazones.

(ii) Qualitative Identification

3. Qualitative identification of carbohydrates
 - Monosaccharides : Pentose, Glucose, Fructose, Mannose
 - Disaccharides : Sucrose, Maltose, Lactose
 - Polysaccharides : Starch, Dextrin and Glycogen
4. Qualitative identification of amino acids
 - Aliphatic : Histidine, Arginine, & Proline
 - Aromatic : Tyrosine, Tryptophan, Phenylalanine
 - Sulphur containing amino acids: Cystine, Cysteine & Methionine
5. Qualitative identification of lipids - solubility, saponification, acrolein test, Salkowski test, Lieberman-Burchard test.

(iii) Isolation

6. Isolation of casein from milk.
7. Isolation of egg albumin from egg white.
8. Isolation of starch from potato.

II QUANTITATIVE ANALYSIS

1. Estimation of glucose.
2. Estimation of protein.

III DEMONSTRATION

1. Blood group test

Text Books

1. Rajan, S., & Selvi Christy. R. (2018). Experimental Procedures in Life Sciences. CBS Publishers & Distributors.
2. Gnanpragasam, N. S., & Ramamurthy. G. (2013). Organic Chemistry Lab Manual. Viswanathan, S., Printers & Publishers.

Reference Books

1. Zubay, C. (1986). Biochemistry. Addison Wesley.
2. Wood, W. B. (1981). Biochemistry- A problem Approach. Addison Wesley.

Web References

1. http://nec.edu.np/Publications/Chemistry_LAB_Manual/Experiment%204.pdf
2. <https://microbenotes.com/osazone-test/>
3. https://www.mlsu.ac.in/econtents/1616_Biochemical%20Tests%20of%20Carbohydrate,%20protein,%

- [20lipids%20and%20salivary%20amylase.pdf](#)
4. <https://vlab.amrita.edu/?sub=2&brch=191&sim=692&cnt=2>
 5. https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/files/2%20ESTIMATION%20OF%20PROTEIN%20BY%20LOWRY.pdf

Pedagogy

Demonstration and practical sessions

Course Designer

1. Dr. S. Saranya

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH2CC2	INORGANIC AND PHYSICAL CHEMISTRY	CORE	5	5

Course Objectives

- The course reviews the chemical bonding, which is a necessary pre-requisite in understanding the nature of chemical bonding existing in compounds.
- Discusses about the s and p block elements.
- Provides basic knowledge about liquid and colloidal state of matter.
- Deliberates the basic concepts of thermochemistry.
- Stretches the knowledge about the different techniques involved in metallurgy.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Recognize and account the fundamental ideas of bonding, s, p block elements, thermochemistry, metallurgy and colloidal state	K1&K2
CO2	Exemplify the knowledge on bonding, periodic elements, liquids, colloids, enthalpies and refining process	K3
CO3	Categorize the types of bonding, s block elements, liquid and colloidal state of compounds and their properties.	K4
CO4	Interpret the percent ionic character, dipole moment	K4
CO5	Interpret Hess's law and techniques used in metallurgy.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	1	2	2	3	3	1	1	2
CO3	3	2	2	3	3	3	3	2	2	3
CO4	3	1	2	3	2	3	3	2	1	2
CO5	3	1	2	3	2	3	3	2	1	2

"1" – Slight (Low) Correlation

"3" – Substantial (High) Correlation

"2" – Moderate (Medium) Correlation

"-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	Chemical Bonding – II Ionic Bond – Lattice Energy- Born-Haber Cycle- polarity in covalent bonds – covalent character of Ionic bond - Fajan's rule - effects of Polarisation- percent ionic character- electronegativity difference. Dipole moment and structure of molecules- Hydrogen bonding - properties, types and consequences.	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
II	s and p- Block Elements s- block elements: General characteristics, comparative study of alkali and alkaline earth metals - oxides. Diagonal relationship between Li and Mg, Be and Al. p-Block Elements: General characteristic of groups 13-17, Boron and its compounds-Boric acid- Borax - Boron nitride - Boron trihalide – diborane - compounds of silicon - silicates, silicones and SiCl ₄ .	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
III	Metallurgy Introduction to Transition metals-Metallurgy-various steps in metallurgy – grinding -pulverizing - concentration (ore dressing)-hand picking - gravity separation - froth floatation, electromagnetic separation, chemical separation - calcinations and roasting - smelting, alumino thermic process- purification of metals - zone refining- vapour phase and electrolytic refining.	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
IV	Liquid and colloidal State: Liquid State - physical properties of liquids – vapour pressure- surface tension- viscosity - refraction- their determination. Liquid Crystals - classification of thermotropic liquid crystals – Smectic - Nematic -Cholesteric Liquid	15	CO1, CO2, CO3	K1, K2, K3, K4

	Crystals- Disc-shaped Liquid Crystals- Polymer Liquid Crystals. Colloids – types of colloidal solutions – classification – preparation – purification – properties – determination of size of particles – gels and their applications –application of colloids.			
V	Thermochemistry Change of internal energy in chemical reaction-change of enthalpy in chemical reaction-enthalpy of reaction at constant volume and constant pressure- enthalpy of neutralization- enthalpy of dissociation- enthalpy of formation-enthalpies of compounds-enthalpies of formation of ions- Kirchoff's equation-Hesse's law and its Application	15	CO1, CO2, CO3	K1, K2, K3, K4
VI	Self-Study for Enrichment (Not to be included for External Examination) Bond characteristics- periodic table-general properties of states of matter- exothermic- endothermic changes - free energy change in chemical reactions- minerals and ores.	-	CO1, CO2, CO3	K1, K2, K3, K4

Text Books

1. Puri, B. R., Sharma, L. R. & Kalia, K. K. (2018). Principles of Inorganic Chemistry. Shoban Lal Nagin Chand & Co., 33rd edition, New Delhi,.
2. Madan, R.D. (2019). Modern Inorganic Chemistry. 3rd edition, S. Chand & Company Ltd,
3. J. D. Lee, (2014). New Concise Inorganic Chemistry, 5th edition, Oxford Publishers.
4. Puri, B.R., Sharma, L.R. & Pathania, M.S. (2022). Principles of Physical Chemistry. Shoban Lal 48th edition. Nagin Chand & Co, New Delhi.

Reference Books

1. Soni, P.L. & Mohan Katyal. (2017). Text book of Inorganic Chemistry. 25th revised edition, Sultan Chand & Sons.
2. Peter Atkins, Julio de Paula, and James Keeler, (2017). Atkins' Physical Chemistry, 11th Edition, Oxford University Press, UK.

Web Reference

1. [Chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_\(Inorganic_Chemistry\).](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_(Inorganic_Chemistry))
2. https://www.chemie-biologie.uni-siegen.de/ac/lehre/part1_liquid_state.pdf
3. <https://byjus.com/jee/colloids>

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designers

1. Dr. K. Uma Sivakami

Semester II	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH2CC2P	PREPARATION AND ANALYSIS OF INDUSTRIAL COMPOUNDS (P)	CORE PRACTICAL	3	3

Course Objectives

- Learn to the diverse roles of inorganic materials in the industry
- Gain knowledge on fertilizers.
- Explain the principle, working and applications of volumetric analysis.
- Perform quantitative analytical methods by titrations.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Provide graduates with the skills, information and learning tools required to carry out professional research, and development and production activities in the field of chemistry.	K1
CO2	Explain the suitability of fertilizers for different kinds of crops and soil.	K2
CO3	Prepare students for professional participation in Chemical industries so as to adapt themselves to jobs which are problem Solving	K3
CO4	Infer the students to be result-oriented in the chemical, biochemical and applied technological fields.	K4
CO5	Apply the concept of volumetric analysis in industrial analysis	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	2	3	3	3	3
CO2	2	2	2	2	2	2	2	3	2	2
CO3	3	2	2	2	2	2	2	2	2	2
CO4	3	2	3	2	2	3	2	2	2	3
CO5	2	3	2	3	3	3	2	2	3	3

“1” – Slight (Low) Correlation –

“2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation –

“-” indicates there is no correlation.

Syllabus

Quantitative Analysis

1. Analysis of sodium bicarbonate present in a commercial sample of soda mint tablet.
2. Determination of total alkali content of a commercial detergent.
3. Determination of free acidity in ammonium sulphate fertilizer.
4. Estimation of phosphoric acid in superphosphate fertilizer.
5. Estimation of calcium in chalk – Permanganometry
6. Estimation of citric acid in orange or lemon

Qualitative Analysis

1. Limit test for sulphate, chloride, barium, iron and magnesium ions.
2. Assay of inorganic compounds
3. Purity checking of compounds

Preparation

1. Preparation of Ferric alum
2. Preparation of Potash alum
3. Preparation of Mohr's salt
4. Preparation of tetrammine copper (II) sulphate
5. Preparation of soap
6. Preparation of Talcum powder
7. Preparation of Caprolactam.

Text Books

1. Svehla, G. (1996). Vogel's Qualitative Inorganic Analysis: Prentice Hall.
2. Satinder, K. Juneja ., Dr. Aran, K. (2020). Inorganic Materials of Industrial Importance: S Vinesh & Co.

Reference Books

1. Kingery, W. D., Bowen H. K.; Uhlmann, D. R. (1976). Introduction to Ceramics, Wiley Publishers: New Delhi.
2. Gopalan, R., Venkappayya, D., Nagarajan, S. (2004). Engineering Chemistry: Vikas Publications.

Web References

1. [https://eusalt.com/_library/_files/EuSalt_AS007-2005_Potassium - Sodium Tetraphenylborate_Volumetric_Method.pdf](https://eusalt.com/_library/_files/EuSalt_AS007-2005_Potassium_-_Sodium_Tetraphenylborate_Volumetric_Method.pdf)
2. http://wwwchem.uwimona.edu.jm/lab_manuals/c10expt3.html
3. <https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2016112814>
4. https://www.google.com/search?q=Determination+of+free+acidity+in+ammonium+sulphate+fertilizer_
5. [https://www.researchgate.net/publication/344350736_Determination_of_alkali_content total fatty matter in cleansing agents](https://www.researchgate.net/publication/344350736_Determination_of_alkali_content_total_fatty_matter_in_cleansing_agents)
6. <https://www.tifr.res.in/~pkjoshi/articles/sodamint.pdf>

Pedagogy

Table Work

Course Designers

1. Dr. P. Pungayee Alias Amirtham
2. Dr. G. Sivasankari.

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH2CC3	MATERIAL SCIENCE	CORE	3	3

Course Objective

- To describe the structure of ceramics and magnetic materials.
- To understand the importance of energy storage materials.
- To gain knowledge about the fuel cell power plant.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall the basic concepts of magnetic, conductors and understand the energy storage materials.	K1&K2
CO2	Apply the concepts to illustrate the role of energy in various materials.	K3
CO3	Analyze the results of different materials using theoretical concepts.	K4
CO4	Evaluate the applications of magnetic, semiconductors,	K4
CO5	Evaluate the applications LED, batteries and fuel cell power plant.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	2	3	3
CO5	3	3	2	2	3	3	3	2	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Conductors and Insulators: Introduction - semiconductors - classification of semiconductors - intrinsic and extrinsic - n-type and p-type - crystal structure and bonding in Si and Ge - elemental and compound semiconductors - applications - Insulators.	9	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
II	Magnetic Materials: Magnetic dipole - dipole moment - magnetic field strength - magnetic susceptibility - diamagnetic - paramagnetic - ferromagnetic - curie temperature - hysteresis curve - antiferromagnetic - ferrimagnetic - hard and soft magnetic materials - properties - examples - applications.	9	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
III	Ceramics and Display Devices: Classification of ceramics - structure of the ceramics- compounds with NaCl, Fluorite and Perovskite structure - properties of ceramics- applications - active display devices- Light Emitting Diode (LED) - passive display devices - Liquid Crystal Display (LCD)- applications.	9	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
IV	Materials for Energy Storage: Batteries – primary and secondary batteries - lithium-lead acid batteries - nickel cadmium batteries - advanced batteries - super capacitors for energy storage - role of carbon nanomaterials as electrodes in batteries and super capacitors.	9	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
V	Fuel cells: Introduction - difference between batteries and fuel cells - components of fuel cells - principle of working of fuel cell - performance characteristics of fuel cells - efficiency of fuel cell - fuel cell power	9	CO1, CO2, CO3,	K1, K2, K3, K4, K5

	plant - fuel processor - fuel cell power section - power conditioner - Advantages and disadvantages of fuel cell power plant.		CO4	
VI	Self Study for Enrichment (Not to be included for External Examination) Bonding in metals and semi-conductors - reason for ferromagnetic spin alignment are contrasted with superconducting spin pairing - ceramic processing - fuel cell stack – hydrogen production and storage.	-	CO1	K1, K2

Text Books

1. Rajendran, V. & Marikani, A. (2009). Materials Science. (9th ed.). Tata McGraw-Hill Publishing Company Limited.
2. VanVlack, L. H., (1975). Elements of materials science and engineering. (6th ed.). Addison-Wesley.
3. Jain, P.C., & Jain, M., (2013). Engineering Chemistry. (6th ed.). DhanpatRai & Sons.

Reference Books

1. Callister, W.D., & Rethwisch, G.D., (2018). Materials Science and Engineering: An Introduction. (10th ed.). Wiley.
2. Kingery, W.D., Bowen, & H.K., Uhlmann, D.R., (1976). Introduction to Ceramics. (2nd ed.). Wiley.
3. Sharma, B.K., (1997). Industrial Chemistry. (8th ed.). Goel Publishing.

Web References

1. <https://www.britannica.com/science/semiconductor>
2. <https://advancedmagnetsource.com/2018/09/03/types-magnetic-materials/>
3. <https://mse.umd.edu/about/what-is-mse/ceramics>
4. <https://www.european-mrs.com/battery-and-energy-storage-devices-materials-eco-design-emrs>
5. <https://georgiasouthern.libguides.com/c.php?g=943952&p=6804654>

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designer

1. Ms. P. Thamizhini

ALLIED COURSE – III
(For Chemistry)
ODE, LAPLACE TRANSFORMS AND STATISTICS
(2022-2023 Onwards)

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UCH2AC3A	ODE, LAPLACE TRANSFORMS AND STATISTICS	ALLIED	4	3

Course Objective

- **Explain** the basics of Ordinary Differential Equations.
- **Explore** the mathematical methods formatted for major concepts.
- **Emphasize** them in the field of Statistics.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Knowledge Level
CO1	Explain various notions in ODE, Laplace transforms & Statistics.	K1, K2
CO2	Classify the problem models in the respective area.	K3
CO3	Identify the properties of solutions in the core area.	K3
CO4	Solve various types of problems in the corresponding stream.	K3
CO5	Analyze the applications of the core area.	K4

Mapping of CO with PO and PSO

Os	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	2	3	2	3	3
CO2	3	2	2	2	2	2	3	2	3	3
CO3	3	2	2	2	2	2	3	2	3	3
CO4	3	2	2	2	2	2	3	2	3	3
CO5	3	2	2	2	2	2	3	2	3	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Ordinary Differential Equations: Equations of the first order but of higher degree – Type A: Equations solvable for $\frac{dy}{dx}$ - Type B: Equations solvable for y - Equations solvable for x - Clairaut's Form (simple cases only). Linear equations with constant coefficients: Definitions – The operator D- Complementary function of a linear equation with constant co-efficients - Particular integral: General method of finding P.I- Special methods for finding P.I.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Laplace Transforms: Laplace Transforms – Definition -Sufficient conditions for the existence of Laplace transform-Basic results-Laplace transform of periodic functions-Some general theorems-Evaluation of integrals using Laplace transform.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Inverse Laplace Transform: The Inverse Transform –Modification of results obtained in finding Laplace transforms to get the inverse transforms of functions- Laplace Transforms to solve ordinary differential equations with constant co-efficients.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Measures of Central Tendency: Arithmetic Mean -- Median -- Mode -- Geometric Mean -- Harmonic Mean. (Simple Problems Only) Measures of Dispersion: Standard Deviation (Simple Problems Only)	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Correlation: Introduction–Meaning of Correlation–Scatter Diagram Karl Pearson's Co-efficient of Correlation – Rank Correlation (Derivations not needed and Simple Problems Only). Linear Regression: Introduction–Linear Regression–Regression Coefficients– Properties of Regression Coefficients (Derivations not needed and Simple Problems Only)	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

VI	Self -Study for Enrichment: (Not included for End Semester Examination) Equations that do not contain x and y for explicitly- Piecewise continuity- Laplace Transforms to solve ordinary differential equations with variable co-efficients - Range-Quartile Deviation– RankCorrelation(RepeatedRanks)	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Narayanan. S, Manicavachagam Pillai. T. K. (2016). *Differential Equations and its applications*. S. Viswanathan Pvt Limited.
2. Gupta. S. C, Kapoor. V. K. (2014). *Fundamentals of Mathematical Statistics*. Sultan Chand & Sons, New Delhi.

Chapters and Sections

UNIT-I Chapter 4: Sections 1-3 [1] Chapter 5: Sections 1-4 [1]

UNIT-II Chapter 9: Sections 1-5 [1]

UNIT-III Chapter 9: Sections 6-8 [1]

UNIT- IV Chapter 2: Sections 2.5-2.9, 2.13(2.13.4 Only) [2]

UNIT- V Chapter 10: Sections 10.1 to 10.4 and 10.7.1[2]
Chapter 11: Sections 11.1 to 11.2(11.2.1 and 11.2.2 only)[2]

Reference Books

1. Narayanan. S, Manicavachagam Pillai. T.K. (2003). *Calculus, Vol. III*. S. Viswanathan Pvt Limited.
2. Pillai Bagavathi. R. S. N. (2019). *Statistics Theory and Practice*. S Chand and Company Limited.
3. Gupta. S.C. & Kapoor. V.K. (2004). *Elements of Mathematical Statistics*. Sultan Chand & Sons, New Delhi.

Web References

1. https://www.youtube.com/watch?v=OM01KTc0_9w
2. <https://www.youtube.com/watch?v=dCVBZbebl8Y>
3. <https://www.youtube.com/watch?v=Y8GXpS31CGI>
4. <https://www.youtube.com/watch?v=IVJjm5FE4x8>
5. <https://www.youtube.com/watch?v=YGOBRCEZiC8>
6. <https://www.youtube.com/watch?v=dLJp6DrPArk>
7. https://www.youtube.com/watch?v=nk2CQITm_eo
8. <https://rcub.ac.in/econtent/ug/bcom/sem4/Business%20Statistics%20Unit%204%20Correlation%20and%20Regression.pdf>

Pedagogy

Power point presentation, Group Discussion, Seminar, Assignment.

Course Designer

1. Dr. P. Geethanjali

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
22UCH2AC3B	BIOCHEMISTRY-II	ALLIED	4	3

Course Objectives

- To gain knowledge about the various analytical techniques in separation and isolation of cells and tissues for studying their functional abnormalities.
- To understand the principles and methodologies involved in biochemical analysis.
- To acquire knowledge on nutritional importance of proteins, carbohydrates, lipids, vitamins and minerals in diet.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Recall and understand the basic tools in biochemistry	K1
CO2	Recollect the techniques involved in the analysis of biomolecules	K2
CO3	Describe the metabolic abnormalities and importance of nutrients in diet.	K3
CO4	Apply various methodologies to analyze biomolecules.	K3
CO5	Investigate the biomolecules using various bio-analytical techniques.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	3	2
CO4	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	2	3	3	2	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Basic Techniques in Biochemistry: Purification – centrifugation – filtration – dialysis - homogenization – adsorption – absorption- partition - centrifuge- types of rotors & application - density gradient centrifugation, sedimentation - sedimentation coefficient- electrophoresis – types.	15	CO1, CO2, CO3	K1, K2, K3, K4
II	Analytical Techniques in Biochemistry: Concept of buffer – preparation- Henderson-Hasselbach equation - working principle of a pH meter. Microscopy: Light microscopy- phase contrast - electron microscope and fluorescent microscope-principle - instrumentation and their applications. UV-visible and fluorescence spectroscopy-principle and instrumentation. Determination of absorption maxima and molar extinction coefficient (of a relevant organic molecule).	15	CO1, CO2, CO3	K1, K2, K3, K4
III	Clinical Biochemistry: Collection of blood – Anticoagulant - preservation - Estimation of Hb - PCV, WBC, RBC - Platelets - ESR. Clotting time - bleeding time - normal value - clinical interpretation. Urine Analysis: Composition – collection – preservation - gross examination - interfering factors - chemical examination - Ketone bodies in urine - bile pigments – hematuria - uric acid - microscopic examination of the urinary sediment.	15	CO1, CO2, CO3	K1, K2, K3, K4

IV	Nutritional Biochemistry: Definition of food and Nutrition - balanced diet. basic five food groups - calorific values of foods - determination by bomb calorimeter - BMR and factors affecting - energy requirements - recommended dietary allowance (RDA) for children - adults - pregnant and lactating women - sources of complete and incomplete proteins. Biological value of proteins.	15	CO1, CO2, CO3	K1, K2, K3, K4
V	Metabolic and Lifestyle Disorders: Obesity - eating disorders like anorexia, nervosa and bulimia. Diabetes mellitus as metabolic syndrome - relationship with hypertension, obesity, hypothyroidism and stress. Cardiovascular disorders - Irritable bowel syndrome - influence of diet - stress and environment on the condition.	15	CO1, CO2, CO3	K1, K2, K3, K4
VI	Self Study for Enrichment (Not to be included for External Examination) Types of buffer- Significance of sugar in urine- Specific dynamic action of foods-Types of life style disorder.	-	CO1	K1, K2

Text Books

1. Swaminathan, M. (2014). Advanced Text Book on Food & Nutrition. (2nd ed.). The Bangalore Press.
2. Chatterjea, M. N., & Rana Shinde. (2012). Textbook of Medical Biochemistry, (8th ed.). Jaypee Brothers Medical Publishers.
3. Plummer, D. T. (1998). An Introduction to Practical Biochemistry. (3rd ed.). Tata McGraw Hill Education Pvt. Ltd.
4. Srilakshmi. B. (2019). Dietetics. (8th ed.). New Age International, New Delhi.

6. Ambika, S. (2012). Fundamentals of Biochemistry for Medical Students. (7th ed.). Lippincott Williams & Wilkins.
7. Jain, J. L., Jain, S., & Jain, N. (2016). Fundamentals of Biochemistry. (Revised ed.). S Chand & Co Ltd.

Reference Books

1. Upadhyay, Upadhyay & Nath (2020). Biophysical Chemistry - Principles and Techniques. (4th ed.). Himalaya Publishing House.
2. Annie Ragland, & Arumugam, N. (2015). Biochemistry and Biophysics. (3rd ed.). Saras Publication.
3. Nelson, D. L., & Cox. M. M. (2017). Lehninger Principles of Biochemistry. (7th ed.). WH Freeman.
4. Voet, D., Pratt, C. W., & Voet, J. G. (2012). Principles of Biochemistry. (4th ed.). John Wiley & Sons.

Web References

1. <https://nptel.ac.in/courses/102103044>
2. <https://nptel.ac.in/courses/102103044>
3. <https://pubmed.ncbi.nlm.nih.gov/27881259/>
4. <https://www.nhs.uk/conditions/metabolic-syndrome/>
5. <https://www.upstate.edu/gch/pdf/services/ibd-read-lab-results.pdf>

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designer

1. Dr. S. Saranya

Semester III	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs. / Week	CREDITS
22UCH3CC4	ORGANIC AND ANALYTICAL CHEMISTRY	CORE	6	6

Course Objectives

- To understand the basics of alkanes and cycloalkanes.
- To learn about the chemistry of alkenes and alkynes.
- To learn about concept of aromaticity and reactivity of benzene.
- To understand the aspects of data analyses.
- To learn the techniques of thermoanalytical methods.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Recall and understand the fundamental concepts of organic compounds and analytical techniques.	K1
CO2	Describe the nature of hydrocarbons, errors and different thermo analytical methods.	K2
CO3	Interpret the chemical reactions of hydrocarbons and thermogram.	K3
CO4	Analysis different reactions of organic molecules and analytical data.	K4
CO5	Explain the stability of organic molecules and application of thermograms.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	2	2	2	3	3	2	2	2
CO3	3	2	1	2	2	3	3	1	1	2
CO4	3	2	2	3	3	3	3	2	2	3
CO5	3	1	2	3	2	3	3	2	1	2

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-” Indicates there is No Correlation.

UNIT		HOURS	Cos	COGNITIVE LEVEL
I	<p>Alkanes and cycloalkanes:</p> <p>Introduction - preparation - catalytic hydrogenation of alkenes and alkynes from haloalkanes, carbonyl compounds and sodium salts of carboxylic acids - physical properties and chemical properties - halogenation, nitration, sulfonation, chloro sulfonation, oxidation reaction.</p> <p>Cycloalkanes - strain in ring compounds: Baeyer's Strain theory - preparation of cycloalkanes - chemical properties of cycloalkanes.</p>	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	<p>Alkenes and Alkynes:</p> <p>Introduction - preparation of alkenes - reduction of alkynes - elimination reaction - physical properties - chemical properties - stability of alkenes, electrophilic addition reactions, free radical addition reactions - oxidation reactions, allylic substitution reactions, polymerization reactions.</p> <p>Alkynes - Introduction - preparation of alkynes - physical properties - addition of hydrogen, electrophilic and nucleophilic addition reactions - oxidation reactions - isomerization - polymerization reactions.</p>	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	<p>Concept of aromaticity and benzene:</p> <p>Introduction - structure of benzene - Kekule structure - resonance structure - orbital picture of benzene - resonance energy, stability of benzene - Huckels rule and</p>	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

	aromaticity - aromaticity in benzene-preparation and chemical properties of benzene - Electrophilic substitution reactions of benzene - halogenation, nitration, alkylation, acylation and sulfonation and their mechanism - orientation and reactivity in monosubstituted and disubstituted benzene.			
IV	Data Analysis: Definition for analytical chemistry and chemical analysis - qualitative and quantitative analysis - classification of chemical analysis - error - definition - classification of errors - accuracy and precision - minimization of errors - limiting of reduction - significant figure - mean - median - standard deviation - distribution of random errors - reliability of results (Q-test) - confidence interval limit - comparison of results - students t-test - F-test.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Thermoanalytical Methods: Introduction - various techniques of thermal analysis - thermal gravimetric analysis - principle, thermogram, factors affecting thermogram, instrumentation and applications. Differential thermal analysis - factors affecting DTA curve - instrumentation - application of DTA - Differential scanning calorimetry - instrumentation for DSC - factors affecting DSC curves - application of DSC - comparison of DSC with DTA - Thermometric titration - theory -	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

	instrumentation - applications.			
VI	Self-Study for Enrichment: (Not to be included for External Examination) IUPAC name of organic molecules, distinguish electrophile and nucleophile - types of cleavages - types of hybridization - resonance - exothermic and endothermic reaction.	-	CO1, CO2, CO3	K1, K2, K3, K4

Text Books

1. Bhupinder, M., & Manju, M. (2015). Organic chemistry. (2nd edition), Delhi, PHI Learning Private Limited.
2. Bahl, B.S., & Bahl, A. (2010) Advanced Organic Chemistry. (12th edition), New Delhi, Sultan Chand & Co.
3. Soni, P.L., & Chawla, H. M. (1983) Textbook of Organic chemistry. Sultan Chand & Sons.
4. Gopalan, R., Subramanian, P. S., & Rengarajan, K. (2003). Elements of Analytical Chemistry. 2nd edition, Sultan Chand & Sons.
5. Chatwal, G. R., & Anand, S. K. (2005). Instrumental methods of chemical analysis. Himalaya publishing house.

Reference Books

1. Finar, I. L. (1996) Organic Chemistry. Vol 1 & 2, (6th edition) England, Addison Wesley Longman Ltd.
2. Morrison, R.T., Boyd, R. N., & Bhattacharjee, S. K. (2011) Organic Chemistry (7th edition), Pearson India.
3. Vogel A. I. (1978). Text Book of Quantitative Inorganic analysis, The English Language Book Society, Fourth edition.
4. Skoog, D. A., West, D. M., & Holler, F. J. (1995). Fundamentals of Analytical chemistry, 7th edition, Harcourt College Publishers.

Web References

1. <https://www.khanacademy.org/science/organic-chemistry/bond-line-structures>.
2. <https://kpu.pressbooks.pub/organicchemistry/chapter/1-3-resonance-structures>.
3. https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental_Modules.
4. <https://chemistryhall.com/basic-organic-chemistry-> .
5. <https://ams.uokerbala.edu.iq/wp/wp-content/uploads/2017/11/analytical-chemistry-2.pdf>.

6. <https://www.tutorialsduniya.com/notes/basic-analytical-chemistry-notes/>.
7. <https://www.studocu.com/in/document/mgm-institute-of-health-sciences/analytical-chemistry/analytical-chemistry-lecture-notes/23655112>.
8. <https://pdfs.semanticscholar.org/4297/626dad995612a5bec4cbd9c41d2a2f6f0146.pdf>.
9. <https://soe.unipune.ac.in/studymaterial/ashwiniWadegaonkarSelf/621%20Unit%202.pdf>.
10. https://www.brainkart.com/article/Thermoanalytical-Analysis_30855/.

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar.

Course Designer

- Dr. C. Rajarajeswari

Semester III	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs. / Week	CREDITS
22UCH3CC3P	ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS (P)	CORE	3	3

Course Objectives

- To learn the techniques of methods of different organic compounds through functional group identification with elemental analysis.
- To exhibit the derivative for functional group.
- To prepare organic compounds using various reactions.

Course outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Observe the physical state, odour, colour and solubility of the given organic compounds.	K1
CO2	Detect the presence of special elements in an unknown organic compound performing a systematic analysis.	K2
CO3	Identify the presence of various functional groups in the given organic compounds.	K3
CO4	Exhibit the solid derivative with respect to the identified functional group.	K4
CO5	Prepare organic compounds and exhibit their crude and recrystallized sample.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	3	2	3	1	1	1	3
CO2	3	2	1	3	2	2	3	1	1	2
CO3	3	3	1	1	2	3	2	2	2	3
CO4	3	3	2	2	2	2	2	2	2	2
CO5	3	2	1	1	2	3	2	2	1	2

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-” Indicates there is No Correlation.

SYLLABUS

I. ANALYSIS OF SIMPLE ORGANIC COMPOUNDS

- Identification of acidic, basic, phenolic and neutral organic compounds.
- Test for aliphatic/aromatic nature of the compound.
- Test for saturation / unsaturation.
- Detection of element present.
- Identification of functional groups.
- Confirmation by preparation of solid derivatives / characteristic color reactions,

Note: Mono –functional compounds are given for analysis. (Carboxylic acid, phenols, carbohydrates, amides, amines, aldehydes, ketones and esters).

II. PREPARATION OF ORGANIC COMPOUNDS (SINGLE STAGE)

1. Salicylic acid from methyl salicylate (Hydrolysis).
2. Acetanilide from aniline (acetylation).
3. m-Dinitrobenzene from Nitrobenzene (Nitration).
4. Benzoic acid from Benzaldehyde (Oxidation).
5. 2, 4, 6, tribromoaniline from aniline (Bromination)

Text Book

1. Venkateswaran, V., Veerasamy, R., & Kulandaivelu, A. R. (1997). Basic principles of Practical Chemistry. 2nd edition, New Delhi, Sultan Chand & Sons.
2. Ganapragasam, N.S., & Ramamurthy, G. (1998). Organic Chemistry Lab Manual. Viswanathan Co. Pvt. Ltd.

Reference book

Gurtur, J. R., & Kapoor, R. (1997). Advanced Experimental Chemistry. S. Chand and Co. Ltd. New Delhi.

Web References

1. [https://iscnagpur.ac.in/study_material/dept_chemistry/3.1 MIS and NJS Manual for Organic Qualitative Analysis.pdf](https://iscnagpur.ac.in/study_material/dept_chemistry/3.1_MIS_and_NJS_Manual_for_Organic_Qualitative_Analysis.pdf).
2. <https://www.vedantu.com/iit-jee/qualitative-analysis-of-organic-compounds>.
3. <http://amrita.olabs.edu.in/?sub=73&brch=8&sim=116&cnt=2>.
4. [http://home.miracosta.edu/dlr/211exp3.htm#:~:text=Methyl%20salicylate%20\(an%20ester\)%20can,which%20is%20released%20by%20hydrolysis](http://home.miracosta.edu/dlr/211exp3.htm#:~:text=Methyl%20salicylate%20(an%20ester)%20can,which%20is%20released%20by%20hydrolysis).
5. <https://www.youtube.com/watch?v=wsXFYgCWzvg>.

Pedagogy

Demonstration and Practical Sessions.

Course Designer

- Dr. C. Rajarajeswari

Semester- III	Internal Marks: 25			External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS	
22UCH3AC4	PHYSICS-I	SECOND ALLIED COURSE-I (AC)	4	3	

Course Objectives

- To understand the behavior of matter in everyday life.
- To know the basic concepts of properties of matter.
- To acquire the knowledge in thermodynamics and heat conduction.
- To impart the ideas of semiconductors.

Pre-Requisites

- Get depth knowledge of physics in day today life
- Understand the fundamentals of elasticity and elastic nature of materials.
- Knowledge about the concepts of viscosity.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to,	Cognitive Level
CO 1	Recall the basic concepts of elasticity, viscosity and surface tension to solve problems encountered in everyday life.	K1
CO 2	Understand the concepts of the centre of gravity, states of equilibrium of rigid bodies and also stability of floating bodies.	K2
CO 3	Apply the behavior of the laws of thermodynamics, thermal conductivity and black body radiation.	K3
CO 4	Analyse the theories and experiments on interference and diffraction using air wedge, Newton's ring.	K4
CO 5	Evaluate the formation, characteristics and applications of diodes and transistor.	K5, K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	3	3	3	3	3	3	3	2	3
CO 2	2	3	3	3	3	3	3	2	2	3
CO 3	2	3	3	3	3	3	3	3	2	3
CO 4	2	3	3	2	3	3	3	3	3	3
CO 5	2	3	3	2	3	3	3	3	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” – indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	PROPERTIES OF MATTER Introduction - Stress – Strain – Young’s modulus- Rigidity modulus – Bulk modulus – Relations between elastic constants and Poisson’s Ratio (definition alone). Viscosity: Viscous force – Co-efficient of Viscosity – Streamline flow and Turbulent flow – critical velocity - Poiseuille’s formula for co-efficient of viscosity of a liquid (Stoke’s Method)	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	MECHANICS Basic concepts– Centre of Gravity- solid hemisphere – Hollow hemisphere. States of Equilibrium: Equilibrium of a rigid body –Stable, unstable, and neutral equilibrium – Example Stability of Floating bodies – Metacentre – Determination of Metacentric height of a ship.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	THERMAL PHYSICS Thermodynamics: Definitions - Significance and limitations of thermodynamic Processes such as reversible and irreversible, adiabatic, isothermal, isobaric, isochoric, and cyclic process - Laws of thermodynamics - enthalpy, entropy and heat capacity. Relationship between Cp and Cv - Joule -Thomson effect.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	OPTICS Interference: Introduction – Superposition of waves –Principle of interference-Air wedge – Newton’s rings. Polarization: Nicol Prism – Nicol Prism as Polarizer and Analyzer – Laurent’s half Shade Polari meter.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	ELECTRONICS Semiconductors: Classification of materials based on energy band (Conductors, semiconductors and insulators) - Intrinsic and extrinsic semiconductor. Diodes : PN Junction diode – Biasing of PN junction-V-I characteristics of junction diode –Zener diode – Characteristics of Zener diode.	11	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	SELF STUDY FOR ENRICHMENT (Not to be included for External	-	CO1, CO2,	K1, K2,

	Examination) Applications of Elasticity-Low Viscous silicon liquid immersed transformers- Rigid body of solid systems - Kinetic theory of matter-Properties of optical materials- Characteristics, Working and Applications of LED.		CO3, CO4, CO5	K3, K4, K5, K6
--	--	--	---------------------	-------------------------

Text Books

1. Murugesan R, (2017), *Properties of matter*, S. Chand & Co. Pvt. Ltd., Revised Edition
2. Narayanamoorthy and Nagarathinam N, (2005), *Mechanics Part II*, The National Publishing Company, Chennai.
3. BrijLal, Subrahmanyam N, Hemne P S, (2021), *Heat and Thermodynamics and Statistical Physics*, S. Chand & Co. Pvt. Ltd., Revised edition
4. Dr. Subramaniyam N, Brijlal and Dr. Avathanulu M N, (2015), *Optics*, S. Chand & Co. Pvt. Ltd. – 5th Edition, New Delhi.
5. Mehta V K and Rohit Mehta, (2015), *Principles of Electronics*, S. Chand and company Ltd

Reference Books

1. Brijlal and Subramaniyan, (2005), *Properties of Matter*, S. Chand & Co. Pvt. Ltd.
2. Mathur D S, (2006), *Mechanics*, S. Chand & Co. Reprint Edition.
3. Brijlal and Subramaniyan, (2001), *Thermal Physics*, S. Chand & Co.
4. Murugesan R and Kiruthiga Sivaprasath, (2014), *A Text Book of Optics*, S. Chand & Co. Pvt. Ltd.- 9th revised edition Ramnagar, New Delhi.
5. Vijayendran V, Viswanathan S, (2004), *Digital Fundamentals*, Printers & Publishers Private Ltd, Chennai.

Web References

1. <https://byjus.com>
2. <https://digitalcommons.unl.edu/cgi/viewcontent>
3. <https://sciencing.com>
4. <https://nptel.ac.in/courses/122106025>

Pedagogy

Chalk and Talk, Seminars, Power Point Presentation, Quiz, Assignment and Group discussion.

Course Designer

Dr.R.Mekala

Semester III	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22UCH3AC5P	PHYSICS -I (P)	SECOND ALLIED COURSE- II (AP)	4	3

Course Objectives

- To acquire a general foundational knowledge of physics experiments.
- To identify and solve problems at the frontier of physics knowledge.
- To get hands-on experience with practical skills.

Pre-requisites

- Basic knowledge on usage of scientific apparatus.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO 1	Find applications of physics experiments in real world appliances	K1
CO 2	Construct the experiment by arranging and assembling the equipment.	K2
CO 3	Build practical hands-on experience by various techniques.	K3
CO 4	Compare the experimental values with standard values.	K3
CO 5	Apply the physics theory to design basic electrical circuits and develop practical understanding	K4

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	1	1	1	2	1	3	2	1	2	1
CO 2	2	2	2	2	2	3	3	1	2	1
CO 3	1	3	2	3	1	3	2	1	3	1
CO 4	2	1	3	3	2	1	3	1	3	2
CO 5	3	2	3	3	3	1	3	2	3	2

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-” indicates there is no correlation

Syllabus

LIST OF EXPERIMENTS (Any 8)

1. Young's modulus – Uniform bending (Pin and Microscope).
2. Acceleration due to gravity- Compound Pendulum.
3. Viscosity of liquid – Stoke's method.
4. Surface Tension and Interfacial Surface Tension – Drop weight method.
5. Specific Heat Capacity of liquid – Newton's law of Cooling.
6. Air wedge – thickness of thin wire.
7. Meter Bridge – Specific Resistance of a coil.
8. Carey Foster's Bridge - Specific Resistance of a coil.
9. Post office Box- Determination of Temperature Coefficient.
10. Potentiometer – Low range voltmeter Calibration.
11. Characteristics of Junction diode.
12. Characteristics of Zener diode.
13. Basic Logic gates
14. Comparison of EMF between Leclanche and Daniel cells.
15. Internal resistance of the Leclanche using Potentiometer.

Text Books

1. Somasundaram. S, (2012). *Practical Physics*, Apsara Publications, Tiruchirappalli.
2. Sasikumar. R, (2011), *A Book for Practical Physics*. PHI Learning Pvt. Ltd, New Delhi

Reference Books

1. Srinivasan.S, (2011) *A Text Book of Practical physics*, Sultans and publications, New Delhi.
2. Prof. Namboodiri pad, M.N., Prof.Daniel, P.A., (1982). *B.Sc., Practical Physics*. G.B.C. Publications, Cochin.

Web References

1. <https://vlab.amrita.edu/?sub=1&brch=280&sim=550&cnt=1>
2. <https://vlab.amrita.edu/index.php?sub=1&brch=280&sim=1518&cnt=4>
3. <http://amrita.olabs.edu.in/?sub=1&brch=5&sim=225&cnt=4>

Pedagogy

Demonstration, practical sessions, and viva voce

Course Designer

Dr. K. Kannagi

Semester III	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs. / Week	CREDITS
22UCH3GEC1	CHEMISTRY IN EVERYDAY LIFE	GENERIC ELECTIVE COURSE	2	2

Course Objectives

- To know about the importance of Chemistry in everyday life.
- To gain knowledge in food and nutrition.
- To learn the Chemistry of building materials and plastics.
- To learn about the role of chemicals in cosmetics.
- To gain knowledge about dyeing processes.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Recognize and account the importance of role of chemistry in industry and pollution control.	K1 & K2
CO2	Exemplify the chemistry of materials used in everyday life.	K3
CO3	Categorize the chemistry of materials used in everyday life.	K4
CO4	Interpret the uses of chemicals in day today life and its impact.	K5
CO5	Illustrate and classify the importance of chemistry used in commercial and daily life.	K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	1	2	2	3	3	1	1	2
CO3	3	2	2	3	3	3	3	2	2	3
CO4	3	1	2	3	2	3	3	2	1	2
CO5	3	1	2	3	2	3	3	2	1	2

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation “-” Indicates there is No Correlation.

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Chemistry of Air and Water: Air - components and their importance; photosynthetic reaction, air pollution, green - house effect, ozone layer depletion and the impact on our life style. Water - sources of water, qualities of potable water, soft and hard water, methods of removal of hardness - water pollution.	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
II	Food and Nutrition: Carbohydrates, proteins, fats - definition and their importance as food constituents - balanced diet - calories minerals and vitamins (sources and their physiological importance). Chemicals in food production - fertilizers - need, natural sources; urea - NPK fertilizers and super phosphate.	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
III	Building materials: Cement, ceramics, glass and refractories - definition - composition and application - plastics - polythene - PVC - bakelite - polyesters - melamine - formaldehyde resins - preparation and uses - merits and demerits of plastics - environmental impact and awareness. Biodegradable polymers.	15	CO1, CO2, CO3	K1, K2, K3, K4
IV	Chemistry of Cosmetics: Cosmetics - tooth paste - face powder - face cream - lip stick - hair dye - soaps (natural soaps, baby soap, and transparent soap) and detergents - shampoos, nail polish - perfumes - general formulation and preparations - possible hazards of cosmetic use.	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5

V	Dye Chemistry: Dyes - classification of dyes - based on mode of application - acid - basic - direct - mordant - vat - sulphur. Pigment - solvent and food dye - based on chemical constitution - nitroso dye - nitro dye - azo dye - thiazole dye - methods of dyeing - direct dyeing - vat dyeing - mordant dyeing and disperse dyeing.	15	CO1, CO2, CO3	K1, K2, K3, K4
VI	Self-Study for Enrichment (Not to be included for External Examination) Reverse osmosis - desalination of water - refining and bleaching agents - types of dyes and pigments - importance of pollution control.	-	CO1, CO2, CO3	K1, K2, K3, K4

Text Books

1. Vaithyanathan, S. (2006). Textbook of Ancillary Chemistry; Priya Publications, Karur.
2. Sharma, B. K. (2014). Industrial Chemistry; GOEL publishing house, Meerut, 16th edition.
3. Jayashree Ghosh. (2006). Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, 2nd edition.

Reference Books

1. Billmeyer, F. N. (1971). Textbook of Polymer Science, Wiley Interscience.
2. Prakash. (2011). Comprehensive Industrial Chemistry, Pragati Prakashan, Meerut.
3. Poucher, W. A., Joseph, A., & Brink. (2000). Jr. Perfumes, Cosmetics and Soaps, Springer.
4. De, A. K. (1990). Environmental Chemistry, New Age International Public Co.

Web References

1. https://www.educationusingpowerpoint.co.uk/preview-278-Chemistry_1_Air_and_Water.html.
2. <https://www.slideshare.net/harikafle944/food-and-nutrition-general-concept>.
3. <https://slideplayer.com/slide/261357/>.
4. <https://www.slideshare.net/amirhamza1234/presentation-on-dye>.

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar.

Course Designer

- Dr. K. Uma Sivakami

Semester IV	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH4CC5	INORGANIC AND ORGANIC CHEMISTRY	CORE	6	6

Course Objectives

1. To learn the general characteristics of d and f block elements.
2. To understand the reactions of organometallic compounds.
3. To study about the preparation and properties of alcohols, phenols and ethers.
4. To understand the arrangement of atoms in space, isomers and the nomenclature.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Outline the synthesis of organometallics and oxygen containing functional groups and symmetry elements.	K1, K2
CO2	Describe the general characteristics of d and f block elements, organic compounds and stereoisomers.	K3
CO3	Analyze the trends of the periodic properties, reactions and types of stereoisomers.	K4
CO4	Distinguish between 3d, 4d and 5d elements, functional isomers and	K5
CO5	Predict the properties of transition, inner transition elements and configuration of organic compounds	K6

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	1	2	2	3	3	1	1	2
CO3	3	2	2	3	3	3	3	2	2	3
CO4	3	1	2	3	2	3	3	2	1	2
CO5	3	2	3	3	3	3	3	2	2	2

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	CONGNITIVE LEVEL
I	Chemistry of d-Block Elements: Position of d-block element-electronic configuration-classification-general characteristics -atomic radii-ionic radii-metallic character-melting point and boiling point-atomic volume - densities-ionization energies-standard oxidation potential - reducing properties-variable oxidation state-catalytic properties-color of transition metal complexes-Magnetic properties-formation of complex compounds-formation of interstitial compounds-alloy formation. comparison between elements of 3d series with 4d and 5d series.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Chemistry of f-Block Elements: General characteristics of f block elements-comparative account of lanthanides and actinides-occurrence-oxidation state-magnetic properties-color and spectra-lanthanides - actinides-separation by ion exchange - solvent exchange methods-lanthanide and actinide contraction - chemistry of thorium - uranium-occurrence-ores- extraction and uses-compounds of uranium and thorium-preparation-properties-uses.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Chemistry of Organometallic compounds: Introduction-classification-preparation properties and uses of organo magnesium compounds, organozinc compounds,	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

	organolithium, organocopper, organolead, organophosphorus and organoboron compounds			
IV	Chemistry of Alcohols, phenols and Ethers: Nomenclature- preparation of alcohols-industrial source of alcohols-physical properties -chemical properties-uses-chemistry of glycols and glycerols-uses-preparation of phenols including di and tri hydric phenols - physical and chemical properties-uses-aromatic electrophilic substitution mechanism-theory of orientation and reactivity- preparation of ether - epoxides - physical properties-chemical properties-uses.	18	CO1, CO2, CO3, CO4, CO5	
V	Stereochemistry: Stereoisomers - types- concept of chirality- elements of symmetry - enantiomers - diastereomers –fisher projection representation -R, S configuration- sequence rule-D and L- nomenclature- erythro and threo nomenclature. Compounds with two stereogenic centre-optical isomers of lactic acid, tartaric acid. geometrical isomers – <i>cis- trans</i> system- <i>E-Z</i> system. Racemic mixture- resolution of racemic mixture – Walden Inversion – conformational analysis of methane, ethane and n-butane and cyclohexane.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	Self-Study for Enrichment: (Not to be included for External Examination) Periodic table- classification of elements- periodic properties - types of organic		CO1, CO2, CO3	K1, K2, K3, K4

	reaction - Basics of symmetry and isomers.			
--	--	--	--	--

Text books

1. Puri B. R, Sharma L. R, Kalia K. K. Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. Madan R. D. Modern Inorganic Chemistry, 2nd edition, S. Chand & Company Ltd., 2000.
3. Bhupinder M. Manju M., Organic chemistry, (2 nd edition), Delhi, PHI Learning Private Limited.
4. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
5. Soni P.L. Chawla H.M., Text book of Organic chemistry, Sultan Chand & Sons.

Reference books

1. Malik W.U, Tuli G.D, Madan R.D, selected topics in Inorganic chemistry, S Chand and Company limited, New Delhi.
2. Lee J. D. Concise Inorganic Chemistry, 20th revised edition, Sultan Chand & Sons, 2000.
3. Finar I.L., Organic Chemistry, Vol 1&2, (6th edition) England, Addison Wesley Longman Ltd. (1996).
4. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011)

Web References:

1. <https://unacademy.com/content/cbse-class-12/study-material/chemistry/d-block-elements/>
2. <https://study.com/learn/lesson/d-block-elements-properties-electron-configuration.html>
3. <https://www.aakash.ac.in/important-concepts/chemistry/actinides>
4. https://www.usb.ac.ir/FileStaff/2896_2019-4-18-0-9-32.pdf
5. <https://colapret.cm.utexas.edu/courses/Chapter%2015.pdf>
6. <https://www.askiitians.com/revision-notes/chemistry/alcohols-phenols-and-ether/>

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designers

Dr. C. Rajarajeswari

Semester IV	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH4CC4P	INORGANIC QUALITATIVE ANALYSIS (P)	CORE	4	4

Objectives

- To learn the techniques of semi micro qualitative analysis.
- To know the nature of acidic and basic radicals.
- To learn the separation of groups.

Course outcomes

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

CO	CO Statements	Knowledge Level
CO1	Recall the nature of acidic and basic radicals	K1
CO2	Identify the cations and anions present in the mixture	K2
CO3	Analyze the principles of inorganic qualitative analysis.	K3
CO4	Demonstrate the experimental methods of group separation	K4
CO5	Plan, execute and record all the experimental results.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	3	2	3	1	1	1	3
CO2	3	2	1	3	2	2	3	1	1	2
CO3	3	3	1	1	2	3	2	2	2	3
CO4	2	2	2	3	1	2	2	2	1	1
CO5		3	3	1	3	2	3	3	3	1

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

SYLLABUS INORGANIC QUALITATIVE ANALYSIS (P)

Analysis of a mixture containing two cations and two anions of which one will be an interfering acid radical.

Semi micro methods using the conventional method with sodium sulphide may be adopted.

Cations to be studied:

Lead, copper, bismuth, iron, aluminium, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium.

Anions to be studied:

Carbonate, Sulphate, Nitrate, Chloride, Fluoride, Borate, Oxalate and Phosphate.

Text Books

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry,
2nd edition, New Delhi, Sultan Chand & sons (1997)

Reference book

1. Svehla G. Sivasankar B. Vogels Qualitative Inorganic Analysis, 7th Edition, Pearson Education

Web References

1. <http://rbmcollege.ac.in/sites/default/files/files/reading%20material/inorganic-qualitative-analysis.pdf>
2. https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules
3. <https://byjus.com/chemistry/salt-analysis/>
4. <https://chemlab.truman.edu/files/2015/07/Inorganic-Qualitative-Analysis.pdf>
5. <https://www.teachmint.com/tfile/studymaterial/b-sc/inorganicchemistry/qualitativeanalysis/a9301386-a267-44c7-886a-09c64f439dcb>

Pedagogy

Demonstration and practical sessions

Course Designers

❖ **Dr. C. RAJARAJESWARI**

Semester IV	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22UCH4AC6	PHYSICS - II	SECOND ALLIED COURSE – III	4	3

Course Objectives

- To provide the basic knowledge about the concepts of current electricity.
- To introduce the basic concepts of magnetostatics.
- To understand modern wave mechanics, which are basic for modern physics.
- To apply the principles of electronics in day to life.
- To understand the modern lasers and digitization of computers.

Pre-Requisites

- Basic laws of electricity.
- Fundamental knowledge in modern physics.
- Get in-depth knowledge about the concepts of digital electronics.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Students will be able to,	Cognitive Level
CO 1	Acquire knowledge on elementary ideas of electricity, magnetism, modern and laser physics, digital electronics.	K1, K2
CO 2	Able to understand the knowledge on basic laws of current electricity, different types of magnetism, wave mechanics and modern laser, electronics.	K2
CO 3	Recall the of elementary ideas of electricity and magnetism, modern wave mechanics and digitization of computers.	K3
CO 4	Analyze the behavior of laser physics and modern physics in our day-to-day life.	K4
CO 5	Discuss the characteristics of Kirchoff's law and Specific resistance, photoelectric effect, types of lasers and modern electronics.	K5

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	3	3	3	3	3	3	3	3	3
CO 2	2	3	3	3	3	3	3	2	2	3
CO 3	2	3	3	3	3	3	3	3	3	3
CO 4	2	3	3	2	3	3	3	3	2	3
CO 5	2	3	3	2	3	3	3	3	2	3

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-” - indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	CURRENT ELECTRICITY Ohm's law–Law of resistance in series and parallel–Specific resistance–capacitor–capacitors in serial and parallel–Kirchoff's laws–Wheatstone's network – condition for balance. Carey Foster's bridge – measurement of resistance–measurement of specific resistance–determination of temperature coefficient of resistance–Potentiometer–calibration of Voltmeter.	14	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
II	MAGNETISM Intensity of magnetization-Susceptibility-Types of magnetic materials-Properties of para, dia and ferromagnetic materials-ferrimagnets and their applications-Hysteresis-Experiment to draw M-H curve (Horizontal Method)-energy loss in hysteresis.	10	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
III	MODERN PHYSICS Photo electric effect–Laws of photo electric effect – Einstein's photo electric equation–verification of Einstein's photo electric equation by Millikan's experiment–photo electric cells–applications. Wave mechanics: De Broglie concept of matter waves – characteristics and calculation of De Broglie wave length -Study of De Broglie matter wave by G. P. Thomson Experiment.	14	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
IV	LASER PHYSICS Laser: Basics of Lasers-Principle of Laser-Stimulated Absorption-Stimulated Emission-Spontaneous Emission- population inversion–meta stable state – conditions for laser actions-Types–Ruby laser-He-Ne laser-applications of lasers–Raman effect–Raman shift –stokes and anti stokes lines.	10	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5

V	DIGITAL ELECTRONICS Number systems-conversion of binary into decimal– conversion of decimal to Binary–binary addition and subtraction-Basic logic gates-AND, OR, NOT gates- NAND and NOR as an universal logic gates-Boolean Algebra–Laws of Boolean Algebra-De Morgan’s theorems- verifications using truth tables.	12	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
VI	SELF STUDY FOR ENRICHMENT (Not to be included for External Examination) Meter bridge-B-H Curve-Atomic & Nuclear Physics- Fiber optics-Artificial intelligence–Electronic School books.	-	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5

Text Books

1. Murugesan R (2001), *Electricity and Magnetism*, S. Chand & Co. Pvt. Ltd, Third edition.
2. Murugesan R, Kiruthiga Sivaprasath (2017), *Modern Physics*, S. Chand & Co. Pvt.Ltd, Sixteenth Revised color edition.
3. Brijlal & Subramanian, (1995), *Electricity and Magnetism*, Ratan Prakashan Mandir.
4. Sedha R. S. (2004), *A text book of Digital Electronics*, S. Chand & Co. Pvt. Ltd, First edition.

Reference Books

1. Murugesan R, (2010), *Allied Physics Paper I and II*, S.Chand & Co, New Delhi, Revised Edition.
2. Narayanamurthi R, (1988), *Electricity and Magnetism*, The National Publishing Co, First Edition.
3. Arthur Beiser, Mahajan, Choudhury, (2015), *Concepts of Modern Physics*, Pustakkosh Publications, India.
4. Donald P. Leach, Albert Paul Malvino, Goutam Saha, (2008), *Digital principle and Applications*, Mc Graw-Hill Publishing Company, 6th Editions, New York.
5. Vijayendran V, Viswanathan S, (2004), *Digital Fundamentals*, S. Viswanathan Printers Pvt. Ltd, Revised edition.

Web References

1. <https://wepdf.com/al/allied-physics>
2. <https://archive.nptel.ac.in/courses>
3. <https://nptel.ac.in/courses>
4. <https://www.askiitians.com/revision-notes/physics/atomic-physics/>

Pedagogy

Chalk and talk, PPT, Quiz, Assignment and Group discussion

Course Designer

Dr. R. Mekala

Semester IV	Internal Marks: 25 External Marks: 75			
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH4GEC2	FOOD ADULTERANTS AND HEALTH CARE	GENERIC ELECTIVE COURSE-II	2	2

Course Objective

- To provide an understanding of food and nutrition
- To provide an understanding of the chemical basis of food preservation and the effects of processing and storage on food quality
- To familiarize the student with common experimental methods used in the study of the major food adulterant
- To know various types of health care, balanced diet and role of water balance in health.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Know the outline about the importance of health, sources of food, hazards of food additives and food poisoning.	K1&K2
CO2	Classify and identify common adulterants in different foods, food poisoning and impacts on health.	K3
CO3	Understand the common Food additives in food products, its prevention laws and importance of water balance in health care.	K4
CO4	Recognize the significance of nutrients, balanced diet and types of health care.	K5
CO5	Predict the nutrient, functions, sources of non-adulterants food and water for health care.	K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	1	2	2	3	3	1	1	2
CO3	3	2	2	3	3	3	3	2	2	3
CO4	3	1	2	3	2	3	3	2	1	2
CO5	3	1	2	3	2	3	3	2	1	2

“1” – Slight (Low) Correlation “2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Food and food poisoning: Sources of food - types - advantages and disadvantages - constituents of food - carbohydrate - protein -fats and oils - vitamins and minerals - natural toxicants - food Poisoning: sources - causes and remedy - causes and remedies for acidity- gastritis- indigestion and constipation.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5,K6
II	Food adulterants: Adulterants- common adulterants in different foods - milk and dairy products - vegetable oils – fats - spices – condiments - cereals pulses - sweetening agents and beverages- contamination with toxic chemicals - pesticides and insecticides - Laws of prevention of food adulteration - Methods for detection of common adulterants in milk- milk products- oils and fats -sweetening agents - grains - spices - coriander powder - turmeric powder - coffee powder - tea dust and asafoetida.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5,K6
III	Food additives: Food additives: artificial sweeteners- saccharin - cyclamate and aspartame- food flavors: esters - aldehydes and heterocyclic compounds- antioxidants: permitted - non- permitted food colors- stabilizers - thickeners and emulsifiers -other functional additives- soft drinks- formulation health drinks- preservatives- baking powder - yeast.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5,K6

IV	Health: Definition of Health- WHO standard - balanced diet- Primary health care - secondary and tertiary health care- Primitive health care: preventive - curative - rehabilitative health care - spiritual health care- concepts of social medicine -preventive medicine and community medicine.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5,K6
V	Water Balance in health: As a nutrient- functions- sources- requirements- distribution of water in the body- exchange of water in the body- composition of body fluids- water exchange between plasma and interstitial fluid-Water imbalance – dehydration- water intoxication.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5,K6
VI	Self-Study for Enrichment (Not to be included for External Examination) Preservation of food by use of chemicals-Preservation by use of sugar-pickling-principles of Food Preservation- diet for children and adults-role of water in health.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5,K6

Text Books:

1. Seema Yadav, Food Chemistry, Anmol publishing (P) Ltd., New Delhi, 2006.
2. Alex Ramani, Food Chemistry, MJP publishers, Chennai., 2009.
3. Jayashree Ghosh, Text book of Pharmaceutical Chemistry S. Chand & Co. Publishers, New Delhi, 2003.
4. S. Lakshmi, Pharmaceutical Chemistry, S. Chand& Sons, New Delhi,2004.

Reference Books:

1. Thomas M. Devlin, Textbook of Biochemistry with Clinical Correlations, John Wiley & Sons; 7th edition, 2010.
2. Ashutosh Kar, Medicinal Chemistry, New Age International, 2007.
3. Joshi A.S., Nutrition & Dietetics, Tata Mcgraw hill, New Delhi, 1998.

Web Reference

<https://www.slideshare.net/HiwrHastear/food-poisoning-60301801>.

<https://www.slideshare.net/swatishikha10/food-adulteration-96507428>.

<https://www.slideshare.net/bhambieannmalacas/food-additives-ppt>.

<https://www.slideshare.net/sivanandareddy52/definition-concept-of-health>.

<https://www.slideshare.net/rajud521/balance-water>.

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designer

Dr. K. Uma Sivakami.

Semester IV	Internal Marks:40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HRS./ WEEK	CREDITS
22UCH4SEC1P	CHEMISTRY OF CONSUMER PRODUCTS (P)	SKILL ENHANCEMENT COURSE	2	2

Course Objectives

- To know the basic knowledge in chemistry of consumer products and modern trends in the industry.
- To provide the practical training to the students in consumer product analysis

Course outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statements	Knowledge Level
CO 1	On the successful completion of the course, students will be able to Outline the various adulterants in food products.	K1
CO 2	Explain the procedures for detecting the adulterants.	K2
CO 3	Identify the nature of adulterants added to consumer products.	K2
CO 4	Differentiate the pure and impure food samples.	K2
CO 5	Calculate the percentage composition of food colorant in food and beverages.	K3

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	3	2	3	1	1	1	3
CO2	3	2	1	3	2	2	3	1	1	2
CO3	3	3	1	1	2	3	2	2	2	3
CO4	3	3	2	2	2	2	2	2	2	2
CO5	3	2	1	1	2	3	2	2	1	2

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-” Indicates there is No Correlation

Syllabus

01. Detection of adulterants in milk and milk products.
02. Detection of adulterants in oil
- 03, Detection of adulterants in spices and condiments.
04. Detection of adulterants in food products.
05. Estimation of food colors. (Colorimetric analysis)

Text Books

1. Sally A. Henrie, (2015), Green Chemistry Laboratory Manual for Green Chemistry, Press Taylor & Francis Group and Informa Business.

Reference book

1. Gajanan Shrike, (2022), Food & Beverage Adulteration and its Implications theory and Practice, Notion Press.

Web References

1. <https://dfda.goa.gov.in/images/PDF-DOCUMENTS/quciktestforsomeadullterantsinfood-fssaiinitiative.pdf>
2. <https://www.hansshodhsudha.com/first-second-issues/New%20Hansraj%20College%20Book-1-20-26.pdf>
3. <https://www.fssai.gov.in/book-details.php?bkid=201>

Pedagogy

Demonstration and Practical Sessions

Course Designer

- Dr. A.Sharmila

Semester V	InternalMarks:25	ExternalMarks:75		
COURSECODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UCH5CC6	INORGANIC CHEMISTRY -I	Core Course	6	6

Course Objective:

- To understand the concept of metallurgy
- To impart basics and theories of coordination compounds.
- To study biologically important coordination compounds.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Explain the process of metallurgy and reactions of complexes.	K1, K2
CO2	Recognize the Ellingham diagram and basic concepts of co-ordination chemistry.	K3
CO3	Examine the purification process, Werner theory, 10Dq and MO diagram of octahedral complexes.	K3
CO4	Analyze calcination, roasting, Sidgewick theory, stability and magnetic property of metal complexes.	K4
CO5	Criticize metallurgical process, VB, CFSE, MO theories and reactions of coordination compounds.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2	3	3	3	3	3
CO2	3	2	2	3	2	2	3	3	3	2
CO3	3	3	3	2	2	3	2	2	2	3
CO4	3	3	3	2	3	3	2	2	2	3
CO5	3	3	2	3	3	3	3	2	3	3

“1”–Slight (Low)Correlation
 “3”–Substantial (High)Correlation

“2”–Moderate(Medium)Correlation
 “-”indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	Cos	CONGNITIVE LEVEL
I	UNIT-I Metallurgy Minerals and ores - process - ore dressing - gravity separation - froth flotation magnetic separation - chemical separation- calcination and roasting. Extraction of metal-chemical reduction-auto reduction-electrolytic reduction-metal displacement. Refining methods - Van Arkel method - electrolytic refining - vapour phase refining-ion exchange method-Thermodynamic principles of metallurgy-Ellingham diagram - observations - applications.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4
II	UNIT-II Coordination Compounds –I Introduction – classification of ligands – uses of chelates -nomenclature of coordination compounds-isomerism- structural isomerism – stereo isomerism - bonding theories - Werner’s theory -Sidgwick's concept of coordination - Valence bond theory – postulates - geometries of tetrahedral - square planar and octahedral complexes - limitations.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3
III	UNIT-III: Coordination Compounds –II Crystal field theory - shapes of d orbitals-assumptions- splitting of d-orbitals in octahedral-tetrahedral and square-planar complexes - crystal field stabilization energy- factors affecting magnitude of $10Dq$ – color of the transition metal complexes – number of unpaired electron - magnetic properties of octahedral complexes– spectrochemical series – Jahn -Teller theorem.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
IV	UNIT -IV: Stability of Metal Complex Labile and inert complexes - thermodynamic stability and kinetic stability-stepwise and overall	18	CO1 CO2 CO3 CO4	K1 K2 K3 K4

	formation constant- Relation between β_n and K_n - factors affecting stability of metal complexes- chelate effect – Experimental determination of stability constant and composition of complex.		CO5	
V	UNIT-V: Ligand substitution reactions Types of substitution reaction – Nucleophilic – Electrophilic substitution reactions – hydrolysis reaction – Acid hydrolysis - base hydrolysis of octahedral complexes – Anation reaction- Substitution reaction in square planar complexes - trans effect – Theories of trans effect - applications. Mechanism of substitution reaction in Pt(II) complexes- Factors affecting rate of substitution.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4
VI	Self-study: (Not included for End Semester Examination) Diagonal, trigonal and tetragonal distortion, instability constant – John Teller Distortion stabilization Energy		CO1 CO2 CO3 CO4 CO5	K1 K2 K3

Text Books:

1. Malik, W. U., Tuli, G. D., & Madan, R. D. (1998). *Selected topics in inorganic chemistry*. S. Chand Publishing.
2. Housecroft, C. E., & Sharpe, A. G. (2008). *Inorganic chemistry* (Vol. 1). Pearson Education.
3. Cotton, F. A., Wilkinson, G., Murillo, C. A., & Bochmann, M. (1999). *Advanced inorganic chemistry*. John Wiley & Sons.
4. Madan, R. D. (2019). *Satya Prakash's Modern Inorganic Chemistry*. S. Chand Publishing.
5. Prakash, S., Tuli, G. O., Basu, S. K., & Madan, R. D. (2000). *Advanced Inorganic Chemistry*, Vol 2, S. Chand Group, New Delhi, India.

Reference Books:

1. Chhatwal, G. R., & Mehra, H. (1974). *Advanced inorganic chemistry*.
2. Sharma, R. K. (2007). *Text Book of Coordination Chemistry*. Discovery publishing house.
3. Gopalan, R. (2001). *Concise coordination chemistry*. Vikas publishing house.

4. Srivastva, A. N. (Ed.). (2020). *Stability and Applications of Coordination Compounds*. BoD–Books on Demand.
5. Raj, G. (2010). *Advanced Inorganic Chemistry: Volume II*. Krishna Prakashan Media.

Web Reference:

1. <https://download.e-bookshelf.de/download/0000/5777/25/L-G-0000577725-0002359455.pdf>
2. https://www2.chemistry.msu.edu/courses/cem151/chap24lect_2019.pdf
3. <https://www.scribd.com/document/464488620/INTRODUCTION-TO-COORDINATION-CHEMISTRY>
4. <https://egyankosh.ac.in/bitstream/123456789/71758/3/Unit-4.pdf>
5. <https://teachmint.storage.googleapis.com/public/555766642/StudyMaterial/4730da7d-1f2a-4a70-a473-0cc7cd84dc13.pdf>

Pedagogy

Chalk and talk, PPT, You tube, E-content, Group Discussion, Assignment, Quiz and Seminar

Course Designers

Dr.P. Pungayee Alias Amirtham

Semester V	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs. / Week	CREDITS
22UCH5CC5P	PHYSICAL CHEMISTRY (P)	CORE PRACTICAL - V	3	3

Course Objectives

- To learn the methods of finding CST, TT, Molecular weight and rate constant.
- To understand the fundamentals of conductometric and potentiometric titrations.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Recall the basic principles related to physical chemistry experiments.	K1 & K2
CO2	Scientifically plan and perform kinetics, rast and adsorption experiments.	K3 & K4
CO3	Relate the effect of impurity on phenol water system and identify the molecular weight of unknown compound.	K4 & K5
CO4	Calculate and process the experimentally measured values and compare with graphical data.	K5
CO5	Examine the concentration of ions using potentiometer, conductometer and interpret the data scientifically	K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	1	2	2	3	3	1	1	2
CO3	3	2	2	3	3	3	3	2	2	3
CO4	3	1	2	3	2	3	3	2	1	2
CO5	3	1	2	3	2	3	3	2	1	2

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-” Indicates there is No Correlation.

SYLLABUS

1. Determination of rate constant for acid catalyzed ester hydrolysis.
2. Critical Solution Temperature - Phenol-Water system.
3. Effect of impurity (NaCl) on Critical Solution Temperature.
4. Rast Method – Determination of molecular weight of unknown solute.
5. Transition temperature of a salt hydrate – determination of molecular weight.
6. Phase Diagram of simple eutectic system.
7. Adsorption of acetic acid on activated charcoal, verification of Freundlich isotherm.
8. Kinetics of Persulphate-Iodide Reaction.
9. Preparation of buffer solutions at different pH
 - i) Sodium acetate-acetic acid
 - ii) Ammonium chloride-ammonium hydroxide
10. Conductometric Acid-Base Titration - (HCl vs NaOH).
11. Potentiometric Redox Titration – (FAS vs KMnO_4).
12. Determination of equivalent conductance of a strong electrolyte (NaCl/KCl).

Text Books

1. Viswanathan B and Raghavan P.S, Practical Physical Chemistry (2009), Viva Books, New Delhi.
2. Sundaram, Krishnan (1996), Raghavan, Practical Chemistry (Part II), Viswanathan Co. Pvt.
3. Athawale and Parul Mathur (2008), Experimental Physical Chemistry, New Age International (P)Ltd., New Delhi.
4. Lewers E.G (2011), Computational Chemistry: Introduction to the Theory and Applications of Molecular and Quantum Mechanics, 2nd Ed., Springer, New York.

Reference Books

1. Yadav J.B, (2001), Advanced Practical Physical Chemistry, Goel Publishing House,
2. Gurthu J.N and Kapoor R (1987), Advanced Experimental Chemistry, S. Chand & Co.,

Web References

1. <https://www.slideshare.net/mohdsakharkar/acid-base-catalysed-ester-hydrolysis>.
2. <https://www.slideshare.net/sandeepkumaryadav4/critical-solution-temperature-of-phenolwater-system>.
3. <https://davjalandhar.com/dbt/chemistry/SOP%20LabManuals/B.Sc.%20SEM%20V.pdf>.
4. <https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/chemistry/lelm106.pdf>.
5. <https://www.slideshare.net/adujoy/triiodide>.

Pedagogy

Chalk and talk, E-content, Demo, Hands on training, Quiz, Assignments.

Course Designer

➤ Dr. K. Uma Sivakami

Semester V	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH5CC7	ORGANIC CHEMISTRY-I	CORE	6	6

Course Objectives

- This course helps to learn the reactions of carboxylic acids, amines, carbonyl compounds and Heterocyclic compounds.
- To recognize the mechanism of rearrangements.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On successful completion of the course, the student will be able to	Knowledge level
CO1	Recognize the nature of organic compounds and rearrangements	K1
CO2	Discuss about synthesis of organic compounds.	K2
CO3	Demonstrate various reactions of different functional group with mechanism.	K3
CO4	Distinguish the reactivity of organic substances and rearrangements.	K4
CO5	Predict the appropriate method for separation of amines and pathways of rearrangements.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO 1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	1	2	2	3	3	1	1	2
CO3	3	2	2	3	3	3	3	2	2	3
CO4	3	1	2	3	2	3	3	2	1	2
CO5	3	2	3	1	2	3	3	2	3	3

1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Carboxylic Acid and Their Derivatives Aliphatic acids: Saturated monocarboxylic acid – resonance structure – relative strength of carboxylic acids (effect of substituents) - Reactive methylene compounds: Preparation- properties - uses of ethyl acetoacetate - diethyl malonate. Aromatic acids: Monocarboxylic acids – general methods of preparation - properties - reactions of benzoic acid - salicylic acid. Dicarboxylic acid: Preparation - properties - uses of phthalic acid - terephthalic acid.	18	CO1 CO2 CO3 CO4	K1, K2, K3, K4
II	Chemistry of Nitrogen Compounds Amines: aliphatic and aromatic amines - classification – general methods of preparation- properties and reactions - separation of mixture of amines - Basicity of amines - effect of substituents - distinction between primary, secondary and tertiary amine - Aliphatic diazo compounds: Preparation - properties of diazomethane-Diazonium compounds: Benzene diazonium chloride – structure - reactions - synthetic applications of diazo coupling reaction.	18	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
III	Carbonyl Compounds - Aldehydes and Ketones Structure - acidity of α -hydrogen – methods of preparation- physical properties - chemical properties – reactivity of carbonyl group- nucleophilic addition - addition of HCN - addition of derivatives of ammonia - addition of sodium bisulphate - addition of Grignard reagent - Reformatsky - Wittig reaction - oxidation and reduction reactions - Aldol condensation - Benzoin condensation - Cannizzaro reaction – Iodoform reaction.	18	CO1 CO2 CO3 CO4	K1, K2, K3, K4
IV	Heterocyclic Compounds and Dyes Heterocyclic Compounds: Nomenclature – Chemistry of	18	CO1 CO2	K1, K2, K3, K4

	furan- thiophene - pyrrole – pyridine- Fused ring heterocyclic compounds: Quinolone - isoquinoline - indole. Dyes: Introduction – colour - constitution - classification based on structure - application. Preparation and applications of the following dyes – methyl orange- Congo red- malachite green and indigo.		CO3 CO4	
V	Molecular Rearrangements: Types of rearrangement (nucleophilic and electrophilic) – mechanism with evidence for the following re-arrangements - Pinacol – Pinacolone. Benzil - Benzilic acid, Benzidine, Claisen, Fries, Hofmann, Curtius, Lossen, Beckmann and Dienone – phenol rearrangements.	18	CO1 CO2 CO4 CO5	K1, K2, K4, K5
VI	Self-Study for Enrichment (Not to be included for External Examination) Preparation of aliphatic carboxylic acids- nitro alkanes and alkyl nitrites - addition of oxygen nucleophiles - reactions of pyridine-N-Oxide.	--	CO1 CO2 CO3	K1, K2, K3

Text Books

1. Bahl, B.S and Bahl .A. (2010), Advanced Organic Chemistry 12th edition, Sultan Chand &Co., New Delhi.
2. Soni. P.L, (2006), Text Book of Inorganic Chemistry, S. Chand & Co., New Delhi.
3. Bhupinder Mehta and Manju Mehta, (2015), Organic Chemistry, Prentice Hall of India Pvt Ltd., New Delhi.

Reference Books

1. Finar I.L. (1996), Organic Chemistry Volume 1&2 (6th edition), Addison Wesley Longman Ltd., England.
2. Morrison R.T. and Boyd R.N. and Bhattacharya S.K. (2011) Organic Chemistry (7th edition) Pearson India.
3. Tewari K.S., Vishil N.K. and Mehotra. S.N (2001), A text book of Organic Chemistry (1st edition), Vikas Publishing House Pvt Ltd., New Delhi.

4. Pine.S.H, (1987), Organic Chemistry (5th edition), McGraw-Hill International Book Company, New Delhi.
5. Seyhan N. Ege ., (2005)Organic Chemistry (5th edition),Houghton Mifflin Co., New Delhi

Web Reference

1. <https://byjus.com/chemistry/carboxylic-acid-properties/>
2. https://www.ch.ic.ac.uk/widdowson/teach_files/nitrogen/dw1.html
3. <https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/aldket1.htm>
4. https://www.chem.gla.ac.uk/staff/stephenc/teaching/HeterocycleLectures2011_2C12.pdf

Pedagogy

E-content, Lecture, Power Point Presentation, Seminar, Assignment, Quiz, Group discussion, Video/Animation.

Course Designers

1. **Dr. A. Sharmila**

Semester V	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH5CC8	PHYSICAL CHEMISTRY – I	CORE COURSE-VIII	6	6

Course Objective

- To understand laws of thermodynamics, photochemical process and types of electronic transitions,
- To learn the behaviors of dilute solutions and colligative properties, colloids, adsorption phenomena, phase rule and its significances.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Find equilibrium constant and enthalpy of equilibrium reaction at different temperature	K1
CO2	Discuss thermodynamic conditions favoring chemical equilibrium.	K2
CO3	Evaluate physical and chemical adsorption phenomenon	K3
CO4	Explain phase rule and law of dilute solution to predict composition, molecular weight	K3
CO5	Analyse quantum yield and Identify types of electronic transition in organic molecules	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	2	3	1	1	1	3
CO2	3	2	1	3	2	2	3	1	1	2
CO3	2	3	2	1	2	3	2	2	2	3
CO4	3	3	2	2	3	2	2	1	2	3
CO5	3	3	2	3	3	3	3	2	1	3

“1” – Slight (Low) Correlation –

“3” – Substantial (High) Correlation –

“2” – Moderate (Medium) Correlation –

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Chemical Equilibrium, Zeroth and Third Law Thermodynamics Law of mass action - thermodynamic treatment - Van't Hoff reaction isotherm- temperature dependence of the equilibrium constant - Van't Hoff equation- integrated form of Van'tHoff equation – homogeneous-heterogeneous systems (NH ₃ , PCl ₅ and CaCO ₃) - relationship between K _p and K _c - Factors affecting chemical equilibrium - Le - Chatlier principle (Haber's and Contact processes) - Zeroth law of thermodynamics - absolute temperature scale - statement of third law - Nernst heat theorem.	18	CO1, CO2, CO3, CO4	K1, K2, K3,K4, K5
II	Molecular Thermodynamics Thermodynamics of systems of variable composition – partial molar properties – chemical potential – relationship between partial molar quantities – Gibbs Duhem equation -applications- thermodynamic properties of real gases – fugacity concept – calculation of fugacity of real gas – activity - activity coefficient – concept – definition – standard states - experimental determinations of activity and activity coefficient of electrolytes.	18	CO1, CO2, CO3, CO4	K1, K2, K3, K4 ,K5
III	Surface Chemistry Definition of colloids - solids in liquids (Sols) – preparation – purification - properties – kinetic-optical - electrical - stability of colloids – Hardy	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3,

	Schule law - protective colloids - liquids in liquids (emulsions) – preparation - properties - uses - liquids in solids (gels) – preparation- properties - adsorption - physical adsorption - chemisorption- Freundlich - Langmuir adsorption isotherms - applications of adsorption.			K4, K5,
IV	Phase Rule Concept of phase- component - degrees of freedom - Gibb's phase rule - phase equilibrium - one component system – water system - sulphur system – two component system – solid liquid equilibrium. Simple eutectic diagram of Pb-Ag system- simple eutectic diagram- desilverisation of lead compound formation with congruent melting point – (Mg-Zn) - incongruent melting point (Na-K) – NaCl –water system-freezing mixtures.	18	CO1, CO2, CO3, CO4,CO5	K1, K2, K3, K4, K5
V	Electronic Spectroscopy and Photochemistry Molecular spectra - Energy levels of molecular orbitals - electronic spectroscopy - selection rules - types of electronic transitions- concept of chromophore - auxochrome. Photochemistry: Difference between thermal and photochemical processes- laws of photochemistry - Grothus-Draper's law - Stark-Einstein's law of photochemical equivalence - quantum yield- photochemical reaction mechanism- hydrogen-chlorine, hydrogen- bromine reaction - energy transfer processes - Jablonski diagram- qualitative description of fluorescence - phosphorescence – photosensitized reactions.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	Self-Study for Enrichment: (Not to be included for External Examination.) First and second laws of thermodynamics, reduced phase rule equation, Critical solution temperature, BET adsorption isotherm.	-	CO1, CO2 CO3	K1, K2, K3, K4
----	---	---	--------------------	-------------------------

Text Book

1. Puri B. R. ,Sharma, L. R. and Pathania, M. S. (2013). Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., New Delhi
2. S. Glasstone and D. Lewis, (2014). Elements of Physical Chemistry, Mac Millon Ltd, London
3. Banwell C.N, (1994). Fundamentals of Molecular Spectroscopy, Mc GrawHill Education , Noida

Reference books

1. Puri B.R., Sharma L.R., and Kalia K.K (1993), Principles of Physical Chemistry 23rd edition, Shoban Lal Nagin Chand &Co.New Delhi.
2. Maron and Prutton, (1969). Physical Chemistry, Mac Millan, London
3. Atkins P.W., (1994). Physical Chemistry, 5th edition, Oxford University Press.
4. Gabor a Sobarjai and Yimin Li, (2010). Introduction to Surface Chemistry and Catalysis, 2nd edition, John Wiley & Sons, New Jersey

Web References

- <https://ocw.mit.edu/courses/5-61-physical-chemistry-fall-2017/resources/electronic-spectroscopy-and-photochemistry/>
- <https://www.chadsprep.com/chads-general-chemistry-videos/3-laws-of-thermodynamics-definition/>
- <https://www.slideshare.net/ImranNurManik/colligative-properties-of-dilute-solutions-manik>
- <https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.ssgopalganj.in%2Fonline%2FOnline%2520Class%2520520PPT%2FCClass%252012%2FChemistry%2Fch%25205%2520ppt%2520surface%2520chemistry.pptx&wdOrigin=BROWSELINK>
- <https://ccsuniversity.ac.in/bridge-library/pdf/Engg-AG-Engg-Chem-2nd-sem-subodh-Lecture-5.pdf>

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designer

Dr. K. Shenbagam, Assistant Professor, Department of Chemistry

Semester V	InternalMarks:25		ExternalMarks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UCH5DSE1A	NUCLEAR AND INDUSTRIAL CHEMISTRY	DISCIPLINE SPECIFIC ELECTIVE - I	5	4

Course Objective:

- To impart knowledge about radioactivity and nuclear chemistry.
- To provide knowledge about industrial chemistry.

Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Recall subatomic particles, isotopes, isobar, isotones, magic number, fuels and fertilizers.	K1, K2
CO2	Interpret nuclear reaction, radioactive decay and types of hardness.	K3
CO3	Analyze pesticides, insecticides, fertilizers, fuels and radioactive isotopes.	K3
CO4	Describe stability of nucleus, radioactive series, DDT, BHC, LPG and zeolite process.	K3
CO5	Illustrate nuclear models, radioactive series, characteristics of pesticides, fertilizers and estimation and removal of hardness	K3

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2	3	3	3	1	3
CO2	3	2	2	3	2	2	3	3	3	2
CO3	3	3	3	1	2	3	2	2	2	3
CO4	3	3	3	2	3	3	2	1	2	3
CO5	3	3	2	3	3	3	3	2	3	3

“1”–Slight (Low)Correlation

“2”–Moderate(Medium)Correlation

“3”–Substantial (High)Correlation

“-”indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	Cos	CONGNITIV ELEVEL
I	UNIT-I: Introduction to nuclear chemistry: Nucleus- subatomic particles - nuclear forces (Meson theory)- nuclear size – density -stability of nucleus- n/p ratio, curves, stability belts - Whole number rule- binding energy, mass defect -magic number-structure of nucleus- Shell model and Liquid drop model- Nuclear reaction (capturing, particle – particle and spallation reactions). Nuclear fission - nuclear fusion reaction – theories - characteristics features - comparison between nuclear reaction and chemical reaction.	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3
II	UNIT-II: Radioactivity: Natural radioactivity - Radioactive decay- α , β , γ decay, Detection and measurement of radioactivity (Geiger Muller and ionization counter) - radioactive series - group displacement law Rate of disintegration and half - life period - Average life period. Artificial radioactivity - Artificial radioactivity - induced radioactivity - uses of radioisotopes - hazards of radiations - nuclear reactors - nuclear fusion - thermo nuclear reactions - energy source of the sun and stars.	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3
III	UNIT-III: Agricultural Industries: Plant Nutrient- Micro and macro nutrients. Fertilizer: manufacturing of NPK- Complex fertilizers - mixed fertilizers – manufacturing – composition - Pesticides- classification based on origin -chemical structure - target pest - General methods of application – toxicity - safety measures in using pesticides - preparation properties - uses of organic pesticides – DDT and BHC.	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3

IV	UNIT -IV: Industrial fuels: Coal power industries- composition - manufacturing - applications of water gas and producer gas - petroleum refining - chemicals from petroleum refining - natural gas - LPG - petrol - diesel - air pollution problems due to automobiles - remedial measures to control pollution - conversion of coal power into petroleum oil by Fischer-Tropsch and Bergius method - power alcohol -composition and uses.	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3
V	UNIT-V: Industrial water treatment: Hard water and industries - industrial water treatment – problems due to hardness in boiler feed water - determination of hardness of water - Titration method - complexometric method using EDTA - expressing hardness - equivalents of calcium carbonate - water softening methods - Clark’s process - permutit or zeolite process - ion exchange process and reverse osmosis.	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3
VI	Self-study: (Not included for End Semester examination) Toxicity, threshold limit, manufacturing of power alcohol, case studies on nuclear accident, nuclear bomb. Chemistry paper industries, engineering materials used in industries.		CO1 CO2 CO3 CO4 CO5	K1 K2 K3

Text Book:

1. Stocchi, E. Lott, K.A.K. and Short, E.L. (1990). Industrial Chemistry, Vol-I, U.K, Ellis Horwood Ltd.
2. Arnikar, J.H. (2022), Essentials of Nuclear chemistry (5th Ed), New Delhi, New Age International Private Limited.
3. Sharma, B.K. (2014), Industrial Chemistry (17/e Ed), Goel Publishing House

Reference Book:

1. Gurdeep Raj. (2016), Advanced Physical Chemistry, (4th Ed), Meerut, Krishna prakashan media.
2. Puri, Sharma & Pathania (2018) Principles of Physical Chemistry (47th Ed), Jalandhar, Vishal

publication.

3. Samir Sakar, (2009), Fuels and Combustion, (3rd Ed), India, Universities Press.

Web Reference:

1. https://onlinecourses.nptel.ac.in/noc23_cy21/preview
2. <http://www.nou.ac.in/econtent/Msc%20chemistry%20paper%202/MSc%20Chemistry%20Paper-II%20Unit-2.pdf>

Pedagogy

Chalk and talk, PPT, E-content, Discussion, Assignment, Demo,
Quiz and Seminar

Course Designers

Dr. V. Sangu.

Semester V	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
22UCH5DSE1B	BASICS OF NANOSCIENCE AND NANOTECHNOLOGY	DISCIPLINE SPECIFIC ELECTIVE – I	5	4

Course Objective

- To know the synthetic methods of nanomaterials.
- To understand the characterization of nanomaterials.
- To understand carbon-based nanomaterials.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Recall the basic concept of nano scale, synthesis and carbon nanomaterials.	K1
CO2	Explicate the synthesis, properties, instrumentation techniques and carbon nanotube.	K2
CO3	Describe quantum materials, top down, bottom up approach, AFM, SEM CNT, CNF and CNB.	K3
CO4	Analyze the types, properties, size, structure and bonding in nano materials.	K4
CO5	Assess nanomaterials, CVD, TEM, arm chair and Zig zag pattern.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	2	3	3
CO5	3	3	3	2	3	3	3	2	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Fundamentals of Nanoscience and Nanotechnology Historical perspectives - ancient - medieval - modern periods in nanoscience and nanotechnology - terms and definitions - scale of material - macro - meso - micro and nanoscale - size dependent- classification of nanomaterials - properties of materials - surface and volume - surface energy - band gap in metals - bulk vs nano - quantum nanostructures - importance of nanoscience.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Properties of nanomaterials Thermal properties - melting point - heat capacity- Curie temperature-coefficient of thermal expansion - electrical properties - lattice constant - phase transformation – mechanical properties - elastic modulus - hardness and strength - toughness - optical properties - magnetic properties - biological properties - antimicrobial activity and toxicity.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Synthesis of nanomaterials Synthesis of nanomaterials - top-down and bottom-up approaches - principles and types - physical methods - milling - etching - sputtering - LASER ablation - chemical vapour deposition (CVD) - chemical methods - chemical reduction - precipitation - sol- gel method - solvothermal	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

	synthesis - sonochemical synthesis - biological methods - microbial synthesis - phytosynthesis.			
IV	Characterization techniques of nanomaterials Spectroscopic methods - UV-Visible absorption - emission spectroscopy - IR spectroscopy - scanning probe methods: AFM - electron probe methods - SEM - TEM - X-ray methods - particle size determination-Dynamic light scattering method.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Carbon based nanomaterials Structure - bonding in nano material - arm chair - zig-zag - chiral patterns - theory of formation of different structures - growth process of CNT - single walled carbon nano tubes - multi walled carbon nano tubes - graphite - diamond - different types of carbon nano materials - CNF- CNB - structure - properties.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment (Not to be included for External Examination) Natural - man-made nanomaterial - significance of nanoscale - synthesis using microorganisms - thermal decomposition of complex precursors - carbon based nano materials - fullerenes - structure - properties of supramolecular assemblies.	-	CO1	K1, K2

Text Books

1. Goyal, R.K., (2018). Nanomaterials and Nanocomposites: Synthesis, Properties, Characterization,

New York: Taylor & Francis Group. CRC Press.

2. Hornyak L.G., Tibbals H.F., Dutta J., and Moore J.J., (2009). Introduction to Nanoscience & Nanotechnology, New York: CRC press. Print.
3. Sharon M., Pandey S., & Oza G., (2012). Bionanomaterials: Concepts and Applications, New Delhi: Ane Books Pvt. Limited. Print.
4. Kumar N., & Kumbhat S., (2016). Essentials in nanoscience and nanotechnology, New Jersey: John Wiley & Sons., Inc.

Reference Books

1. Balaji, S., (2010). Nanobiotechnology, Chennai: MJP Publishers. Print.
2. Cao, G. & Wang, Y., (2011). Nanostructures and Nanomaterials: (Synthesis, Properties and Applications),
New Delhi: World Scientific Publishing Co. Pvt. Ltd. Print.
3. Poole, C.P., & Owens F.J., (2010). Introduction to Nanotechnology, New Delhi:
John Wiley and Sons (Asia) Pvt. Ltd. Print.

Web References

1. https://drive.google.com/file/d/1KXRsfv11_ydF02BG43kLyQ2cds1nKQ4Y/view
2. https://drive.google.com/file/d/1OhqFIDLhatyUEl1wA4-Xvn_AuV3hQiz6/view
3. https://drive.google.com/file/d/1vq9hJo_2znn9oxqkIasgwccsCyURzAnM/view
4. <https://drive.google.com/file/d/1LUQswFQs60brycdtVd2uo1RHsEYGllfx/view>

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designer

Dr. P. Thamizhini

Semester V	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UCH5DSE1C	POLYMER CHEMISTRY	DISCIPLINE SPECIFIC ELECTIVE	5	4

Course Objectives

- To enrich the knowledge in the chemistry of polymers.
- To study the concepts of polymerization and techniques
- To emphasize the impact of less toxic polymers for sustainable development

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Recall polymers terms, properties, glass transition temperature melting point of polymers.	K1
CO2	Illustrate the preparation, properties and applications of Polymers	K2
CO3	Acquaint various polymer processing technologies and molding techniques.	K3
CO4	Analyze the mechanisms of the reactions that lead to the formation of polymers	K4
CO5	Implantation of polymer applications to improve socio economic facts	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	2	3
CO2	3	3	2	3	3	3	3	2	2	2
CO3	2	3	3	3	3	2	3	3	3	2
CO4	3	3	2	3	2	3	2	2	2	2
CO5	2	3	1	2	3	3	3	3	2	3

“1”–Slight (Low)Correlation

“2”–Moderate(Medium)Correlation

“3”–Substantial (High)Correlation

“-”indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction to Polymers Definition of monomer, polymer and polymerization – classification of polymers on the basis of sources and applications - thermosetting and thermoplastics. Functionality and degree of polymerization. Types of polymerization reactions: Chain polymerization - free radical and ionic polymerization – coordination polymerization- step polymerization polyaddition – polycondensation - ring opening - group transfer – electrochemical – metathetical polymerization.	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
II	Tacticity, Properties and Reactions of Polymers Tacticity in polymers- Isotactic, syndiotactic and atactic polymers - Glass transition temperature (T_g) -factors affecting T_g . Relationship between T_g and M_n , T_g and T_m -Importance of T_g . Molecular weight of polymer - number average (M_n) - weight average (M_w). sedimentation - viscosity average molecular weights. Reactions - Hydrolysis – hydrogenation – addition – substitutions – cross linking and cyclisations reaction. Polymer degradation- thermal, photo and oxidation degradation of polymers (basics only)	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5

III	Polymerization Techniques and Moulding Technique	15	CO1	K1
			CO2	K2
	Bulk –solution - emulsion - melt condensation -		CO3	K3
	interfacial polycondensation – plasma		CO4	K4
	polymerization – polymerization in supercritical fluids. Moulding techniques – Injection – compression - extrusion - rotational - calendaring.		CO5	K5
IV	Chemistry of Commercial Polymers	15	CO1	K1
	Preparation, properties and uses of the		CO2	K2
	polymers – polyethylene- polypropylene –		CO3	K3
	polystyrene – PVC – Teflon –		CO4	K4
	polymethylmethacrylate – polycarbonate – polyurethanes - polyamides (Kevlar) - phenol- formaldehyde - urea-formaldehyde resin - epoxy resins - rubber-styrene - neoprene rubbers.		CO5	K5
V	Biopolymers and Recycling of plastic waste	15	CO1	K1
	Biopolymer films – biodegradable mulching-		CO2	K2
	properties – uses - disadvantages of biodegradable		CO3	K3
	polymers- applications of biopolymers in horticulture		CO4	K4
	Food Packaging - nanocomposite films - coating - preparation - uses of PHBV- PGA- PLA – PCL- steps involved in recycling of plastics.		CO5	K5
VI	Self-Study for Enrichment	-	CO1	K1
	(Not to be included for External Examination)		CO2	K2
	Polydispersity and polydispersity index of polymers.		CO3	K3
	Examples of monodispersed and polydispersed		CO4	K4
	polymers. Molecular mass & mechanical properties. Size of polymer molecules.			

Text Books

1. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, (1978). Polymer Science
Wiley Eastern Ltd., New Delhi
2. Sharma, B.K, 1989, Polymer Chemistry, Goel Publishing House, Meerut.
3. Premamoy Ghosh, 2011, Polymer Science and Technology, 3rd edition, Tata McGraw
Hill Education Private Limited, New Delhi.
4. George Odian, 2004, Principles of Polymerization, 4th edition, John Wiley and Sons, New York.
5. F. W. Billmayer, Text book of Polymer Science, 3rd edition, John Wiley & Sons

Reference Books

1. Arora M.G., Singh, M. and Yadav M.S (1989), Polymer Chemistry, 2nd Revised edition, Anmol Publications
Private Ltd., New Delhi.
2. Joel R. Fried, 2014, Polymer Science and Technology, 3rd Edition, Pearson.
3. Anilkumar & S.K. Gupta, 2020, Fundamentals of Polymer Science and Engineering, Tata McGraw
Hill, New Delhi

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designer

1. Dr. R. Subha

Semester: V	InternalMarks:40		ExternalMarks:60	
COURSECODE	COURSETITLE	CATEGORY	Hrs /Week	CREDITS
22UCH5SEC2P	WATER ANALYSIS (P)	SKILL ENHANCEMENT COURSE-II	2	2

Course Objective:

1. To learn the techniques of titrimetric analyses.
2. To know the estimation of several cations and anions
3. To know the estimation of total hardness of water.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall the basic principles of volumetric analysis and estimation	K1, K2
CO2	Estimate water quality parameters such as dissolved oxygen content, chloride content of the water samples.	K3
CO3	Interpret quality of water from the experimentally measured values.	K3
CO4	Exhibit ethical principles in engineering practices	K3
CO5	scientifically plan and perform experiments to estimate water quality parameters.	K3

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

“1”–Slight (Low)Correlation

“3”–Substantial (High)Correlation

“2”–Moderate(Medium)Correlation

“-”indicates there is no correlation

Syllabus

1. Determination of total hardness of water by EDTA method.
2. Determination of methyl orange alkalinity of water.
3. Determination of phenolphthalein alkalinity of water.
4. Determination of chloride content of water by argentometric method.
5. Estimation of dissolved oxygen in water by Winkler's method.
6. Estimation of chemical oxygen demand of water.
7. To determine the TDS of a given sample of water.
8. Determination of Phosphates in given water sample.
9. Determination of Sulphates in given water sample.

Text Book:

1. Khanna, D.R. Bhutiani, R. Daya. (2008). Laboratory Manual of Water and Wastewater Analysis, New Delhi, Publishing House.
2. Venkateswaran, V. Veeraswamy, R. Kuandaivelu. (1997). Basic Principles of Practical Chemistry. 2nd edition. New Delhi, Sultan Chand & Sons

Reference Book:

1. Vogel A. I. (2000). Text book of quantitative inorganic analysis. The English language book Society.

Web Reference:

1. <http://www.titrations.info/EDTA-titration-calcium>
2. <https://www.youtube.com/watch?v=qmVQs6Q7tso>
3. <https://srnvalliammai.ac.in/wp-content/uploads/2022/05/1903610-water-and-waste-water-analysis-laboratory-manual.pdf>
4. https://youtu.be/Lp_O8dolCXk
5. <https://youtu.be/zXvEmlFqicw>
6. <https://youtu.be/Sa0WfA9UGG0>
7. <https://youtu.be/6QsRkG5jy90>
8. <https://youtu.be/ve53HN9za7E>

Pedagogy

Chalk and talk, PPT, E-content, Discussion, Assignment, Demo, Quiz and Seminar

Course Designers

Dr.V. Sangu.

Semester VI	Internal Marks: 25			External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS	
22UCH6CC9	ORGANIC CHEMISTRY-II	CORE	5	5	

Course Objectives

- This course helps to learn the Chemistry of carbohydrates, proteins, vitamins, alkaloids and terpenoids.
- To recognize the mechanism of various oxidizing and reducing reagents and spectroscopy techniques for the elucidation of structures.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Knowledge Level
CO1	On successful completion of the course, the student will be able to Recall the basic concepts of biomolecules, reagents and spectroscopy.	K1
CO2	Classify the types of amino acids, alkaloids, terpenoids, reagents and spectrum.	K2
CO3	Interpret the reactions of biomolecules, mechanism of redox reactions and instrumentations.	K3
CO4	Analyze the structure of carbohydrates, proteins, vitamins, properties of reagents and application of spectroscopic techniques.	K4
CO5	Deduce the λ_{\max} value, vibrational frequency and chemical shift of organic molecules.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO 1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	1	2	2	3	3	1	1	2
CO3	3	2	2	3	3	3	3	2	2	3
CO4	3	1	2	3	2	3	3	2	1	2
CO5	3	2	3	1	2	3	3	2	3	3

1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	CHEMISTRY OF CARBOHYDRATES Carbohydrate: Classification-properties of monosaccharides (glucose and fructose) - structure and configuration of monosaccharides- interconversion. Ascending and descending series-mutarotation - epimerization- cyclic structure - determination of size of sugar rings. Disaccharides: Sucrose, maltose - structure elucidation. Polysaccharide: Starch and cellulose (elementary treatment).	15	CO1 CO2 CO3 CO4	K1,K2, K3, K4
II	CHEMISTRY OF PROTEINS AND VITAMINS Amino acids: Zwitterion –isoelectric point-general methods of preparation and reactions of amino acids. Peptides: Peptide linkages. Proteins: Classification of proteins -structure of proteins - primary structure - end group analysis - Edman method-secondary structure-tertiary structure-denaturation - colour reactions of proteins. Nucleic acids: Elementary treatment of DNA and RNA. Vitamins: Classification, structure and biological importance of vitamins A,B ₁ ,B ₂ ,B ₆ , B ₁₂ and C.	15	CO1 CO2 CO3 CO4	K1,K2, K3, K4
III	CHEMISTRY OF ALKALOIDS AND TERPENOIDS Alkaloids: Classification-isolation-methods for synthesis of coniine, piperine, nicotine and quinine. Terpenoids: Classification – isoprene-special isoprene rule- methods for synthesis of citral, limonene, menthol and camphor.	15	CO1 CO2 CO3 CO4	K1,K2, K3, K4
IV	OXIDATION AND REDUCTION Oxidation: Osmium tetroxide – chromyl chloride – ozone – DDQ–dioxiranes- lead tetraacetate- selenium dioxide–Dess-Martin reagent. Reduction: Catalytic hydrogenation using Wilkinson Catalyst – reduction with LAH, NaBH ₄ , tri-tert-butylaluminum hydride, NaCNBH ₃ , hydrazines.	12	CO1 CO2 CO3 CO4	K1,K2, K3, K4

V	ORGANIC SPECTROSCOPY UV - Vis spectroscopy: Types of electronic transitions – bathochromic shift- hypsochromic shift- hyperchromic shift and hypochromic shift. Instrumentation- solvent effects on λ_{max} -Woodward-Fieser rules for calculation of λ_{max} : Dienes only. IR spectroscopy: Number and types of fundamental vibrations – selection rules- modes of vibrations - instrumentation - position of IR absorption frequencies for functional groups like aldehyde, ketone, alcohol, acid, amine and amide. NMR spectroscopy: Principle - chemical shift-factors affecting the chemical shift - inductive effect and hydrogen bonding - TMS, delta scales, splitting of signals - spin-spin coupling, NMR spectrum of EtOH, n-propyl Bromide and isopropyl bromide.	18	CO1 CO2 CO4 CO5	K1, K2, K3, K4, K5
VI	Self-Study for Enrichment (Not to be included for External Examination) Nomenclature and isomerism of carbohydrates, source of vitamins, oxidation with KMnO_4 , wavelength and frequency of electromagnetic radiations.	--	CO1 CO2 CO3	K1, K2, K3

Text Books

1. Bahl, B.S and Bahl, A. (2010), Advanced Organic Chemistry 12th edition, Sultan Chand & Co., New Delhi.
2. Soni, P.L, (2006), Text Book of Inorganic Chemistry, S. Chand & Co., New Delhi.
3. Bhupinder Mehta and Manju Mehta, (2015), Organic Chemistry, Prentice Hall of India Pvt Ltd., New Delhi.
4. Y.R. Sharma, (2007), Elementary Organic Spectroscopy, S. Chand Publishing, New Delhi.

Reference Books

1. Finar I.L. (1996), Organic Chemistry Volume 1&2 (6th edition), Addison Wesley Longman Ltd., England.
2. Morrison R.T. and Boyd R.N. and Bhattacharya S.K. (2011) Organic Chemistry (7th edition) Pearson India.
3. Tewari K.S., Vishil N.K. and Mehotra, S.N (2001), A text book of Organic Chemistry (1st edition), Vikas Publishing House Pvt Ltd., New Delhi.
4. Pine, S.H, (1987), Organic Chemistry (5th edition), McGraw-Hill International Book Company, New Delhi.

5. Seyhan N. Ege., (2005) Organic Chemistry (5th edition), Houghton Mifflin Co., New Delhi

Web Reference

1. <https://www.jsscacs.edu.in/sites/default/files/Department%20Files/carbohydrates.pdf>
2. <https://www.chips.ac.in/pages/downloads/PPTs/Pchemistry/Chemistry%20of%20Proteins.pdf>
3. https://www.bhu.ac.in/Content/Syllabus/Syllabus_3006312720200418020716.pdf
4. <https://byjus.com/chemistry/infrared-spectroscopy/>

Pedagogy

E-content, Lecture, PowerPoint Presentation, Seminar, Assignment, Quiz, Group discussion, Video/Animation.

Course Designer

1. Dr. A. Sharmila

Semester VI	InternalMarks:25		ExternalMarks:75	
COURSECODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UCH6CC10	PHYSICAL CHEMISTRY-II	CORE CORSE	6	5

Course Objective

- To understand theory of electrolyte and electrolytic conductance.
- To apply measurements of conductance and EMF measurements.
- To familiarize fundamentals of. NMR,IR and Raman spectroscopy
- To understand law of solutions and types of liquid-liquid solutions.

Prerequisite::

Conductance, electrolytes, electromagnetic radiations, solvent and solute interactions.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Understand theories of electrolytes, electrodes, basics concepts of spectroscopy and laws of dilute solutions.	K1,K2
CO2	Apply measurements conductance and EMF measurements, spectroscopy and purification techniques.	K3
CO3	Explain Hittorf's method, working of reversible electrodes, Splitting patterns pattern of NMR signals, mode of vibration of diatomic molecules, purification techniques of solutions.	K4
CO4	Compare Raman and IR spectroscopy, strong and weak electrolyte, reversible and irreversible electrodes, Ideal and non-ideal solutions.	K5
CO5	Determine concentration by conductance and EMF measurements, predict number of fundamental modes of vibrations, Abnormal molecular weight.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2	3	3	3	1	3
CO2	3	2	2	3	2	2	3	3	3	2
CO3	3	3	3	1	2	3	2	2	2	3
CO4	3	3	3	2	3	3	2	1	2	3
CO5	3	3	2	3	3	3	3	2	3	3

“1”–Slight (Low)Correlation

“2”–Moderate(Medium)Correlation

“3”–Substantial (High)Correlation

“-”indicates there is no correlation

UNIT	CONTENT	HOURS	Cos	CONGNITIVE LEVEL
I	Electrochemistry-I: Electrolytic conductance –specific, equivalent and molar conductance–Relations between them – measurement of conductance and cell constant. Factors affecting of conductance in solutions – Strong and weak electrolytes. Migration of ions – transport number–determination (Hittorf method only)– Kohlrausch’s law – applications – Determination of equivalent conductance of weak electrolyte at infinite dilution - Ionic product of water - solubility of sparingly soluble salts and Ionic product of water. Ostwald’s dilution law–Determination of degree of dissociation of weak electrolytes. Theory of strong electrolytes –Debye – Huckel – Onsager theory-verification of Onsager equation – Relaxation and electrophoretic effects.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
II	Electrochemistry –II: Galvanic cells – Reversible and Irreversible cells – EMF and its measurement–Weston Standard cell–types of reversible single electrodes – standard Hydrogen electrode – Calomel electrode – Derivation of Nernst equation for single electrode potentials –Electro chemical series – significance. Application of thermodynamic application of emf measurements – calculation of thermodynamic quantities of Galvanic cell– Determination of pH of the solution using glass electrodes–potentiometric titrations.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
III	Dilute Solutions: Ideal solutions, Raoult's law - ideally dilute solutions- Henry's law – non-ideal solutions - vapour pressure - temperature curves – azeotropes – hydrochloric acid- water system- ethanol-water systems and fractional distillation - partially miscible liquids - phenol-water - tri methylamine-water, nicotine- water system- effect of impurity on consolute temperature - immiscible liquids and steam distillation – Nernst distribution law-applications of distribution law. Colligative Properties - elevation in boiling point, depression in freezing point-osmotic pressure (Definitions and their relationship with molecular weight of solute only. Abnormal molecular weight–Van’tHoff factor.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
IV	Spectroscopy-I: Introduction-various types of spectroscopy - Born-Oppenheimer approximation. Rotational spectroscopy: Rotation spectra of diatomic molecules-determination of bond length and moment of Inertia from rotational spectra-numerical problems IR	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5

	spectroscopy: theory - stretching and bending vibrations (H ₂ O and CO ₂) -important spectral regions for the characterization of functional groups-fingerprint region-qualitative relation of force constant to vibrational frequency. Applications of vibrational spectroscopy.			
V	UNIT – V Spectroscopy- II: Raman spectroscopy: Principle - Rayleigh and Raman scattering - Stokes and Anti-stokes lines - differences between IR and Raman spectroscopy - mutual exclusion principle. NMR spectroscopy: Theory of NMR spectrum –Relaxation methods -chemical shift -shielded and de-shielded protons, spin-spin coupling pattern of n-butanol, 2-Butanol in aprotic solvent. Coupling constant and factors affecting coupling constant.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
VI	Self-study: (Not for final examination) Eigen value, conductance, cell constant, glass electrode, Daniel cell, batteries, Factors influencing vibrational levels, liquid-solid, liquid-gas solutions.		CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5

Text Books

1. Puri B.R., Sharma L.R. and Pathania M.S. (2019), Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., New Delhi.
2. Grutu, J.N. & Grutu, A. (2015). Advanced Physical Chemistry. Pune, India. Pragathi Publisher, 18th Edition
3. Akins, P. W. (2008). Physical Chemistry. Oxford, UK. Oxford University Press, 8th Edition.
4. Antropov L.I. (1977), Theoretical electrochemistry, Mir Publishers.
5. Banwell C.N. (1994), Fundamentals of Molecular Spectroscopy, McGraw Hill Education, Noida.

Reference Books

1. Gurdeep Raj Maron S. Hand Lando J.B. (1974), Fundamentals of Physical Chemistry, Macmillan Publishers, New York.
2. Kaur, K. (2014), Spectroscopy, 16th edition, Pragati Prakashan Educational Publisher.
3. Soni P.L, Dharmarha O.P. & Dash U.N. (2016), Textbook of Physical Chemistry, Sultan Chand & Sons, New Delhi.

WebReferences

1. https://oms.bdu.ac.in/ec/admin/contents-n/148_20220208103603106.pdf
2. <https://www.slideshare.net/slideshow/form-4-chapter-6-electrochemistry/166214651>
3. <https://tmv.ac.in/ematerial/chemistry/pm/SEM%204%20NMRS.pdf>
4. https://uomustansiriyah.edu.iq/media/lectures/6/6_2020_10_09!12_07_57_AM.pdf
5. https://www.youtube.com/watch?v=WTmj_9VT5oE
6. <https://microbenotes.com/electron-spin-resonance-esr-principle-instrumentation-applications/>
7. <https://www.youtube.com/watch?v=yd9GN5lAxdQ>

Pedagogy

Chalk and talk, PPT, E-content, Discussion, Assignment, Demo, Quiz, Seminar

Course Designers

Dr. V.Sangu,

Semester VI	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCH6CC6P	GRAVIMETRIC ANALYSIS AND PHYSICAL PARAMETER(P)	CORE	4	4

Course Objectives

- To perform the gravimetric analysis and estimating the given compound.
- To provide the practical training to the students in physical parameter techniques.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	List the various steps of gravimetric analysis.	K1
CO2	Know about the accuracy in Gravimetric estimations and its Significance	K1
CO3	Identify the types of impurities in precipitates.	K2
CO4	Demonstrate gravimetric analysis to different samples.	K3
CO5	Analyze the physical constants of the organic compounds	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	2	2	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	2	3	3
CO5	3	3	3	2	3	3	3	2	3	3

“1”–Slight(Low) Correlation

“3”–Substantial (High)Correlation

“2”–Moderate(Medium)Correlation

“-”indicatesthereisno correlation.

Syllabus

I. GRAVIMETRIC ANALYSIS

1. Estimation of Lead as Lead chromate.
2. Estimation of Barium as Barium Chromate.
3. Estimation of Nickel as Nickel–DMG complex.
4. Estimation Calcium as Calcium oxalate monohydrate
5. Estimation of Barium as Barium Sulphate.
6. Estimation of Lead as Lead Sulphate.
7. Estimation of percentage of water of hydration in barium chloride crystals.

II. PHYSICAL PARAMETERS

1. Determination of melting point of a solid.
2. Determination of boiling point of a liquid.

Text Books

1. Venkateswaran, V. & Veeraswamy, R. & Kuandaivelu. (1997). Basic Principles of Practical Chemistry. 2nd edition. New Delhi, Sultan Chand & Sons.
2. Gnanaprakasam, N. S. & Ramamoorthi, G. (2007). Organic Chemistry Lab Manual, New edition, SV printers.

Reference Books

1. Furniss, B. S. (Ed.). (2011). Vogel's textbook of practical organic chemistry. Pearson Education India.

Web References

1. <https://www.youtube.com/watch?v=vra0wtZVFkw>
2. <https://www.youtube.com/watch?v=DCLp6A8PMnI>
3. <https://www.youtube.com/watch?v=xaQUTlruvFU>

Pedagogy

Demonstration and Practical sessions

Course Designer

Dr. P. Thamizhini

SemesterVI	InternalMarks: 40		ExternalMarks:60	
COURSECODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
22UCH6DSE2AP	ANALYTICAL TECHNIQUES(P)	DSE	4	4

Course Objectives

- To acquire knowledge about performing analytical experiments.
- To gain more insights on analytical methods such as chromatography, titrations and pH measurements

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statements On the successful completion of the course, students will be able to	Cognitive Level
CO1	List and separate the given compounds using various analytical methods.	K1
CO2	Apply the theoretical concepts to perform experiments	K1
CO3	Identify the quality of the given compounds using methods such as chromatography, Titrations and pH measurements.	K2
CO4	Examine the quantity of the given compounds using methods such as chromatography, titrations and pH measurements.	K3
CO5	Analyze the given samples using analytical techniques.	K4

Mapping of CO with PO and PSO

CO	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	-	2	3	3	2
CO2	2	2	2	3	2	3	3	3	3	2
CO3	2	3	3	1	2	2	3	3	2	1
CO4	2	3	3	1	2	2	3	3	2	2
CO5	2	3	3	1	2	2	3	3	2	2

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

Syllabus

1. Paper Chromatography–Separation of mixture:

- a) Sugars
- b) Amino Acids
- c) Dyes
- d) Metal ions
- e) Indicators

2. Thin Layer Chromatography–Separation of mixture:

- a) Nitro compounds.
- b) Metal ions

3. Separation of plant pigments using paper chromatography:

- a) Chlorophyll A
- b) Chlorophyll B
- c) Xanthophylls
- d) Carotenoids

4. Analysis of Milk of Magnesia.

5. Analysis of soil

- a) Determination of pH of soil.
- b) Determination of total soluble salts.
- c) Determination of carbonate and bicarbonate.
- d) Determination of calcium, magnesium and iron.

6. Determination of calcium ion concentration in eggshell/milk/lime stone samples.

7. Determination of caffeine in tea samples.

Text Books:

1. F.W.Fifield and D. Kealey (2000) Principles and Practice of Analytical Chemistry, Blackwell Science Ltd.
2. R.V. Dils (2010) Analytical Chemistry: Methods of Separation, Van Nostrand, New York.
3. Daniel, C. Harris (2015) Quantitative Chemical Analysis, W. H. Freeman.

Reference Books:

1. J. Mendham (2009) Vogel's Quantitative Chemical Analysis, Pearson Education.
2. V. Venkateswaran. & R. Veeraswamy & Kuandaivelu (1997) Basic Principles of Practical Chemistry. 2nd edition. New Delhi, Sultan Chand & Sons.

Web References:

1. https://www.youtube.com/watch?v=8wmQ_xWqZbo
2. https://www.youtube.com/watch?v=mz_xcNrTK_U
3. <https://byjus.com/biology/separation-of-plant-pigments-through-paper-chromatography>
4. <https://slideplayer.com/slide/10934323>.
5. <https://www.slideshare.net/RAKSHITDOGRA1/determination-of-caffeine-in-tea-samplespdf>.

Pedagogy

Demonstration and Practical sessions

Course Designer

Dr. K. Uma Sivakami

Semester VI	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs. / Week	CREDITS
22UCH6DSE2BP	COSMETIC CHEMISTRY(P)	DSE	4	4

Course Objectives

- To learn the chemistry involved in cosmetics.
- To impart skills on the preparation of cosmetics.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statements On the successful completion of the course, students will be able to	Cognitive Level
CO1	Identify the types of cosmetics and learn about their chemistry	K1
CO2	Articulate the ingredients present in personal care products and Appl it in their preparation.	K2
CO3	Explain the percentage composition of raw materials.	K3
CO4	Interpret the methods of preparation of cosmetics.	K3
CO5	Formulate anhydrous and hydrous based cosmetic products.	K3

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	1	3	3	2	3	3
CO2	2	3	2	3	1	3	3	2	3	1
CO3	3	3	2	3	1	3	3	2	2	1
CO4	3	3	3	3	1	3	3	2	2	2
CO5	3	3	2	3	1	3	3	2	2	2

“1”– Slight (Low) Correlation

“2”– Moderate (Medium) Correlation

“3”– Substantial (High) Correlation

“-” Indicates there is No Correlation.

SYLLABUS

1. Preparation of Talcum Powder.
2. Preparation of bath soap.
3. Preparation of nail polish remover.
4. Preparation of room freshener
5. Preparation of lip palm.
6. Preparation of hand wash.

Text Books

- 1) Swarnlata.S.&Shailendra.S.(2019).Cosmetics:APracticalManual.3rdedition. BSP Books.
- 2) Carli.B.(2020).CosmeticFormulations:ABeginnersGuide.InstituteofPersonal Care Science.

ReferenceBook

- 1) PerryRomanowski. (2009)Beginning CosmeticChemistry,Allured Pub Corp.
- 2) RameshKumari. (2018). Chemistryof Cosmetics, Prestige Publishers.

Web References

1. <https://www.wikihow.com/Make-Your-Own-Body-Lotion>
2. <https://byjus.com/question-answer/a-explain-the-process-of-preparation-of-soap-in-the-laboratory-b-why-is-common/>
3. <https://learncanyon.com/how-to-make-a-hydrating-lip-balm/>

Pedagogy

Demonstration and Practical Sessions.

Course Designer

- Dr. S. Devi

Semester VI	Internal Marks:40		External Marks:60	
COURSECODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UCH6DSE2CP	ANALYSIS OF HERBALPRODUCTS (P)	DSE	4	4

Course Objective

1. To know estimate the phytochemical in medicinal herbs.
2. To learn methods to prepare lotion, cream, churna and table.

Prerequisites

medicinal herbs, phytochemical, lotion, cream, churna.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Understand the principle and testing methods of Excipients of natural origins.	K1,K2
CO2	Isolate, identify and estimate alkaloids, phenol content, aldehydes present in medicinal plant	K3,K4
CO3	Prepare and analyses herbal churna, tablet, lotion and shampoo.	K4,K5
CO4	Analysis chemical compounds present in the herbal medicines	K4
CO5	Predict the amount of chemical compounds in a given sample.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	3	2	3	1	1	1	3
CO2	3	2	1	3	2	2	3	1	1	2
CO3	3	3	1	1	2	3	2	2	2	3
CO4	3	3	2	2	3	3	3	3	3	3
CO5	3	3	2	2	3	3	3	3	3	3

“1”–Slight (Low) Correlation

“2”–Moderate (Medium) Correlation

“3”–Substantial (High) Correlation

“-” indicates there is no correlation

SYLLABUS

Experiments:

Physical and chemical test for evaluation of herbal medicines:

I. Quantitative estimation

1. Determination of total alkaloids in cinchona extract.
2. Determination of acid value of castor oil.
3. Determination of aldehyde content in lemon oil.
4. Estimation of total phenol content powdered herbal drug.
5. Refractive index value of castor oil.

II. Qualitative test for preliminary phytochemicals:

1. Flavonoids, phenolic compounds, alkaloids, glycosides, carbohydrates, carotenoids, proteins, tannin, amino acids, sterols Screening of Aqueous Extract of Neem.

III. Preparation of drugs:

1. Preparation Turmeric Cream.
2. Preparation Herbal Lotion.
3. Preparation and Standardization of Methi-Shikakai Shampoo.
4. Preparation of Orange Syrup B.P.C.

Text Books

1. Willow J. H. Liu (2021), Traditional Herbal Medicine Research Methods: Identification, Analysis, Bioassay, and Pharmaceutical and Clinical Studies, Jon Wiley publication

Reference Books

1. Rajasekhar K.K, Kishore Band Bhavitha J(2021), Text book of herbal and cosmetic analysis, independent online publication, ISBN-13:979-8754102170.

Web References

<http://www.sarajapharmacycollege.com/downloads/HDT.pdf>

Pedagogy

E-content, Demo, Handson training

Course Designers

Dr. V.Sangu