CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

PG AND RESEARCH DEPARTMENT OF CHEMISTRY

B.Sc. CHEMISTRY

(For the Candidates admitted from the Academic year 2023 - 2024 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)	Pothutamil-I	23ULT1	6	3	3	25	75	100
			Hindi ka Samanya Gyan aur Nibandh	23ULH1						
			Poetry, Grammar and History of Sanskrit Literature	23ULS1						
			Foundation Course: Paper I – French I	23ULF1						
	II	English Language Course - I (ELC)	General English -I	23UE1	6	3	3	25	75	100
	III	Core Course - I (CC)	General Chemistry-I	23UCH1CC1	5	5	3	25	75	100
		Core Practical - I (CP)	Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations (P)	23UCH1CC1P	3	3	3	40	60	100
		First Allied Course - I (AC)	Calculus and Fourier Series	22UCH1AC1A	4	3	3	25	75	100
			Biology – I	23UCH1AC1B						
		First Allied Course - II (AC)	Algebra, Analytical Geometry of 3D & Trigonometry	22UCH1AC2A	4	3	3	25	75	100
			Biology (P)	23UCH1AC2BP				40	60	
	IV	Ability Enhancement Compulsory Course - I (AECC)	Value Education	23UGVE	2	2	-	100	-	100
				Total	**30**	**22**				**700**
II	I	Language Course - II (LC)	Pothutamil -II	23ULT2	6	3	3	25	75	100
			Hindi Literature & Grammar – II	22ULH2						
			Prose, Grammar and History of Sanskrit Literature	23ULS2						
			Basic French – II	22ULF2						

	II	English Language Course - II (ELC)	General English– II	23UE2	6	3	3	25	75	100
	III	Core Course - II (CC)	Inorganic and Physical Chemistry	23UCH2CC2	5	5	3	25	75	100
		Core Practical - II (CP)	Inorganic Materials of Industrial Importance (P)	23UCH2CC2P	3	3	3	40	60	100
		Core Course - III (CC)	Material Science	23UCH2CC3	2	2	3	25	75	100
		First Allied Course - III (AC)	ODE, Laplace Transforms and Statistics	22UCH2AC3A	4	3	3	25	75	100
			Biology – II	23UCH2AC3B						
		Ability Enhancement Compulsory Course - II (AECC)	Environmental Studies	22UGEVS	2	2	-	100	-	100
	IV	Ability Enhancement Compulsory Course - III (AECC)	Innovation and Entrepreneurship	22UGIE	2	1	-	100	-	100
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
				Total	**30**	**22**				**800**
III	I	Language Course - III (LC)	Pothutamil-III	23ULT3	6	3	3	25	75	100
			Hindi Literature & Grammar – III	22ULH3						
			Drama, Grammar and History of Sanskrit Literature	23ULS3						
			Intermediate French – I	22ULF3						
	II	English Language Course - III (ELC)	Learning Grammar through Literature – I	23UE3	6	3	3	25	75	100
	III	Core Course - IV (CC)	Organic and Analytical Chemistry	23UCH3CC4	5	5	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**	**22**				**700**
15 Days INTERNSHIP during Semester Holidays										
IV	I	Language Course - IV (LC)	Puthutamil- IV	23ULT4	6	3	3	25	75	100
			Hindi Literature and Functional Hindi	22ULH4						
			Alankara, Didactic and Modern Literatures and Translation	23ULS4						
			Intermediate French – II	22ULF4						
	II	English Language Course - IV (ELC)	Learning Grammar through Literature – II	23UE4	6	3	3	25	75	100
	III	Core Course - V(CC)	Inorganic and Organic Chemistry	23UCH4CC5	6	5	3	25	75	100
		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**	**24**				**800**
V	III	Core Course - VI(CC)	Inorganic Chemistry	23UCH5CC6	6	5	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	23UCH5CC7	6	5	3	25	75	100
		Core Course - VIII(CC)	Physical Chemistry – I	23UCH5CC8	6	5	3	25	75	100
		Discipline Specific Elective - I (DSE)	A. Nuclear and Industrial Chemistry	23UCH5DSE1A	5	3	3	25	75	100
			B. Basics of Nanoscience and Nanotechnology	23UCH5DSE1B						
			Polymer Chemistry	23UCH5DSE1C						
	IV	Ability Enhancement Compulsory Course - IV(AECC)	UGC Jeevan Kaushal - Professional Skills	22UGPS	2	2	-	100	-	100
		Skill	Water Analysis (P)	22UCH5SEC2P	2	2	3	40	60	100

		Enhancement Course - II (SEC)								
		Extra Credit Course	SWAYAM	As per UGC Recommendation Extra Credit Course						
				Total	**30**	**25**				**700**
VI	III	Core Course - IX(CC)	Organic Chemistry – II	22UCH6CC9	5	5	3	25	75	100
		Core Course -X (CC)	Physical Chemistry – II	23UCH6CC10	6	4	3	25	75	100
		Core Course - XI (CC)	Cyber Security	22UGCS	5	4	3	25	75	100
		Core Practical - VI (CP)	Gravimetric Analysis and Physical Parameter (P)	23UCH6CC6P	4	3	4	40	60	100
		Discipline Specific Elective - II (DSE)	A. Analytical Techniques(P)	23UCH6DSE2AP	4	3	3	40	60	100
			B. Cosmetic Chemistry (P)	23UCH6DSE2BP						
			C. Analysis of Herbal Products (P)	23UCH6DSE2CP						
		Project	Project Work	22UCH6PW	5	4	-	-	100	100
	V	Gender Studies	Gender Studies	22UGGS	1	1	-	100	-	100
		Extension activity		22UGEA	0	1	0	-	-	-
				Total	**30**	**25**				**700**
				Grand Total	**180**	**140**				**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	69	99
	Project Work	1	4	
	Internship	1	2	
	First Allied	3	9	
	Second Allied	3	9	
	DSE	2	6	
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		**140**

*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:

a) The passing minimum for CIA shall be40%out of 25 marks (i.e. 10marks)

b) The passing minimum for End Semester Examinations shall be 40% out of 75 marks (i.e.30 marks)

For Practical:

a) The passing minimum for CIA shall be 40% out of 40 marks (i.e. 16marks)

b) The passing minimum for End Semester Examinations 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**
23UCH1CC1	**GENERAL CHEMISTRY – I**	**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 basics of organic chemistry 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
CO2	Explain the concepts of atomic structure, chemical bonding, reactive intermediates and different types of titrations.	K2
CO3	Illustrate the knowledge on atomic structure, bonding, MO theory, isomerism, reaction intermediates, solid state and analytical techniques.	K3
CO4	Categorize the quantum numbers, elements, hybridization, stability of intermediates, titrations and acid radicals.	K4
CO5	Interpret the periodic properties, geometry of molecules, bond order 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 "2" – Moderate (Medium) Correlation

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

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Atomic Structure and Periodic Properties:** Bohr's model of atom - Photoelectric effect - Compton effect - Dual nature of Matter - De Broglie wavelength - Davisson and Germer's experiment - Heisenberg's Uncertainty Principle - Schrodinger equation. Atomic orbital - quantum numbers - Principal, azimuthal, magnetic and spin quantum numbers - significance. Principles governing the occupancy of electrons in various quantum levels - Pauli's exclusion - principle, Hund's rule, Aufbau Principle, (n+l) rule, stability of half -filled and fully filled orbitals. Modern periodic table - classification of elements - Trends of periodic properties along the period and group - Electronegativity scale - applications.	17	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Chemical Bonding - I:** Introduction- types - ionic bond - Born Haber cycle - lattice energy - Madelung constant - Fajan's rule - covalent bond - polar and non - polar covalent bonds partial ionic character of covalent bond - percentage of ionic character -coordinate bond - Bond parameters - Factors influencing bond parameters - metallic bond -Electron Sea model - Band theory - Van der Waals force - Hydrogen bonding – types-	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

	properties and effects.			
III	**Chemical bonding - II:** VB theory - postulates - limitation - different types of hybridization - VSEPR theory - shapes of different types of molecules - limitation - MO theory - bonding, antibonding and non - bonding orbitals, bond order, MO diagrams of H_2, He_2, C_2, O_2, O^{2+}, O^{2-}, O_2^{2-}, N_2, NO, HF and CO - magnetic characteristics - comparison of VB and MO theories.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Basics of Organic Compounds:** IUPAC nomenclature of compounds - classification - isomerism - types - structural and stereo isomerism - cleavage of bonds: homolytic and heterolytic cleavages reagents and substrates; types of reagents - electrophiles - nucleophiles. Reaction intermediates - generation - properties - structure and stability of carbocation, carbanion, free radicals, carbenes and nitrenes - Electronic effects: Inductive - electromeric - mesomeric (resonance) - hyperconjugation and steric effects - Dipole moment.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
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 concentration - Primary and Secondary standards- Different types of titrations - Acid - Base Titrations, Tritimetric method,	15	CO1, CO2, CO3 CO4	K1, K2, K3, K4

	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 - Difference between ionic and covalent compounds - Do and Don't in the Science Lab	-	CO1, CO2, CO3, CO4	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.. & Sathya Prakash. (2003). Modern Inorganic Chemistry. 2nd ed.; S. Chand and Company. New Delhi.
3. Madan, R.D. (2019). Modern Inorganic Chemistry. 3rd edition. S. Chand & Company Ltd.
4. Bahl, B. S., & Arun Bahl. (2021). Text book of Organic Chemistry. 22nd revised edition. Chand & Company Ltd.
5. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2022). Principles of Physical Chemistry. 48th edition. Shoban Lal Nagin Chand & Co, New Delhi.
6. 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). Textbook of Inorganic Chemistry. 25th revised edition. Sultan Chand & Sons.
2. Huheey, J. E. (1993). Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed .; Addison, Wesley Publishing Company: India.
3. 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

- Dr. P. Pungayee Alias Amirtham
- Dr. P. Thamizhini

Semester I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs./ Week**	**CREDITS**
23UCH1CC1P	**QUANTITATIVE INORGANIC ESTIMATION (TITRIMETRY) AND INORGANIC PREPARATIONS (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.
- To learn the preparations of inorganic compounds.

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	Describe the basic principles involved in volumetric analysis and inorganic preparations.	K1
CO2	Demonstrate the experimental methods of volumetric analysis and estimate the chlorine content in bleaching powder and copper in brass.	K2
CO3	Determine the hardness of water and saponification value of oil.	K3
CO4	Apply volumetric analysis for the estimation of compounds.	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	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	2	1	2	2	3	2	2	1
CO5	2	2	2	3	2	2	2	3	2	2

"1"– Slight (Low) Correlation "2"– Moderate (Medium) Correlation

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

SYLLABUS

I. Titrimetric Quantitative Analysis:

Calculation of equivalent weight and Preparation of standard solution.

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 Iron (II) sulphate using $KMnO_4$ as link and standard Mohr's salt solution. (Permanganometric titration).
4. Estimation of oxalic acid using $KMnO_4$ as link and standard oxalic acid solution.
5. Estimation of $KMnO_4$ using thio as link and standard $K_2Cr_2O_7$ solution.
6. Estimation of copper (II) sulphate using $K_2Cr_2O_7$ solution. (Dichrometric titration)
7. Estimation of Mg (II) ions by EDTA solution. (Complexometric Titration)
8. Estimation of chloride ion in barium chloride solution using standard standard sodium chloride. (Argentometric titration)

II. Applied Experiments:

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

III. Preparation of Inorganic Compounds:

1. Potash alum.
2. Tetraammine copper(II) sulphate.
3. Mohr's salt

Text Books

1. Venkateswaran, V., Veeraswamy R., and 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

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

Web References

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

Pedagogy

Demonstration and Practical Sessions.

Course Designers

- Dr. C. Rajarajeswari
- Dr. S. Devi

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

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

Semester I	**Internal Marks: 25**			**ExternalMarks:75**
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UPH1AC1/ 22UCH1AC1	**CALCULUS AND FOURIER SERIES**	**ALLIED**	**4**	**3**

Course Objective

- Explore the students with mathematical methods formatted for their major concepts and train themin 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:** 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 completeformal 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.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Integration of Rational algebraic functions– Rule (a)– Rule (b) $\int \frac{lx+m}{ax^2+bx+c}dx$ Integration of the form x – Rule ax2 + bx + c (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 $\int \frac{dx}{a+b\cos x}$	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**Reduction Formula:** 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] $\int \sin^n x dx$ (without proof) and illustrations. $\int \sin^n x \cos^m dx$	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**Double and Triple Integrals:** Definition of the double integral-Evaluation of Double integral(Problems Only)-Changeof order and evaluation of the double integral (Problems only).	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3,K4
V	**Fourier Series:** Definition of Fourier Series – Finding the Fourier	10	CO1, CO2, CO3,	K1, K2, K3,

	Coefficients for a given periodic function with period 2□ -Even and Odd functions–Half range Fourier series. 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) $\int_0^{\frac{\pi}{2}} \cos^n dx$ Integrals in simple cases(Problems Only)-Development in cosine series -Development in sine series.		CO4, CO5	K4
VI		-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

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

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 1to 4[3]

Reference Books

1. Sankarappan, S. Arulmozhi,G. (2006). Vector Calculus, Fourier series and Fourier Transforms. VijayNicole Imprints Private Limited.

2. Vittal, P.R.(2014). Allied Mathematics. Margham Publications.
3. Singaravelu, A.(2003). Differential Calculus and Trigonometry. R Publication.

b 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=w6llnAQX_f8**
4. **https://www.youtube.com/watch?v=LMcj8o0ERNE**
5. **https://www.youtube.com/watch?v=_GAwQGCyWy0**
6. **https://www.youtube.com/watch?v=9X3gqehcFII**

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**	**HOURS/ WEEK**	**CREDITS**
23UCH1AC1B	**BIOLOGY - I** (FOR CHEMISTRY STUDENTS)	**ALLIED**	**4**	**3**

Course Objectives

- To learn about the classification of plants and general characteristics of plants, fungi and algae.
- To acquire more knowledge about the general characters of bryophytes, gymnosperms and angiosperms with examples.
- To understand the organ structure and function.
- To gain basic knowledge about plant and animal biology

Course Outcome and Cognitive Level Mapping

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

CO Number	**CO Statement**	**owledgeLevel**
CO1	Recall and infer the factual and conceptual information required for understanding of Microbes, Plants and Animals.	K1, K2
CO2	Illustrate morphological, anatomical and reproduction of various organisms and appreciate their adaptive strategies.	K2
CO3	Identify and analyse the characteristics and basic needs of living organisms.	K3. K4
CO4	Compare and interpret the relationship between organisms and environment.	K4, K5
CO5	Explain the characteristics of major taxa and compare and contrast their anatomical and physiological characteristics	K4, K5

Mapping of CO with PO and PSOs

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

"1" – Slight (Low) Correlation, "2" – Moderate (Medium) Correlation,

"3" – Substantial (High) Correlation, "-" indicates there is no correlation.

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	Basis of Classification – Bentham and Artificial, Natural Classification of plants. Morphology, Structure and reproduction: Algae - *Sargassum* as an example and its economic importance; Fungi – Yeasts as an example and its economic importance.	**11**	**CO1, CO2, CO3, CO4, CO5**	**K1, K2, K3, K4, K5, K6**
II	Bryophytes – General characters – *Funaria* as an example- alternation of generation. Pteridophytes – General characters – *Selaginella*. Gymnosperm – General Characters – *Pinus* – Economic uses of gymnosperms. Angiosperms – Monocot flower – *Allium cepa*. Dicot flower – *Nerium oleander*.	**13**	**CO1, CO2, CO3, CO4, CO5**	**K1, K2, K3, K4, K5, K6**
III	Organization, movement and secretions of gastrointestinal tract, Respiration – respiratory organs in mammals – morphology –respiratory pigments. Blood and circulation – composition of blood– General organization of circulatory systems.	**13**	**CO1, CO2, CO3, CO4, CO5**	**K1, K2, K3, K4, K5, K6**
IV	Excretion – excretory organs – general organization in man – muscular system – ultra structure of voluntary muscle.	**10**	**CO1, CO2, CO3, CO4, CO5**	**K1, K2, K3, K4, K5, K6**
V	Nervous system – CNS – Autonomic nervous system – Endocrine glands in man	**13**	**CO1, CO2, CO3, CO4, CO5**	**K1, K2, K3, K4, K5, K6**
VI	**Self - Study for Enrichment (Not included for End Semester Examination)** Blue Green Algae, Penicillium, Lichens	**-**	**CO1, CO2, CO3, CO4, CO5**	**K1, K2, K3, K4, K5, K6**

Text Books

1. Singh, V., Pande, P.C., Jain, D.K. (2021). *A Text Book of Botany*. Rastogi Publications. Meerut.
2. Veer, B. R. (2021). *Parker and Haswell Textbook of Zoology Vertebrates*. 8th edition. Medtech Science Press.
3. Agarwal, V. K. (2018). *Zoology for Degree Students B. Sc. First Year*. S. Chand Publishing.
4. Vashishta, P.C. (2014). *Botany for Degree Students Gymnosperms*. Chand & Company Ltd, Delhi.

5. Chatterjee, C.C. (2004), *Human Physiology Volume I. Medical Allied.* New Central Agency, Kolkata
6. Chatterjee C.C (2004), *Human Physiology Volume II, Medical Allied.* New Central Agency, Kolkata

Reference Books

1. Parihar, N.S. (2012). *An introduction to Embryophyta – Pteridophytes*. Surjeet Publications, Delhi.
2. Alexopoulos, C.J. (2013). *Introduction to Mycology*. Willey Eastern Pvt. Ltd.
3. Coulter, M. J. (2014). *Morphology of Gymnosperms*. Surjeet Publications, Delhi.
4. Pandey, B.P. (1986), *Text Book of Botany (College Botany) Vol I &II*. S. Chand and Co. New Delhi.
5. Best and Taylor. (1992). *The Physiological Basis for Medical Practice.* Saunders Company.
6. Chaudhri, K. (1993). *Concise Medical Physiology*. New Central Book Agency (Parentral) Ltd., Calcutta.

Web References

1. https://www.kobo.com/us/en/ebook/the-algae-world
2. http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html
3. http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm
4. https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/
5. https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf
6. https://www.us.elsevierhealth.com/medicine/cell-biology
7. https://www.us.elsevierhealth.com/medicine/genetics
8. https://www.kobo.com/us/en/ebook/plant-biotechnology-1

E-Books

1. https://www.pdfdrive.com/bsc-botany-d34484852.html
2. https://www.pdfdrive.com/pteridophytes-gymnosperms-palaeobotany-d56995666.html
3. https://www.pdfdrive.com/biology-botany-textbooks-online-e8895584.html
4. https://www.pdfdrive.com/biology-botany-higher-secondary-first-year-text-books-online-e2009127.html
5. https://www.pdfdrive.com/a-text-book-of-botany-and-pharmacognosy-e158788414.html
6. https://www.pdfdrive.com/a-text-book-of-botany-e57877390.html
7. https://www.pdfdrive.com/the-basics-of-biology-e107180613.html

Pedagogy

Power point presentation, Group Discussion, Seminar, Assignment, Animations

Course Designers

1. Dr. R. UMA MAHESWARI
2. Dr. M. KEERTHIGA

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		ExternalMarks:75	
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UPH1AC2/ 22UCH1AC2	**ALGEBRA, ANALYTICAL GEOMETRY OF 3D & TRIGONOMETRY**	**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 withPO and PSO

Cos	PSO1	PSO2	PSO 3	PSO 4	PSO 5	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 $\cos n$ and $\sin n$ - Expansion of $\tan(A \quad B \quad C \ldots\ldots)$ (omitting examples on formation of equations) –Powers of sines and cosines of θ in terms of functions of multiples of θ – Expansions of $\cos^n$ when n is a positive integer – Expansions of $\sin^n$ when n is a positive integer – Expansions of *sin* and *cos* in a series of ascending powers of - The expansions of *sin* and *cos* 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 apoint. (Only problems) - Expansion of tan□ in terms of powers of □- 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 1-5,6,6.1,7,8 [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 GammaPublishing house.
2. Pandey, H.D. Khan, M.Q. & Gupta, B.N.(2011). A Text Book of Analytical

Geometry and VectorAnalysis. 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=9DyPyJb2N9g**
5. **https://www.youtube.com/watch?v=HOk2XLeFPDk**
6. **https://www.youtube.com/watch?v=G1C1Z5aTZSQ**

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: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/ WEEK**	**CREDITS**
23UCH1AC2BP	**BIOLOGY (P)** (FOR CHEMISTRY STUDENTS)	**ALLIED**	**4**	**3**

Course Objectives

- To perform experiments using microscope.
- To study about cells and their morphology by appropriate technique.
- To gain knowledge in morphological identification of plant parts.
- To perform experiments on human blood cells.

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Define and outline the basic instruments involved in Biology	K1, K2
CO 2	Identify and explain the morphology of various parts of plants and animals.	K2, K3
CO 3	Dissect and list the different types of vascular tissues.	K4
CO 4	Compare and contrast the monocot and dicot flower based of T.S section.	K4, K5
CO 5	Determine the various types of cells in living organisms.	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	2	3	3	1
CO2	3	3	3	3	2	3	2	3	3	1
CO3	3	2	3	3	2	3	2	3	3	1
CO4	3	3	3	3	2	3	2	3	3	3
CO5	3	3	3	3	2	3	3	3	3	2

"1" – Slight (Low) Correlation, "2" – Moderate (Medium) Correlation, "3"– Substantial (High) Correlation, "-" indicates there is no Correlation.

Syllabus

1. Epidermal peel of onion.
2. Squamous epithelium from human cheek cells.
3. Epidermal peel of leaf to observe stomata
4. Xylem and phloem from Cucurbita stem.
5. Identification of Striated muscle fibers (Cockroach).
6. Study of morphological modification of plant parts – Root, stem and leaf.
7. To dissect a dicot flower, construct floral diagram and write floral formula.
8. To dissect a dicot flower, construct floral diagram and write floral formula.
9. Observation of human blood cells.

Reference Books

1. Christopher, G., Krista, C., Delores, B. (2021). *General Biology Laboratory Manual.* 2nd edition. Kendall/Hunt Publishing Co, U.S.

2. Chiyedza, S. (2018). *General Biology Laboratory Manual.* 3rd edition. Kendall/Hunt Publishing Co, U.S.

3. Leslie, A. K. (2018). *Integrating Lecture and Lab: A General Biology Laboratory Manual.* 3rd edition. Cognella, Inc.

4. David, M., James, P., Joy, B. P. (2006). *Laboratory Manual-General Biology.* 5th edition. Brooks/Cole;

5. Subramaniam, N.S. (1996). *Laboratory Manual of Plant Taxonomy*. Vikas Publishing House Pvt. Ltd., New Delhi.

6. Noggle, G.R., Fritz, G.J. (2002). *Introductory Plant Physiology*. Prentice Hall of India, New Delhi.

E-Books

1. https://www.pdfdrive.com/a-textbook-of-practical-botany-d57965065.html
2. https://www.pdfdrive.com/a-text-book-of-practical-botany-2-d156822597.html
3. https://www.pdfdrive.com/practical-botany-ii-d46799996.html
4. https://www.pdfdrive.com/practical-botany-d158065762.html

5. https://www.pdfdrive.com/botanical-illustration-d176078869.html

6. https://www.pdfdrive.com/practical-botany-for-advanced-level-and-intermediate-students-d157593255.html

Web References

1. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883
2. https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gy mnosperms&printsec=frontcover
3. https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-ebook/dp/B07CV96NZJ
4. https://medlineplus.gov/genetocs/understanding/basics/cell/
5. https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf
6. http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf
7. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4

Pedagogy

Practical Observation and Demo

Course Designers

1. Dr. R. UMA MAHESWARI
2. Dr. M. KEERTHIGA

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
23UCH2CC2	**INORGANIC AND PHYSICAL CHEMISTRY**	**CORE**	**5**	**5**

Course Objectives

- This course stretches the knowledge about the different techniques involved in metallurgy.
- Discusses about the sand p block elements.
- Provides basic knowledge about solid state and colloidal state of matter.
- Deliberates the basic concepts of gaseous state.

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 the fundamental ideas of metallurgy, s &p block elements, solid, colloidal and gaseous state.	**K1**
CO2	Summarize the knowledge on symmetry operations, metals, colloids, molecular velocities and refining process.	**K2**
CO3	Demonstrate the purification process, structure and applications of compounds.	**K3**
CO4	Categorize the crystals, periodic elements, colloidal state of compounds	**K4**
CO5	Interpret the metallurgytechniques, properties of periodic elements and colloids, crystal planes and laws of gaseous state.	**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	2	3	1	2	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	COGNITIVE LEVEL
I	**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 CO5	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 CO5	K1, K2, K3, K4, K5
III	**Solid State** Crystalline and amorphous solids - isotropy and anisotropy - interfacial angle- symmetry in crystal systems - elements of symmetry - space lattice and unit cell - Bravias lattices - seven crystal systems. Law of rational indices - Miller indices - x-ray diffraction – Bragg's law - derivation of Bragg's equation - representation of planes - space lattice - reciprocal lattice. Bragg's equation - experimental technique- powder method and rotating crystal method.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Colloids** Colloids – types of colloids –preparation –purification – dialysis – optical properties – kinetic properties – electrical properties of colloids – gold number – stability of sols – associated colloids – cleansing action of soaps and detergents – emulsions – gels – applications of	12	CO1, CO2, CO3, CO4,	K1, K2, K3, K4,

	colloids**.**		**CO5**	**K5**
V	**Gaseous State** Kinetic theory of gases - derivation of kinetic gas equation - gaseous laws - type of molecular velocities - average velocity - most probable velocity - RMS velocity- Maxwell's distribution of molecular velocities - effect of temperature on distribution of molecular velocities - Maxwell's distribution of molecular energies – collision diameter- collision number - mean free path - viscosity of gases - calculation of collision diameter - mean free path from viscosity measurement.	**18**	**CO1, CO2, CO3, CO4, CO5**	**K1, K2, K3, K4, K5**
VI	**Self-Study for Enrichment** **(Not to be included for External Examination)** Minerals and ores - periodic table- states of matter– vanderwaals equation.	**-**	**CO1, CO2, CO3**	**K1, K2, K3**

TextBooks

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. ShobanLal 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. https://classnotes.org.in/class12/chemistry12/general-principles-processes-isolation-elements/purification-refining-metal/
2. https://www.askiitians.com/iit-jee-s-and-p-block-elements/
3. https://byjus.com/jee/solid-state/
4. https://byjus.com/jee/colloids
5. https://www.embibe.com/exams/gaseous-state/

Pedagogy

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

Course Designer

Dr. A.Sharmila

Semester II	Internal Marks: 40	External Marks:60		
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
23UCH2CC2P	**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE (P)**	**CORE PRACTICAL**	**3**	**3**

Course Objective

- Enable the students to develop the preparative skills in inorganic preparations.
- Enable the students to check the purity of organic compounds by determining the melting or boiling points.
- At the end of the course, the students should be able to plan the experimental projects and execute them.

Course Outcome

Course Outcome and Cognitive Level Mapping

CO Number	COStatement Onthesuccessful completion ofthe course,students willbeableto	Cognitive Level
CO1	Recall the skills required to carry out professional researchand production activities in the field of chemistry.	**K1**
CO2	Define the various terms such as normality, molality, molarity, equivalent weight and molecular weight.	**K1**
CO3	Select the specific titric method to estimate the amount of analyte present in the given solution.	**K1**
CO4	Describe the principles and procedures of various titrimetric methods.	**K2**
CO5	Prepare solutions of desired concentrations.	**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	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

I. Preparation of Solutions

Molarity, Molality, Normality solutions and Buffers.

II. Volumetric Analysis

1. Complexometric titrations
    a. Estimation of Zinc
    b. Estimation of Magnesium
    c. Estimation of Calcium
2. Estimation of Barium Chloride by Mohr's method.
3. Estimation of Chloride ions by Volhard's method.

III. Preparation of Inorganic Compounds.

1. Cuprous Chloride
2. Borax
3. Prussian Blue
4. Potassium trioxalatoferrate (III)
5. Tristhioureacopper(II)sulphatedihydrate

Text Books

1. Ramanujam, V.V. (1995) Inorganic Semi-micro Qualitative Analysis. Chennai: National,.
2. Vogel, A. I. (1996). Vogel's Qualitative Inorganic Analysis, Revised by Svehla, G. Logman Scientific.

Reference Books

1. V.Venkateswaran, R.veeraswamy&A.R.Kulandaivelu, (1992). Basic Principles ofpractical chemistry, 3rd Edn,.
2. Gopalan, R., Venkappayya, D., Nagarajan, S. (2004). Engineering Chemistry: VikasPublications.

Web References

1. https://davjalandhar.com/dbt/chemistry/SOP%20LabManuals/B.Sc.%20SEM%20I.pdf
2. https://www.youtube.com/watch?v=fv6LJ0KAG1U
3. https://www.youtube.com/watch?v=S2RZ_KyUI9E

Pedagogy

Hands on training, E-Content, Demo

CourseDesigner

Dr. A.Sharmila

Semester II	Internal Marks: 25		External Marks: 75	
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs/Week**	**CREDITS**
23UCH2CC3	**MATERIAL SCIENCE**	**CORE**	**2**	**2**

Course Objective

- To describe the structure of ceramics and magnetic materials.
- To understand the importance of polymer materials.
- To gain knowledge about composites.

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 conductors, magnetic, polymer, LCD and composite materials.	K1
CO2	Describe the classification of different materials.	K2
CO3	Illustrate the role of energy in various materials.	K3
CO4	Analyze the materials using theoretical concepts.	K4
CO5	Evaluate semiconductors, hysteresis curve, perovskite structure, reinforced composites.	K5

Mapping of COwithPO 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
"2" – Moderate (Medium) Correlation
"3" – Substantial (High) 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.	06	CO1, CO2, CO3, CO4, CO5	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.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Ceramics and Display Devices** Classification of ceramics - structure of the ceramics- compounds with Fluorite - Perovskite structure - properties of ceramics- applications - active display devices- Light Emitting Diode (LED) - passive display devices - Liquid Crystal Display (LCD)- applications.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Polymer Materials** Introduction - polymerization mechanism - degree of polymerization - classification of polymers - structure of polymer - fabrication process - properties – applications.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Composite Materials** Introduction - constitution - classification - particle reinforced – fibre reinforced - fiber glass reinforced - other fiber reinforced - metal matrix fiber - hybrid	06	CO1, CO2, CO3, CO4,	K1, K2, K3, K4,

	composites processing of fiber reinforced -composites - applications of composite materials.		CO5	K5
VI	**Self Study for Enrichment** (Not to be included for External Examination) Composite interfaces - bonding mechanisms - other interfacial properties - polymer matrix composites - ceramic matrix composites - composite strengths - fibers as reinforcements.	-	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.). Dhanpat Rai & Sons.

ReferenceBooks

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

WebReferences

1. https://www.uniweimar.de/kunstundgestaltung/wiki/images/Conductors,insulators, semiconductors.pdf
2. https://slideplayer.com/slide/13949334/
3. https://www.youtube.com/watch?v=WHYfDVxi-Qw
4. https://irimee.indianrailways.gov.in/instt/uploads/files/1435551295008-POLYMER-%20L-1.pdf

Pedagogy

Chalkandtalk,PPT,Discussion, Assignment,Demo, Quiz,Seminar

Course Designer

Dr. P. Thamizhini

ALLIED COURSE – III

(For Chemistry)

ODE, LAPLACE TRANSFORMS AND STATISTICS

(2022-2023 Onwards)

Semester II	Internal Marks: 25		ExternalMarks: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.

CourseOutcomes

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 COwithPO and PSO

Cos	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:** Eqautions 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 –Rank Correlation (Repeated Ranks)	-	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	InternalMarks:25			External Marks: 75
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
23UCH2AC3B	**BIOLOGY - II**	**ALLIED**	**4**	**3**

Course Objectives

- To gain knowledge about the bacterial and viral structure and diseases
- To understand the structure and function of various cellorganelles.
- To acquire knowledge on sex linked inheritance in man.
- To understand the basic concepts of molecular biology.
- To study the biotech applications.

Course Outcome and Cognitive Level Mapping

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

CONo.	CO Statement	Knowledge Level
CO1	Recall and infer the factual and conceptual information required for understanding of microbiology, cell biology, genetics and biotechnology.	K1, K2
CO2	Illustrate basic concepts of various branches of applied biology for sustainable development of mankind.	K2
CO3	Develop and compare the structure and function of cells and explain the Development of various cells.	K3. K4
CO4	Classify the beneficial and harmful effects of organisms and explain the role of organisms in various field of human welfare.	K4, K5
CO5	Elaborate the core concepts and fundamental so fgeneticengineering for the human welfare.	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	2	2	1
CO2	3	3	2	3	2	3	2	2	2	1
CO3	3	3	2	2	2	3	2	2	2	2
CO4	3	3	3	2	2	2	2	2	2	2
CO5	3	3	3	2	3	1	3	2	3	2

"1" – Slight (Low) Correlation, **"2"–Moderate(Medium)Correlation,**
"3" – Substantial (High) Correlation, **"-" indicates there is no correlation.**

ALLIED
BIOLOGY-II

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	**Microbiology:** General structure of prokaryotic cell (E. Coli), Morphology of Bacteria: Coccus type: - Micrococcus and Staphylococcus, Bacillus type: - Micro bacillus and Streptobacillus, Spirochetes, and Comma shaped. Bacterial and Viral disease: Pathogenesis, Symptoms, Prevention, And Control-Gonorrhea and AIDS.	12	CO1, CO2, CO4	K1,K2,K3, K4,K5,K6
II	**Cell Biology:** Structure and functions of the following cell components: Cell membrane, Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.	11	CO1, CO2, CO3	K1,K2,K3, K4,K5,K6
III	**Genetics:** Mendelism – Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross.	13	CO3, CO5	K1,K2,K3, K4,K5,K6
IV	**Molecular biology** Structure and functions of DNA, Structure and functions of RNAs (t RNA, mRNA, and rRNA),DNA Replication and Protein synthesis.	11	CO2, CO5	K1,K2,K3, K4,K5,K6
V	**Biotechnology** Recombinant DNA -Construction and applications, Stem Cell Culture-Methods and applications, Transgenic animals-Methods and applications and DNA finger printing-Methods and applications	13	CO2, CO3, CO5	K1,K2,K3, K4,K5,K6
VI	**Self-Study for Enrichment (Not included for End Semester Examination)** Viral disease: COVID, Ultra structure of cell wall, *in vitro* animal cell culture, DNA as genetic material, Genetically modified organism.	-	CO4, CO5	K1,K2,K3, K4,K5,K6

TextBooks

1. BenjaminA.P.2020.*Genetics:AConceptualApproach.*7thEdition,WHFreemanpublisher,
2. Verma,P.S&Agarwal,V.K.(2022).*CellBiology,Genetics,MolecularBiology,Evolution and Ecology*. S Chand and Company Ltd.
3. VishnuShankar,S.(2021).*FundamentalsofGeneticsandMolecularBiology*.Red'shine Publication Pvt. Ltd.
4. Pragya,K.(2020).*EssentialsofGenetics*.DreamtechPress.
5. Rao, K., Krishnamurthy, K.V and Rao, G.S. (1979). *Ancillary Botany.* S. Viswanathan Pvt. Ltd., Madras.

ReferenceBooks

1. Poonam,A.(2022).*LippincottIllustratedReviews:CellandMolecularBiology*.Wolters Kluwer India Pvt Ltd.
2. Harvey,L.,ArnoldB.,Chris,A.K&Monty,K.(2021).*MolecularCellBiology*Ninth edition. W. H. Freeman
3. Nancy,L.C.,Rachel,R.G.,Carol,C.G.,Gisela,G.S&Cynthia,W.(2020).*Molecular Biology: Principles of Genome Function* 3rd Edition. Oxford University Press.
4. Lieberman. (2020). *BRS Biochemistry, Molecular Biology, and Genetics.* 7th edition.Wolters Kluwer India Pvt Ltd.
5. Jocelyn, E.K., Elliott, S.G & Stephen, T.K. (2017). *Lewin's GENES XII* 12th edition. Jonesand Bartlett Publishers, Inc

E-Books

1. https://www.pdfdrive.com/lewins-genes-xii-e185848559.html
2. https://www.pdfdrive.com/introduction-to-genetics-a-molecular-approach-e187102063.html
3. https://www.pdfdrive.com/the-cell-a-molecular-approach-e186369576.html
4. https://www.pdfdrive.com/genetics-a-conceptual-approach-e186741220.html
5. https://www.pdfdrive.com/cell-biology-genetics-molecular-biology-evolution-and-ecologye157248372.htm

WebLinks

1. https://microbenotes.com/category/molecular-biology/
2. https://www.easybiologyclass.com/topic-genetics/
3. https://ocw.mit.edu/courses/7-03-genetics-fall-2004/pages/lecture-notes/
4. http://ndl.iitkgp.ac.in/document/bnZnR2hPaUVqRU9TbFc2Rmp1MVJzN0dyTCs3OGxyRzdaUWpPTzdRV2pBTT0
5. http://ndl.iitkgp.ac.in/document/Qkh4R2FGUkRNZjFicFUvWmpzQ2loU1NPaEl6eWpVaXpnNGUwc21iQzZKbUdaczdobHlyeWNpditXM2hpaFNOS1F6dVc4NGltYWZEQ09YbEVlWjJtelE9PQ

Pedagogy

Powerpoint presentation,GroupDiscussion,Seminar,Assignment,Animations

Course Designer

Dr. M. KEERTHIGA

Semester III	Internal Marks: 25			External Marks: 75
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs. / Week**	**CREDITS**
23UCH3CC4	**ORGANIC AND ANALYTICAL CHEMISTRY**	**CORE**	**5**	**5**

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 Familiarize themselves with chromatography.

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 and understand the fundamental concepts of organic compounds and analytical techniques.	K1
CO2	Describe the nature of hydrocarbons, errors and different analytical methods.	K2
CO3	Interpret the chemical reactions of hydrocarbons.	K3
CO4	Analysis different reactions of organic molecules.	K4
CO5	Explain the stability of organic molecules and application of Chromatography.	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.

SYLLABUS

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Alkanes and cycloalkanes:** 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, chlorosulfonation, oxidation reaction. Cycloalkanes - strain in ring compounds: Baeyer's Strain theory - preparation of cycloalkanes - chemical properties of cycloalkanes.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Alkenes and Alkynes:** 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. Alkynes - Introduction - preparation of alkynes - physical properties - addition of hydrogen, electrophilic and nucleophilic addition reactions - oxidation reactions - isomerization - polymerization reactions.	17	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Concept of aromaticity and benzene:** Introduction - structure of benzene - Kekule structure - resonance structure - orbital picture of benzene - resonance energy, stability of benzene - Huckels rule and aromaticity - aromaticity in benzene- preparation and chemical properties of benzene - Electrophilic substitution reactions of benzene - halogenation, nitration, alkylation, acylation and sulfonation.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

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.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Basics of Chromatography:** Chromatography – theory and practice: chromatograph (elution time and volume) - capacity factor- column efficiency - resolution - sample preparation - principle and applications of Thin layer chromatography and Column chromatography.	13	CO1 CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
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 - sample preparation in chromatography.	-	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.

Pedagogy

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

Course Designers

- **Dr. G. Sivasankari**
- **Dr. C. Rajarajeswari**

Semester III	Internal Marks: 40	External Marks: 60		
COURSE CODE	**COURSETITLE**	**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

"1" – 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 Books

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 Books

1. 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_Qrganic_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.
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 "2" – Moderate (Medium) Correlation
"3" – Substantial (High) 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. Murugeshan 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. Murugeshan 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 LearningPvt. Ltd, NewDelhi

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	
COURSECODE	**COURSE TITLE**	**CATEGORY**	**Hrs./ Week**	**CREDITS**
22UCH3GEC1	**CHEMISTRY IN EVERYDAY LIFE**	**GENERICELECTIVE 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 On the successful completion of the course, students will be able to	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 to daylife 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 lifestyle. 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 superphosphate.	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-toothpaste-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-nitrodye-azo dye - thiazole dye - methods of dyeing - direct dyeing-vat dyeing-mordantdyeinganddisperse 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).Text book of Ancillary Chemistry; Priya Publications, Karur.
2. Sharma,B.K.(2014).IndustrialChemistry;GOELpublishinghouse,Meerut,16th edition.
3. Jayashree Ghosh.(2006). Fundamental Concepts Applied Chemistry,S.Chand&Co.Publishers, 2nd edition.

Reference Books

1. Billmeyer, F.N.(1971).Text book of Polymer Science, Wiley Inter science.
2. Prakash.(2011).ComprehensiveIndustrialChemistry,PragatiPrakashan,Meerut.
3. Poucher,W.A., Joseph,A., &Brink. (2000). Jr. Perfumes, Cosmetics and Soaps, Springer.
4. De,A.K.(1990).EnvironmentalChemistry,NewAgeInternationalPublicCo.

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		
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs/Week**	**CREDITS**
23UCH4CC5	**INORGANIC AND ORGANIC CHEMISTRY**	**CORE**	**6**	**5**

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 On the successful completion of the course, students will be able to	Cognitive Level
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 "2"–Moderate (Medium) Correlation

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

Syllabus

UNIT	CONTENT	HOURS	COs	CONGNITIVE LEVEL
I	**Chemistry of d-Block Elements**: Position of d-block elements in the periodic table-electronic configuration-classification-general characteristics -atomic radii-ionic radii-metallic character-melting point and boiling point-atomic volume and densities-ionization energies-standard oxidation potential and 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 off Block Elements**: General characteristics of f block elements- comparative account of lanthanides and actinides-occurrence- oxidation state-magnetic properties-color and spectra-lanthanides and actinides-separation by ion exchange and solvent exchange methods- lanthanide and actinide contraction -chemistry of thorium and 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 organomagnesium compounds, organozinc compounds, organolithium, organocopper, organolead, organophosphorus and organoboron compounds	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Chemistry of Alcohols, phenols and Ethers:** Nomenclature-laboratory preparation **o**f alcohols-	18	CO1, CO2, CO3,	K1, K2, K3,

	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, laboratory preparation of ether, epoxides-physical properties-chemical properties-uses.		CO4, CO5	K4, K5,
V	**Stereo Chemistry:** 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 –*cis-trans* system-*E*-Z system. Racemic mixture-resolution of racemic mixture – Walden Inversion –conformational analysis of ethane and n-butane and cyclohexane.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self-Study for Enrichment:** **(Not to be included for end semester Examination)** Periodic table, classification of elements-periodic properties along the period and column. Different types of organic reaction. Different functional groups and their nature. Basics of symmetry and isomers.		CO1, CO2 CO3	K1, K2, K3, K4

Text books

1. PuriB. R, Sharma L. R, Kalia K. K. Principles of Inorganic Chemistry, 23rd edition, New Delhi, ShobanLalNagin 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.ConciseInorganicChemistry,20threvisededition,SultanChand& 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 (7^{th} edition), Pearson India, (2011)

Web resources

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

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

CO Number	CO Statement On the successful completion of the course, students will be able to	Knowledge Level
CO1	Recall the nature of acidic and basic radicals	K1
CO2	Identify the cations and anions present in the mixture	K2
CO3	Analyse 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	1	3	3	1	3	2	3	3	3	1

"1"– Slight(Low) Correlation "2"–Moderate(Medium)Correlation

"3"–Substantial(High) Correlation "-"indicatesthereisno 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://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/chemistry/lelm107.pdf
5. https://chemlab.truman.edu/files/2015/07/Inorganic-Qualitative-Analysis.pdf
6. https://www.teachmint.com/tfile/studymaterial/b-sc/inorganicchemistry/qualitativeanalysis/a9301386-a267-44c7-886a-09c64f439dcb

Pedagogy

Demonstration and practical sessions

Course Designer

❖ **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. Murugeshan R (2001), *Electricity and Magnetism,* S. Chand & Co. Pvt. Ltd, Thirdedition.
2. Murugeshan 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, Firstedition.

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 Pubications, India.
4. Donald P.Leach, Albert Paul Malvino, Goutam Saha, (2008), *Digital principle andApplications*, Mc Graw-Hill Publishing Company, 6th Editions, New York.
5. Vijayendran V, Viswanathan S, (2004), *Digital Fundamentals*, S. Viswanathan Printers Pvt. Ltd, Revised edition.

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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		ExternalMarks:75	
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs/ Week**	**CREDITS**
22UCH4GEC2	**FOODADULTERANTS AND HEALTH CARE**	**GENERIC ELECTIVE COURSE-II**	**2**	**2**

Course Objective

- To provide an understanding of food and nutrition
- To provide an understanding of thechemical 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 healthcare, balanced diet and role of water balance in health.

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	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	Recognizethesignificanceofnutrients,balanceddietandtypesofhealth 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 "-"indicatesthereisnocorrelation.

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- Primitivehealthcare: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 in toxication.	**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. SeemaYadav,FoodChemistry,Anmolpublishing(P)Ltd.,NewDelhi,2006.
2. AlexRamani,FoodChemistry,MJPpublishers,Chennai.,2009.
3. JayashreeGhosh,TextbookofPharmaceuticalChemistryS.Chand&Co.Publishers,NewDelhi, 2003.
4. S.Lakshmi,PharmaceuticalChemistry,S.Chand&Sons,NewDelhi,2004.

Reference Books:

1. ThomasM.Devlin,TextbookofBiochemistrywithClinicalCorrelations,JohnWiley&Sons;7th edition, 2010.
2. AshutoshKar,Medicinal Chemistry,NewAgeInternational, 2007.
3. JoshiA.S.,Nutrition&Dietetics,TataMcgrawhill,NewDelhi,1998.

WebReference

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	
COURSECODE	**COURSETITLE**	**CATERGORY**	**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 On the successful completion of the course, students will be able to	Cognitive Level
CO 1	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
"4" – Substantial (High) Correlation
"-"–Indicates there is No Correlation

Syllabus

1. Detection of adulterants in milk and milk products.

2. Detection of adulterants in oil.

3. Detection of adulterants in spices and condiments.

4. Detection of adulterants in food products.

5. Estimation of food colors. (Colorimetric analysis)

Text Books

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

Reference Books

1. GajananShrike, (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	Internal Marks:25	External Marks:75		
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs/ Week**	**CREDITS**
23UCH5CC6	**INORGANIC CHEMISTRY**	**Core Course**	**6**	**5**

Course Objective:

- To understand the structure, function and mechanism of metal and metal complexes.
- To impart basics and theories of coordination compounds.
- To study biologically important coordination compounds and biological elements

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 importance of biological elements and reactions of complexes.	K1, K2
CO2	Recognize the basic concepts of co-ordination and bioinorganic chemistry	K3
CO3	Examine the Werner theory, 10 Dq and MO diagramof octahedral complexes and biological functions of elements	K3
CO4	Analyze calcination, roasting, Sidgwick theory, stability, magnetic property of metal complexes and excess and deficiency of trace elements	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
"2"–Moderate(Medium)Correlation
"3"–Substantial (High)Correlation
"-"indicates there is no correlation

Syllabus

Unit	Content	Hours	COs	Cognitive Level
I	**UNIT-I 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 K4 K5
II	**UNIT-II: Coordination Compounds –II** Crystal filed theory - shapes of d orbitals- assumptions- splitting of d-orbitals in octahedral- tetrahedral and square-planar complexes - crystal fieldstabilization energy- factors affecting magnitude of 10Dq – color of the transition metal complexes – number of unpaired electron - magnetic properties ofoctahedral complexes– spectro chemical series – Jahn -Teller theorem.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
III	**UNIT -III: Stability of Metal Complex** Labile and inert complexes - thermodynamic stability and kinetic stability-stepwise and overall 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.	18	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
IV	**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 K5

V	**UNIT V: Bioinorganic Chemistry** Metal ions present in biological systems, classification of elements according to their action in biological system. Na/K-pump, carbonic anhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine. Iron and its application in bio-systems, Haemoglobin and myoglobin	**18**	**CO1** **CO2** **CO3** **CO4** **CO5**	**K1** **K2** **K3** **K4** **K5**
VI	Self-study: **(Not to be included for End Semester Examination)** Diagonal, trigonal and tetragonal distortion, instability constant – John Teller Distortion stabilization Energy		**CO1** **CO2** **CO3**	**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.
6. Huheey J. E., Keiter E. A. and Keiter R. L., Inorganic Chemistry – Principles of structure and reactivity, Pearson Education, 4th Ed. 2002.

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: Vollume II. Krishna Prakashan Media.

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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
6. https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/downloads/Essential_Trace)Elements.pdf
7. https://aiimsrishikesh.edu.in/documents/195_hb_structure_and_function_mbbs_2017_batch.pdf
8. https://www.arsdcollege.ac.in/wp-content/uploads/2020/04/Use-of-chelating-agents-in-medicine.pdf

Pedagogy

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

Course Designers

Dr. C. Rajarajeswari

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 On the successful completion of the course, students will be able to	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 KMnO4).
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.,

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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**
23UCH5CC7	**ORGANIC CHEMISTRY-I**	**CORE**	**6**	**5**

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
"2" – Moderate (Medium) Correlation
"3" – Substantial (High) 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

Dr. A. Sharmila

Semester V	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
23UCH5CC8	**PHYSICAL CHEMISTRY – I**	**CORE COURSE-VIII**	**6**	**5**

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 On the successful completion of the course, students will be able to	Cognitive Level
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 ¬ "2" – Moderate (Medium) Correlation ¬
"3" – Substantial (High) 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 Kp and Kc- 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 Spectroscopyand 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**

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 Spectroscop, 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 Uiversity Press.

4. Gabor a Sobarjai and Yimin Li, (2010). Introduction to Surface Chemistry and Catalysis, 2nd edition, John Wiley & Sons, New Jersey

Web References

1. https://ocw.mit.edu/courses/5-61-physical-chemistry-fall-2017/resources/electronic-spectroscopy-and-photochemistry/

2. https://www.chadsprep.com/chads-general-chemistry-videos/3-laws-of-thermodynamics-definition/)

3. https://www.slideshare.net/ImranNurManik/colligative-properties-of-dilute-solutions- manik

4. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.ssgopalganj.in%2Fonline%2FOnline%2520Class%2520520PPT%2FClass%252012%2FChemistry%2Fch%25205%2520ppt%2520surface%2520chemistry.pptx&wdOrigin=BROWSELINK

5. 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**
23UCH5DSE1A	**NUCLEAR AND INDUSTRIAL CHEMISTRY**	**DISCIPLINE SPECIFIC ELECTIVE - I**	**5**	**3**

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 On the successful completion of the course, students will be able to	Cognitive Level
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	Cognitive Level
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	K 1 K 2 K 3

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	**COURSETITLE**	**CATEGORY**	**Hrs/ Week**	**CREDITS**
23UCH5DSE1B	**BASICS OF NANOSCIENCE AND NANOTECHNOLOGY**	**DISCIPLINE SPECIFIC ELECTIVE – I**	**5**	**3**

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 On the successful completion of the course, students will be able to	Cognitive Level
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
"2" – Moderate (Medium) Correlation
"3" – Substantial (High) 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 CO2 CO3**	**K1, K2, K3**

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/1OhqFlDLhatyUEl1wA4-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
23UCH5DSE1C	POLYMER CHEMISTRY	DISCIPLINE SPECIFIC ELECTIVE	5	3

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

Text Books

1. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, (1978). Polymer Science Wiley Eastern Ltd., NewDelhi
2. Sharma, B.K, 1989, Polymer Chemistry, Goel Publishing House,Meerut.
3. Premamoy Ghosh, 2011, Polymer Scienceand Technology, 3rd edition, Tata McGraw HillEducation Private Limited, New Delhi.
4. George Odian, 2004, Principles of Polymerization, 4th edition, John Wiley andSons, 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 Scienceand 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

Dr. R.Subha

Semester: V	Internal Marks:40		External Marks: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 "2"–Moderate(Medium)Correlation
"3"–Substantial (High)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 Mannual 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://srmvalliammai.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	**COURSETITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UCH6CC9	**ORGANICCHEMISTRY-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 On successful completion of the course, the student will be able to	Knowledge Level
CO1	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, propertiesof 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 "2"–Moderate(Medium)Correlation

"3" – Substantial (High) 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 mono saccharides- interconversion. Ascending and descending series-muta rotation - 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	**CHEMISTRYOF PROTEINS ANDVITAMINS** Aminoacids: Zwitterion –isoelectric point-general methods of preparation and reactions of aminoacids. 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	**CHEMISTRYOFALKALOIDSANDTERPENOIDS** 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	**OXIDATIONANDREDUCTION** Oxidation: Osmium tetroxide – chromyl chloride – ozone – DDQ–dioxiranes- leadtetraacetate- seleniumdioxide–Dess-Martin reagent. Reduction: Catalytic hydrogenation usingWilkinson Catalyst – reduction with LAH, $NaBH_4$, tritertiarybutoxy aluminum 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-spincoupling, 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** **(Notto 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),AdvancedOrganicChemistry12th edition,SultanChand &Co., New Delhi.
2. Soni.P.L, (2006),Text Bookof Inorganic Chemistry, S.Chand &Co., NewDelhi.
3. Bhupinder Mehtaand Manju Mehta,(2015),OrganicChemistry,PrenticeHallofIndiaPvt Ltd., New Delhi.
4. Y.R. Sharma,(2007),Elementary Organic Spectroscopy,S .ChandPublishing, New Delhi.

ReferenceBooks

1. Finar I.L. (1996), Organic Chemistry Volume 1&2 (6th edition), Addison Wesley LongmanLtd., England.

2. Morrison R.T. and Boyd R.N. and Bhattacharya S.K. (2011) Organic Chemistry (7th edition) Pearson India.

3. TewariK.S.,VishilN.K.andMehotra.S.N(2001),AtextbookofOrganicChemistry(1st edition), Vikas Publishing House Pvt Ltd., New Delhi.

4. Pine.S.H,(1987),OrganicChemistry(5thedition),McGraw-HillInternationalBookCompany, New Delhi.

5. SeyhanN.Ege .,(2005)OrganicChemistry (5th edition),Houghton Mifflin Co.,NewDelhi

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_30063127202004180207 16.pdf
4. https://byjus.com/chemistry/infrared-spectroscopy/

Pedagogy

E-content,Lecture,PowerPointPresentation,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**
23UCH6CC10	**PHYSICAL CHEMISTRY-II**	**CORE CORSE**	**6**	**4**

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.

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

Syllabus

Unit	Content	Hours	COs	Cognitive 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 consulate 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 soluteonly. 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 spectroscopy: theory - stretching and bending vibrations (H2O and CO2) -important spectral regions for the characterization of functional groups-fingerprint region-qualitative relation of force constant to vibrational frequency. Applications of vibrational spectroscopy.	**18**	**CO1 CO2 CO3 CO4 CO5**	**K1 K2 K3 K4 K5**
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**	**K1 K2 K3**

Text Books

1. PuriB.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.Pragathipublisher,18thEdition
3. Akins, P. W.(2008).Physical Chemistry. Oxford, UK. Oxford UniversityPress,8th Edition.
4. AntropovL.I,(1977),Theoretical electrochemistry, Mir Publishers.
5. BanwellC.N(1994), Fundamentals of Molecular Spectroscopy, McGraw Hill Education, Noida.

Reference Books

1. GurdeepRajMaronS.HandLandoJ.B(1974),FundamentalsofPhysicalChemistry, Macmillan Publishers, New York.
2. Kaur.K,(2014),Spectroscopy, 16thedition,PragatiPrakashanEducationalPublisher.
3. SoniP.L,DharmarhaO.P.&DashU.N(2016),TextbookofPhysicalChemistry, 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	COURSETITLE	CATEGORY	Hrs / Week	CREDITS
23UCH6CC6P	GRAVIMETRIC ANALYSISAND PHYSICALPARAMETER(P)	CORE	4	3

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 On the successful completion of the course, students will be able to	Cognitive Level
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 "2"–Moderate(Medium)Correlation

"3"–Substantial (High)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 hydrationin 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).BasicPrinciplesofPractical Chemistry. 2nd edition. New Delhi, Sultan Chand & Sons.
2. Gnanaprakasam,N.S.&Ramamoorthi,G.(2007).OrganicChemistryLabManual,Newedition, SV printers.

ReferenceBooks

1. Furniss,B.S.(Ed.).(2011).Vogel'stextbookofpracticalorganicchemistry.PearsonEducation 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

Demonstrationand Practicalsessions

Course Designer

Dr.P.Thamizhini

Semester VI	Internal Marks: 40			External Marks:60
COURSECODE	COURSETITLE	CATEGORY	Hrs/Week	CREDITS
23UCH6DSE2AP	ANALYTICAL TECHNIQUES(P)	DSE	4	3

Course Objectives

- ➢ To acquire knowledge about performing analytical experiments.
- ➢ To gain more insights on analytical methods suchas 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	Identifythequalityofthegivencompoundsusingmethodssuchaschromatography, 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 "2"–Moderate(Medium)Correlation
"3"–Substantial(High)Correlation "-"indicatesthereisnocorrelation.

Syllabus

1. Paper Chromatography–Separation of mixture:

a) Sugars

b) Amino Acids

c) Dyes

d) Metalions

e) Indicators

2. Thin Layer Chromatography–Separation of mixture:

a) Nitro compounds.

b) Metalions

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.FifieldandD.Kealey(2000)PrinciplesandPracticeofAnalyticalChemistry, Blackwell Science Ltd.
2. R.V.Dilts(2010)AnalyticalChemistry:MethodsofSeparation,VanNostrand,NewYork.
3. Daniel,C.Harris(2015)QuantitativeChemicalAnalysis,WHFreeman.

Reference Books:

1. J.Mendham(2009)Vogel'sQuantitativeChemicalAnalysis,PearsonEducation.
2. V.Venkateswaran.&R.Veeraswamy&Kuandaivelu(1997)BasicPrinciplesofPractical 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			ExternalMarks:60
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs. / Week**	**CREDITS**
23UCH6DSE2BP	**COSMETIC CHEMISTRY(P)**	**DSE**	**4**	**3**

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	Interpretthemethods 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.

Reference Book

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**
23UCH6DSE2CP	**ANALYSIS OF HERBAL PRODUCTS (P)**	**DSE**	**4**	**3**

Course Objective

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

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 the principle and testing methods of Excipients of natural origins.	K1,K2
CO2	Isolate,identifyandestimatealkaloids,phenolcontent,aldehydespresentin 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