BACHELOR OF SCIENCE

IN

CHEMISTRY

CURRICULUM AND SYLLABUS

(FOR STUDENTS ADMITTED FROM

ACADEMIC YEAR 2020-2021 ONWARDS)

UNDER CHOICE BASED CREDIT SYSTEM

DEPARTMENT OF CHEMISTRY
CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
Nationally Re-Accredited (III Cycle) with 'A' grade (CGPA-3.41 out of 4)
by NAAC
TIRUCHIRAPPALLI -620 018

B.Sc. CHEMISTRY PROGRAMME EDUCATION OBJECTIVE

- Impart functional knowledge of all basic areas of chemistry which continue todevelop throughout the life time.
- Profitable Employment in Private/Government/professional sectors appropriate totheir interest, education and become a dynamic individual.
- Interdisciplinary approach helps in creating innovative ideas for the sustainable development.
- Develop leadership qualities in multi-disciplinary setting through ethical manner.
- Ability to identify and find the solutions to socio-economic environmental problemsfor the development of the country.

PROGRAMME OUTCOMES

- Curriculum enhances the basic concepts, skills in problem solving, critical thinkingand analytical reasoning in chemistry.
- Explore the new area of research with innovative ideas in novel chemistry and other scientific fields.
- Specific placement in R & D, chemical, pharmaceuticals, food products and life Oriented material industries.
- Crop up all the competitive group examinations.
- Imbibed ethical, moral and social values in personal life leading to highly culturedand civilized personality.

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
B.SC., CHEMISTRY COURSE STRUCTURE
UNDER CHOICE BASED CREDIT SYSTEM
(For the candidates admitted from the academic year 2020-2021)

Sem	Part	Course	Title	Subject code	Inst Hrs/ week	Credit	Exam Hrs	Marks		Total
								INT	EXT	
I	I	Language Course I (LC)	,f;fhy ,yf;fpak;	19ULT1	6	3	3	25	75	100
			Story, Novel, Hindi Literature-1 & Grammar-I	19ULH1						
			History of popular Tales Literature and Sanskrit story	19ULS1						
			Communication in French-I	19ULFI						
	II	English Language Course–I (ELC)	Functional Grammar for Effective Communication-I	19UE1	6	3	3	25	75	100
	III	Core Course-I (CC)	General Chemistry-I	19UCH1CC1	6	5	3	25	75	100
		Core Practical –I (CP)	Volumetric Analysis	19UCH1CC1P	3	3	3	40	60	100
		First Allied Course-I (AC)	Mathematics-I	19UCH1AC1	4	3	3	25	75	100
		First Allied Course-II (AC)	Mathematics-II	19UCH1AC2	3	-	-	-	-	-
	IV	UGC Jeevan Kaushal Life Skills	Universal Human Values	20UGVE	2	2	3	25	75	100
	Total				**30**	**19**				**600**
II	I	Language Course II (LC)	,dlf;fhy ,yf;fpaOk; GjpdOk;	19ULT2	6	3	3	25	75	100
			Prose, Dramma, Hindi Literature-2 & Grammar-II	19ULH2						
			Poetry Textual Grammer and Alakara	19ULS2						

			Communication in French-II	19ULF2						
	II	English Language Course –II (ELC)	Functional Grammar for Effective Communication-II	19UE2	6	3	3	25	75	100
	III	Core Course-II (CC)	General Chemistry-II	19UCH2CC2	6	5	3	25	75	100
		Core Practical –II (CP)	Organic Chemistry Practical - I	20UCH2CC2P	3	3	3	40	60	100
		First Allied Course- II (AC)	Mathematics-II	19UCH1AC2	4	3	3	25	75	100
		First Allied Course- III (AC)	Mathematics-III	19UCH2AC3	3	3	3	25	75	100
	IV	Environmental Studies	Environmental Studies	19UGES	2	2	3	25	75	100
	V	Extra Credit Course	SWAYAM ONLINE COURSE	To be fixed later	As per UGC Recommendation					
	Total				**30**	**22**				**700**
III	I	Language Course III (LC)	fhg;gpaOk; ehlfOk	19ULT3	6	3	3	25	75	100
			Medieval, Modern Poetry & History of Hindi Literature-3	19ULH3						
			Poetry Textual Grammer and Vakyarachana	19ULS3						
			Communication in French-III	19ULF3						
	II	English Language Course –III (ELC)	Reading and writing for Effective Communication -I	19UE3	6	3	3	25	75	100
	III	Core Course-III (CC)	General Chemistry-III	19UCH3CC3	6	5	3	25	75	100
		Core Practical – III (CP)	Semi-micro Analysis (P)	19UCH3CC3P	3	3	3	40	60	100

		Second Allied Course-I (AC)	Physics –I	19UCH3AC4	4	3	3	25	75	100
		Second Allied Course-I (AP)	Physics Practical	19UCH3AC1P	3	-	-	-	-	-
	IV	Non-Major Elective -I	Chemistry in Everyday life/ (Part I Tamil)/Basic Tamil (Part I-other Language)	19UCH3NME/ 19ULC3BT1/ 19ULC3ST1	2	2	3	25	75	100
	V	Extra Credit Course	SWAYAM ONLINE COURSE	To be fixed later	As per UGC Recommendation					
			Total		**30**	**19**				**600**
IV	I	Language Course IV (LC)	gz;dla ,yf;fpak	19ULT4	6	3	3	25	75	100
			Letter writing, General Essays, Technical Terms, Proverbs, Idioms & Phrases, Hindi Literature-4	19ULH4						
			Drama, History of Drama Literature	19ULS4						
			Communication in French-IV	19ULF4						
	II	English Language Course –IV (ELC)	Reading and Writing for Effective Communication-II	19UE4	6	3	3	25	75	100
	III	Core Course-IV (CC)	General Chemistry-IV	19UCH4CC4	5	5	3	25	75	100
		Core Practical – IV (CP)	Organic Qualitative Analysis (P)	19UCH4CC4P	3	3	3	40	60	100
		Second Allied Course-I (AP)	Physics Practical	19UCH3AC1P	3	3	3	40	60	100

		Second Allied Course-II (AC)	Physics II	19UCH4AC5	3	3	3	25	75	100
	IV	Non-Major Elective –II	Food Adulterants and Health Care/ (Part I Tamil)/Basic Tamil (Part I-Other Language)	19UCH4NME2/ 19ULC4BT2/ 19ULC4ST2	2	2	3	25	75	100
		Skill Based Elective-I	Forensic Chemistry	19UCH4SBE1A	2	2	3	25	75	100
			Food Chemistry	19UCH4SBE1B						
	V	Extra Credit Course	SWAYAM ONLINE COURSE	To be fixed later	As per UGC Recommendation					
	Total				**30**	**24**				**800**
V	III	Core Course-V (CC)	Inorganic Chemistry-I	19UCH5CC5	5	5	3	25	75	100
		Core Course-VI (CC)	Organic Chemistry-I	19UCH5CC6	5	5	3	25	75	100
		Core Course-VII (CC)	Physical Chemistry-I	19UCH5CC7	6	5	3	25	75	100
		Core Practical- V (CP)	Physical Chemistry (P)	19UCH5CC5P	3	3	3	40	60	100
		Major Based Elective-I	Nuclear and Industrial Chemistry	20UCH5MBE1A/	5	5	3	25	75	100
			Basics of Nanoscience and Nanotechnology	20UCH5MBE1B						
	IV	Skill Based Elective-II	Chemistry of Consumer Products (P) /	19UCH5SBE2AP	2	2	3	40	60	100
			Dye Chemistry (P)	19UCH5SBE2BP						
		Skill Based Elective-III	Water Analysis (P)/	20UCH5SBE3AP	2	2	3	40	60	100
			Biofuels (P)	19UCH5SBE3BP						
		UGC Jeevan Kaushal Life Skills	Professional Skills	19UGPS	2	2	3	25	75	100
	V	Extra Credit Course	Swayam Online Course	To be fixed later	As per UGC recommendations					
	Total				**30**	**29**				**800**
		Core	Organic	19UCH6CC8	6	5	3	25	75	100

VI	III	Course-VIII (CC)	Chemistry-II							
		Core Course-IX (CC)	Physical Chemistry-II	19UCH6CC9	6	5	3	25	75	100
		Core Practical-VI (CP)	Gravimetric Analysis and Physical Constants (P)	20UCH6CC6P	4	4	4	40	60	100
		Major Based Elective-II	Analytical Techniques (P)/	20UCH6MBE2A/	3	3	3	40	60	100
			Chemistry of Nanoscience (P)	20UCH6MBE2B						
		Major Based Elective-III	Polymer Chemistry/	19UCH6MBE3A/	5	5	3	25	75	100
			Pharmaceutical Chemistry	19UCH6MBE3B						
		Project Work	Dissertation	20UCH6PW	5	3	-	40	60	100
	V	Extension Activities	Extension Activities (EA)	19UGEA	-	1	-	-	-	-
		Gender Studies	Gender Studies	19UGGS	1	1	3	25	75	100
	Total				**30**	**27**				**700**
Grand Total					**180**	**140**				**4200**

Language Part – I - 4

English Part –II - 4

Core Paper - 9

Core Practical - 6

Allied Paper - 5

Allied Practical - 1

Non-Major Elective - 2

Skill Based Elective - 3

Major Based Elective - 3

Environmental Studies - 1

Value Education - 1

Professional Skills - 1

Project Work - 1

Gender Studies - 1

Extension Activities - 1

** Extension Activities shall be outside instruction hours

1. Non-Major Elective I & II – for those who studied Tamil under Part I

a) Basic Tamil I & II for other language students

b) Special Tamil I & II for those who studied Tamil upto 10th or +2 but opt for other languages in degree programme

2. Practical

Internal : 40

External : 60

3. Separate passing minimum is prescribed for Internal and External marks

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]

The passing minimum for University Examinations shall be 40% out of 60 marks [i.e. 24 marks]

Subject code 19UCH1CC1	General Chemistry -I	Category	L	T	P	Credit
		Core	90			5

Preamble

To enable the student to know about the atomic structure and periodic properties of elements. To know the different types of bonding, hybridization and MOT, basics of reactive intermediates. To learn the properties of gases and the theoretical aspects of volumetric and Qualitative Inorganic Analysis.

Course outcomes

On successful completion of this course, the student will be able to

CO	CO Statement	Knowledge Level
CO1	Plan to learn atomic orbitals, Classification of s, p, d & f block elements	K2
CO2	Explain the chemical boding	K2
CO3	Interpret the IUPAC nomenclature of compounds and cleavage of bonds	K2
CO4	Explain the Gaseous State of chemical sample	K2
CO5	Outline about the analytical experiments	K2

Mapping with Programme outcome

COs	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**S**	**S**
CO2	**M**	**S**	**S**	**M**	**S**
CO3	**S**	**M**	**S**	**S**	**M**
CO4	**M**	**M**	**S**	**S**	**M**
CO5	**S**	**S**	**M**	**M**	**M**

S- Strong; M-Medium

GENERAL CHEMISTRY –I

UNIT – I ATOMIC STRUCTURE AND PERIODIC PROPERTIES (18 Hrs)

Atomic Orbitals, quantum, numbers - Principal, azimuthal, magnetic and spin quantum numbers and their significance. Principles governing the occupancy of electrons in various quantum levels-Pauli's exclusion- principle, Hund's rule, Aufbau Principle, (n+1) rule, stability of half-filled and fully filled orbitals. - Classification as s, p, d & f block elements - variation of periodic properties along period and group – Electronegativity scale- Pauling's scale, Allred and Rochow's scale - Mulliken's scale -variation of metallic characters – Factors influencing the periodic properties.

UNIT – II CHEMICAL BONDING - I (18 Hrs)

Chemical Bond- definition - types of chemical bond- – Illustration. Intermolecular forces- dipole dipole interaction, induced dipole-induced dipole interaction. Hybridisation – Bond length, Bond energy, Bond angle- factors influencing BL, BE and BA. VB Theory- sp, sp^2, sp^3 hybridisation- geometry of NH_3, H_2O, ClF_3, IF_3. VSEPR theory, Molecular Orbital Theory – Homonuclear (H_2, He_2,O_2,O_2^+,O_2^-,N_2,F_2) and Heteronuclear molecules(CO, NO, HF).

UNIT – III BASICS OF ORGANIC COMPOUNDS (18 Hrs)

IUPAC nomenclature of compounds, Classification, Isomerism, types of isomerism, structural and stero isomerism, Cleavage of bonds: homolytic and heterolytic cleavages. Inductive, electromeric, mesomeric, resonance, hyperconjugation and steric effects. Reaction intermediates, carbocation, carbanion, free radicals, carbenes and nitrenes – generation, properties, structure and stability.

UNIT – IV GASEOUS STATE (18 Hrs)

The Gas constant "R" in different units - deviation from ideal behaviors - Van der Waal's equation for real gases. -Critical Phenomena – PV isotherms of real gases, critical temperature, continuity of state- relation between critical constants and van der Waals constants- Determination of critical volume – the law of corresponding states – reduced equation of state. - Molecular velocities – Root mean square, average and most probable velocities (derivation

from Maxwell-Boltzmann distribution equation)-Maxwell – Boltzmann distribution of molecular velocities (no derivation) - Collision number and mean free path - Collision diameter.

UNIT- V ANALYTICAL METHODS - I (18Hrs)

Storage and handling of chemicals, handling of acids, ethers, toxic and poisonous chemicals, threshold vapour concentration and first aid procedure. - Volumetric analysis- methods of expressing concentration- Primary and Secondary standards- Different types of titrations – Acid- Base Titrations, Tritimetric method, Iodimetry method -Iodometry Method, Complexometric Titration and Precipitation Titration. Qualitative Inorganic Analysis – Dry Test, Flame Test, Interfering acid radicals- Eliminating of Interfering acid radicals.

Text Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publisher's Name
1.	B. R. Puri , L.R. Sharma, K.K. Kalia,	2016	Principles of Inorganic Chemistry", 32nd edition	. "New Delhi, Shoban Lal Nagin Chand & Co
2.	R.D. Madan	2000	Modern Inorganic Chemistry", 2nd edition	S. Chand & Company Ltd
3.	P.L. Soni	2000	Text book of Inorganic Chemistry", 20th revised edition	Sultan Chand & Sons
4.	B. S. Bahl and Arun Bahl	1985	Text book of Organic Chemistry, 22nd Edition	S.Chand & Company Ltd.
5.	P.L. Soni	2012	Text book of Organic Chemistry	Sultan Chand & Sons

Reference Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publisher's Name
1.	B.R. Puri , L.R. Sharma, M.S. Pathania	2013	Principles of Physical Chemistry", 35th edition	New Delhi, Shoban Lal Nagin Chand & Co
2.	R. Gopalan, P.S. Subramanian & K. Rengaraja	2003	Elements of Analytical Chemistry", 2nd edition	Sultan Chand & Sons

Pedagogy

E-content , Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion,Video / Animation

Course Designer

- **Dr. G. Sivasankari,** Assistant Professor, Department of Chemistry
- **Ms. K. Kiruthika,** Assistant Professor, Department of Chemistry

Subject code 19UCH1CC1P	Volumetric Analysis	Category	L	T	P	Credit
		Core				3

Preamble

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

Course outcomes

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

CO	CO Statements	Knowledge Level
CO1	Recall the basic principles of volumetric analysis	K1
CO2	Demonstrate the experimental methods of volumetric analysis	K2
CO3	Compare the hardness present drinking water	K2

Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	M	S	M	S
CO3	S	S	S	S	M

S-Strong ; M- Medium

VOLUMETRIC ANALYSIS

Titrimetric Quantitative Analysis

1. Estimation of HCl Vs NaOH using a standard oxalic acid solution
2. Estimation of Na_2CO_3 Vs HCl using a standard Na_2CO_3 solution
3. Estimation of oxalic acid Vs $KMnO_4$ using a standard oxalic acid solution
4. Estimation of Iron (II) sulphate by $KMnO_4$ using a standard Mohr's salt solution
5. Estimation of Ca (II) Vs $KMnO_4$ using a standard oxalic acid solution.
6. Estimation of $KMnO_4$ Vs thio using a standard $K_2Cr_2O_7$ solution.
7. Estimation of Fe (III) by using $K_2Cr_2O_7$ using a standard Mohr's salt solution using internal and external indicators.
8. Estimation of copper (II) sulphate by $K_2Cr_2O_7$ solution
9. Estimation of Mg (II) by EDTA solution
10. Estimation of Ca (II) by EDTA solution
11. Estimation of As_2O_3 using I2 solution and standard Arsenous oxide solution.
12. Estimation of chloride (in neutral and acid media)

II. Applied Experiments

1. Estimation of Total Hardness of water
2. Estimation of Bleaching Powder
3. Estimation of saponification value of an oil
4. Estimation of copper in brass

Text Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publisher's Name
1.	V. Venkateswaran, R.Veeraswamy and A.R Kuandaivelu	1997	Basic Principles of Practical Chemistry", 2nd edition	New Delhi, Sultan Chand & Sons
2.	Bassett, J et al	1985	Text Book of Quantitative Inorganic Analysis, 4th edition	ELBS Longman

Course Designer

- **Ms. N. Anusuya,** Assistant Professor, Department of Chemistry
- **Ms. P. Thamizhini,** Assistant Professor, Department of Chemistry

Subject code	MATHEMATICS –I	Category	L	T	P	Credit
19UCH1AC1		Allied	60	4	-	3

Preamble

To equip the students with mathematical methods formatted for their major concepts and train them in basic Integrations.

Course Outcomes

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

CO	CO Statement	Knowledge Level
CO1	Explain the concepts of successive differentiation and Leibnitz theorem	K2
CO2	Describe curvature, radius of curvature in Cartesians	K2
CO3	Interpret the properties of definite integrals and evaluate them.	K2
CO4	Solve integrals by trigonometric substitution and by parts.	K3
CO5	Compute integrals of various types	K3
CO6	Apply reduction formula and evaluate the integrals.	K3
CO7	Compute double and triple integrals.	K3
CO8	Classify Fourier series for full range, half range and odd & even functions.	K3

Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	S	S	M
CO2	S	S	S	S	M	M
CO3	S	M	M	M	S	M
CO4	S	S	S	M	S	M
CO5	S	S	M	M	S	M
CO6	S	S	M	M	S	M
CO7	S	S	S	S	M	M
CO8	S	M	M	M	M	M

S-Strong ; M- Medium

CALCULUS AND FOURIER SERIES

UNIT- I SUCCESSIVE DIFFERENTIATION (15 Hrs)

Successive Differentiation - n^{th} derivative of standard functions (Derivation not needed) simple problems only - Leibnitz Theorem (proof not needed) and its applications- Curvature and radius of curvature in Cartesian only (proof not needed)–Simple problem in all these.

UNIT- II EVALUATION OF INTEGRALS (15 Hrs)

Evaluation of integrals of types

1] $\int \frac{px}{ax^2+bx+c}dx$ 2] $\int \frac{px+q}{\sqrt{ax^2+bx+c}}dx$ 3] $\int \frac{dx}{(x+p)\sqrt{ax^2+bx+c}}$ 4] $\int \frac{dx}{a+b\cos x}$

5] $\int \frac{dx}{a+b\sin x}$ 6] $\int \frac{(a\cos x+b\sin x+c)}{(p\cos x+q\sin x+r)}dx$

Integration by trigonometric substitution and by parts of the integrals

1] $\int \sqrt{a^2-x^2}\,dx$ 2] $\int \sqrt{a^2+x^2}\,dx$ $\int \sqrt{x^2-a^2}\,dx$

UNIT- III REDUCTION FORMULA (13 Hrs)

General properties of definite integrals – Evaluation of definite integrals of types

1] $\int_a^b \frac{dx}{\sqrt{(x-a)(b-x)}}$ 2] $\int_a^b (x-a)\sqrt{(b-x)}dx$ 3] $\int_a^b \sqrt{\frac{x-a}{b-x}}\,dx$

Reduction formula (when n is a positive integer) for

1] $\int e^{ax}x^n dx$ 2] $\int \sin^n x\,dx$ 3] $\int \cos^n x\,dx$ 4] $\int_0^{\frac{\pi}{2}} \sin^n x\,dx$ 5] $\int_0^{\frac{\pi}{2}} \cos^n x\,dx$ (with proof) and

6] $\int_0^{\frac{\pi}{2}} \sin^n x\cos^m x\,dx$ (without proof) and illustrations.

UNIT- IV DOUBLE AND TRIPLE INTEGRALS (10 Hrs)

Evaluation of Double and Triple Integrals in simple cases(Problems Only) - Changing the order and evaluating the double integration (Cartesian only).

UNIT –V: FOURIER SERIES **(7 Hrs)**

Definition of Fourier Series – Finding the Fourier Coefficients for a given periodic function with period 2π- Use of Odd and Even functions in evaluating Fourier Coefficients – Half range sine and cosine series.

DISTRIBUTION OF MARKS: THEORY 20% AND PROBLEMS 80%

Pedagogy

Assignment, seminar, Group Discussion.

Text Books

S.No.	Author's Name	Title	Publisher' s Name	Year of Publication
1	S. Narayanan, T.K. Manichavasagam Pillai	Calculus, Volume I.	S. Viswanathan Pvt Limited	2003
2	S. Narayanan, T.K. Manichavasagam Pillai	Calculus, Volume II.	S. Viswanathan Pvt Limited	2003
3	S. Narayanan, T.K. Manichavasagam Pillai	Calculus, Volume III.	S. Viswanathan Pvt Limited	2003

Chapters and Sections

S.No.	Unit	Chapter	Text Book	Sections
1	I	3	1	1.1-2.2
		10	1	2.1-2.3
2	II	1	2	7.3(TYPE-2), 8(CASE 2,5), 9
		1	2	8 (RELEVANT)
3	III	1	2	8 (RELEVANT),11,13.1-13.5
4	IV	5	2	2.1,3.1,4
5	V	6	3	1-7

Reference Book

S.No.	Author's Name	Title	Publisher	Year of Publication
1	S. Arumugam, Issac and Somasundaram	Trigonometry & Fourier series	New Gamma Publishers	1999

Course designers

- **Ms.P. SARANYA,** Assistant Professor, Department of Mathematics
- **Ms.S. VIDHYA,** Assistant Professor, Department of Mathematics

Subject code	MATHEMATICS-II	Category	L	T	P	Credit
19UCH2AC2		Allied	90	6	-	3

Preamble

To equip the students with mathematical methods formatted for their major concepts and train them in Algebra and Trigonometry.

Course Outcomes

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

CO	CO Statement	Knowledge Level
CO1	Define matrices and various procedures for solving matrices.	K1
CO2	Explain Binomial, Logarithmic and Exponential series.	K2
CO3	Describe skew lines, co planarity, sphere and several concepts on sphere.	K2
CO4	Classify series expansion of sine, cosines, and tangents in all manners.	K3
CO5	Compute using hyperbolic and inverse hyperbolic functions.	K3

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	S	S	M
CO2	S	M	M	M	M	M
CO3	S	S	S	M	S	M
CO4	S	S	M	M	S	M
CO5	S	S	M	S	S	M

S-Strong ; M- Medium

ALGEBRA, ANALYTICAL GEOMETRY(3D) AND TRIGONOMETRY

UNIT I SERIES EXPANSION (22 Hrs)

Binomial, Logarithmic and Exponential series (Formulae only) - Summation and Approximation related problems only.

UNIT II MATRICES (10 Hrs)

Non-Singular, Symmetric, Skew Symmetric, Orthogonal, Hermitian, Skew Hermitian and Unitary matrices – Rank of a matrix-consistency of matrices-Characteristic equation, Eigen values, Eigenvectors – Cayley Hamilton's Theorem (proof not needed) – Simple applications only.

UNIT III THREE DIMENSIONAL GEOMETRY (30 Hrs)

Skewlines-Finding the shortest distance between two Skew lines and the equation of the plane containing them –coplanar lines- Condition for Coplanarity – Equation of a Sphere – Tangent Plane – Plane Section of a sphere – Finding the center & radius of the circle of intersection – Sphere through the circle of intersection (Only problems in all the above).

UNIT IV EXPANSION OF TRIGONOMETRIC FUNCTIONS (10 Hrs)

Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ (n being a positive integer) – expansion of

$\sin^n \theta$, $\cos^n \theta$, $\sin^m \theta \cos^n \theta$ in a series of sines and cosines of multiples of θ (θ given in

radians) – Expansion of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of powers of θ (only problems in all the above).

UNIT V HYPERBOLIC FUNCTIONS (18 Hrs)

Euler's Formula for $e^{i\theta}$ - Definition of Hyperbolic functions – Formulae involving Hyperbolic functions – Relation between Hyperbolic and Circular functions – Expansion of sinhx, coshx and tanhx in powers of x – Expansion of Inverse hyperbolic functions

$\sinh^{-1} x$, $\cosh^{-1} x$ *and* $\tanh^{-1} x$ - Separation of real and imaginary parts of sin(x+iy), cos(x+iy),

tan(x+iy), sinh(x+iy), cosh(x+iy) and tanh(x+iy).

DISTRIBUTION OF MARKS: THEORY 20% AND PROBLEMS 80%

Pedagogy

Assignment, seminar, Group Discussion.

Text books

S.No	Authors	Title	Publishers	Year of Publication
1	T.K.Manichavasagam Pillai, T.Natarajan, K.S.Ganapathy	Algebra, Volume I	S. Viswanathan Pvt Limited	2004
2	T.K.Manichavasagam Pillai	Algebra, Volume II	S. Viswanathan Pvt Limited	2004
3	T.K.Manichavasagam Pillai and T.Natarajan	A Text book of Analytical Geometry Part-II 3D	New Gamma Publishers	1991
4	T.K.Manichavasagam Pillai and T.Narayanan	Trigonometry	S. Viswanathan Pvt Limited	2013

Chapters and sections

S.No.	Unit	Chapter	Text book	Sections
1	I	3	1	10,14
		4	1	3,7,9
2	II	2	2	1-16
3	III	3	3	7,8
		4	3	Fully
4	IV	3	4	Fully
5	V	4	4	Fully

Reference book

S.No.	Authors	Title	Publishers	Year of Publication
1	T.K.Manichavasagam Pillai	Analytical Geometry 3D and Vector calculus	New Gamma Publishers	1991

Course designers

- **Ms. P. SARANYA ,** Assistant Professor, Department of Mathematics
- **Ms. S. VIDHYA,** Assistant Professor, Department of Mathematics

Subject Code 19UCH2CC2	General Chemistry- II	Category	L	T	P	Credit
		Core	90		-	6

Preamble

To understand the basics of bonding, nucleophilic substitution and electrophilic addition reaction mechanism. To acquire more knowledge about the alkanes, solid and liquid state.The students realize the theoretical aspects of gravimetric and error analysis.

Course Outcomes

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

CO	CO Statement	Knowledge Level
CO1	Define the basics of bonding	K1
CO2	Recall the concepts of reaction mechanism	K1
CO3	Relate the knowledge of cycloalkanes	K2
CO4	Explain the basics of liquid and solid states.	K2
CO5	Outline about the analytical experiments.	K2

Mapping with program outcomes

CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**S**	**S**
CO2	**S**	**M**	**M**	**S**	**S**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**M**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S-Strong ; M- Medium

GENERAL CHEMISTRY –II

UNIT I CHEMICAL BONDING – II (18Hrs)

Ionic Bond – Lattice Energy- Born-Haber Cycle- Pauling and Mulliken's Scales of Electronegativity, Polarity in covalent bonds – Covalent Character of Ionic Bond - Fajan's rule - Effects of Polarisation- Percent ionic character- electronegativity difference. Dipole moment and structure of molecules – bond Characteristics –bond length and bond energy- Metallic bond and its properties. Coordinate bond – Hydrogen bond – London forces.

UNIT II ALKANES (18Hrs)

Definition, Nomenclature, Methods of preparation of alkanes, Properties and uses. Cycloalkanes- General methods of preparation, properties and uses. Stability of cycloalkanes – Bayer's Strain Theory , Sache- Mohr Theory, Conformational analysis of aliphatic system : Ethane, Propane, Butane - Cyclohexane and its derivatives- Conformations of mono and disubstituted cyclohexanes

UNIT III NUCLEOPHILIC SUBSTITUTION AND ELECTROPHILIC ADDITION REACTION MECHANISM (18 Hrs)

Substitution Reactions- Mechanism and stereochemistry of aliphatic nucleophilic substitution of SN_1, SN_2, SN_i – factors governing SN_1&SN_2 reactions- Aromatic nucleophilic substitution reaction - SN_{Ar} – benzyne intermediate. Addition Reactions- Classification- addition of carbon carbon multiple bond – carbon Hetero atom multiple bond, Michael Addition. Electrophilic Addition – Markovnikoff's rule and Anti- Markovnikoff's rule, Ozonolysis, Diels- Alder reaction, Epoxidation.

UNIT IV SOLID STATE AND LIQUID STATE (18Hrs)

Solid State – Crystalline and Amorphous Solids – Isotropy, Anisotropy and Interfacial Angles- Symmetry- Types- Elements of Symmetry-Point Groups- Unit Cell- Space Lattice and Bravais Lattice – Bragg's Equation- Derivation. Liquid State - Physical Properties of liquids – Vapour Pressure, Surface Tension, Viscosity, Refraction- their Determination. Liquid Crystals – Vapour Pressure- Temperture Diagram –Thermography – Classification of Thermotropic Liquid Crystals – Smectic Liquid Crystals, Nematric Liquid Crystals, Cholesteric, Liquid Crystals, Disc-shaped Liquid Crystals, Polymer Liquid Crystals

UNIT V ANALYTICAL METHODS – II (18Hrs)

Qualitative Inorganic Analysis – Group reagents and group separation- Test for Basic radicals. Gravimetric Analysis – Principles -Types of precipitation – co–precipitation, post precipitation - and precipitation from homogeneous solution-digestion, filtration and washing, drying and ignition. Error Analysis – Accuracy, Precision, Errors- types of errors- Determinate and Indeterminate errors – Mean, Median, Standard Deviation and Variance (Problems also)

Text Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publisher Name
1.	B. R. Puri , L.R. Sharma, K.K. Kalia,	2016	Principles of Inorganic Chemistry", 32nd edition	. "New Delhi, Shoban Lal Nagin Chand & Co
2.	R.D. Madan	2000	Modern Inorganic Chemistry", 2nd edition	S. Chand & Company Ltd
3.	P.L. Soni	2000	Text book of Inorganic Chemistry", 20th revised edition	Sultan Chand & Sons
4.	B. S. Bahl and Arun Bahl	1985	Text book of Organic Chemistry, 22nd Edition	, S.Chand & Company Ltd.
5.	P.L. Soni,	2012	Text book of Organic Chemistry	Sultan Chand & Sons

Reference Books

S. No.	Author Name	Year of publication	Title of the book	Publishers Name
1.	B.R. Puri , L.R. Sharma, M.S. Pathania	2013	Principles of Physical Chemistry", 35th edition	New Delhi, Shoban Lal Nagin Chand & Co
2.	R. Gopalan, P.S. Subramanian & K. Rengarajan	2003.	Elements of Analytical Chemistry", 2nd edition	Sultan Chand & Sons

Pedagogy

E-content, Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion,Video / Animation

Course Designer

- **Ms. K. Kiruthika,** Assistant Professor, Department of Chemistry
- **Dr. G. Sivasankari,** Assistant Professor, Department of Chemistry

Subject Code 20UCH2CC2P	Organic Chemistry Practical I	Category	L	T	P	Credit
		Core			3	3

Preamble

Enable the student to carry out the quantitative analysis of an organic substance and to perform the preparation of organic compounds and to determine the physical constants of it.

Course outcomes

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

CO	CO Statement	Knowledge Level
CO1	Find the physical constants of the organic compounds	K1
CO2	Demonstrate the estimation of organic compounds	K2
CO3	Prepare organic compounds using various reactions.	K3

Mapping with program outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**M**	**S**
CO2	**S**	**S**	**S**	**M**	**S**
CO3	**S**	**S**	**S**	**M**	**S**

S- Strong; M-Medium

ORGANIC CHEMISTRY PRACTICAL -I

1. PREPARATION OF ORGANIC COMPOUNDS (SINGLE STAGE)

a) Salicylic acid from methyl salicylate (Hydrolysis)

b) Acetanilide from aniline (acetylation)

c) m-Dinitrobenzene from Nitrobenzene (Nitration)

d) Benzoic acid from Benzaldehyde (Oxidation)

e) 2, 4, 6, tribromoaniline from aniline (Bromination)

2. QUANTITATIVE ANALYSIS (DEMONSTRATION)

a) Estimation of Ascorbic acid

b) Saponification value of an oil

3. PHYSICAL CONSTANTS

a) Determination of melting point and boiling point of the given organic compound.

Text Books

S.NO	Author Name	Year of Publication	Title of the book	Publisher Name
1.	Mohan.J	2003	Organic Analytical Chemistry- Theory and Practice	Narosa
2.	Ahluwalia.V.K, Bhagat.P and Agarwal.R	2005	Laboratory Techniques in Organic Chemistry	I. K. International
3.	Gnanaprakasam.N.S and Ramamurthy.G	2007	Organic Chemistry Lab Manual	S.Viswanathan Pvt.Ltd

Course Designer

- **Mrs. P. Pungayee Alias Amirtham,** Assistant Professor and Head, Department of Chemistry
- **Ms. A. Sharmila**, Assistant Professor, Department of Chemistry

Subject Code 19UCH2AC3	MATHEMATICS -III	Category	L	T	P	Credit
		Allied	60	4	-	3

Preamble

To equip the students with mathematical methods formatted for their major concepts and train them in the areas of PDE and Laplace transforms.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Define Laplace transforms and solve.	K1
CO2	Rephrase the partial differential equations by eliminating constants and arbitrary functions and solve various types of PDE's.	K2
CO3	Solve ordinary differential equations under several methods.	K3
CO4	Apply inverse Laplace transforms and solve second order ODE	K3
CO5	Classify vectors and vector differentiation	K3

Mapping with Programme Outcomes

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	S	M
CO2	S	M	S	S	S	M
CO3	S	S	M	M	S	M
CO4	S	S	M	M	S	M
CO5	S	M	S	M	S	M

S-Strong ; M- Medium

ODE, PDE, LAPLACE TRANSFORMS AND VECTOR ANALYSIS

UNIT I ORDINARY DIFFERENTIAL EQUATION (15 Hrs)

Ordinary Differential Equation of first order but of higher degree – Equation solvable for x, solvable for $\frac{dy}{dx}$, Clairaut's Form (simple cases only) – linear equations with constant coefficients – Finding Particular integrals in the cases of e^{kx}, sin(kx), cos(kx) (where k is a constant), x^k where k is a positive integer.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS (15 Hrs)

Formation of Partial differential equations by eliminating constants and by elimination of arbitrary functions – definition of general , particular & complete solutions–Singular integral (geometrical meaning not required) – Solutions of first order equations in the standard forms- f (p , q) = 0 , f (x , p , q) = 0 , f (y , p , q) = 0 , f (z , p , q) = 0, f1 (x, p) = f2 (y , q) , z = xp+yq+f(p,q) - Lagrange's method of solving Pp+Qq = R , where P,Q,R are functions of x,y,z – (Geometrical Meaning is not needed)-(only problems in all the above – No proof needed for any formula).

UNIT III LAPLACE TRANSFORMS (10 Hrs)

Laplace Transform – Definition – L(e^{at}) ,L(cos(at)) , L (sin (at)) L(t^n) , where n is a positive integer. Basic theorems in Laplace Transforms (formulae only)- L [e^{-st} cos bt], L [e^{-st} sin bt], L [e^{-st} f (t)] – L [f (t)], L[f' (t)], L [f '' (t)] .

UNIT IV INVERSE LAPLACE TRANSFORMS (10 Hrs)

Inverse Laplace Transforms related to the above standard forms – Solving Second Order ODE with constant coefficients using Laplace Transforms.

UNIT V VECTOR DIFFERENTIATION (10 Hrs)

Gradient of a vector – directional derivative – unit normal vector - tangent plane – Divergence- Curl – solenoidal & irrotational vectors – Double operators - Properties connecting grad., div., and curl of a vector.

Distribution of Marks: THEORY 20% AND PROBLEMS 80%

Pedagogy

Assignment, seminar, Group Discussion.

Text Books

S.No	Authors	Title	Publishers	Year of publication
1.	S. Narayanan, T.K. Manicavachagam Pillai	Differential Equations and its applications	S. Viswanathan Pvt Limited	2013
2.	P.R.Vittal & V.Malini	Vector Analysis	Margham Publications	2016

Chapters and sections

S.No.	Unit	Chapter	Text book	Sections
1.	I	4	1	1-4
2.	II	12	1	1-5.4
3.	III	9	1	1-5
4.	IV	9	1	6-8
5.	V	1	2	FULL SECTION

Reference Books

S.No	Authors	Title	Publishers	Year of publication
1.	S. Narayanan, T.K. Manicavachagam Pillai	Calculus, Vol. III	S. Viswanathan Pvt Limited	2003
2.	M.L. Khanna	Differential Calculus	Jaiprakashnath and Co.,	2004

Course Designers

- **Ms. P. SARANYA,** Assistant Professor, Department of Mathematics
- **Ms. S. VIDHYA ,** Assistant Professor, Department of Mathematics

CORE COURSE-III
GENERAL CHEMISTRY-III

Semester-III	GENERAL CHEMISTRY-III	Hours/Week-6	
Core Course-III		Credit-5	
Course Code-19UCH3CC3		Internal 25	External 75

Objectives

- This course helps to learn the chemistry of s and p-block elements
- To know the properties of inter halogen compounds.
- To learn the stereochemistry of organic molecules and thermodynamics.

Course Outcomes

On successful completion of this course, the student will be able to

CO	CO Statement	Knowledge Level
CO1	Recall the basic concepts of s and p-block elements	K1
CO2	Demonstrate the preparation and properties of organo metallic compounds.	K2
CO3	Analyze the concepts of thermodynamics	K2
CO4	Outline the basics of qualitative and quantitative analysis.	K2
CO5	Identify the stereochemistry of organic molecules	K3

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**
CO3	**S**	**S**	**S**	**M**	**S**
CO4	**M**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**S**	**M**	**S**

S- Strong; M-Medium

SEMESTER-III
GENERAL CHEMISTRY-III

UNIT I s and p- BLOCK ELMENTS (**18 Hrs)**

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, Borazine, Boron nitride, Boron trihalide, diborane, Compounds of silicon - Silicates , Silicones, $SiCl_4$.

UNIT II CHEMISTRY OF ORGANOMETALLIC COMPOUNDS (**18 Hrs)**

Grignard reagent – preparation-nucleophilic addition, substitution reaction, organolithium compounds – preparation, reactions with α, β-unsaturated ketones, vinyl halides, CO_2 and aryl halides – uses. Frankland's reagent – preparation, reactions with less electropositive metal chloride, aryl halide and Reformatsky reaction – uses. Gilmann reagent – preparation, reactions with cyclo alkyl and aryl halide – uses. Tetra ethyl lead (TEL) – preparation, properties and uses.

UNIT III STEREOCHEMISTRY (**18 Hrs)**

Principles of symmetry – symmetry elements (Cn, Ci and Sn) - asymmetry and dissymmetry – isomerism – constitutional isomers - stereoisomers – enantiomers – diastereomers - geometrical isomerism – meso and dl compounds - conventions used in stereochemistry: Newman, Sawhorse and Fischer notations and their interconversions. Cahn-Ingold-Prelog rules for simple molecules - R, S and E,Z notations to express configurations. Chirality - optical isomerism - optical activity – polarimeter – specific rotation - stereochemistry of allenes and spiranes. Resolution of racemic mixture – conformational analysis of ethane, n-butane, cyclohexane.

UNIT IV THERMODYNAMICS-I (**18 Hrs)**

Definitions- system and surrounding- isolated, closed and open system- state of the system- Intensive and extensive variables. Significance and limitations of thermodynamic processes such as reversible and irreversible, adiabatic, isothermal, isobaric, isochoric and cyclic process. State and path functions, Zeroth law of thermodynamics, Work of expansion at constant pressure and volume. First law of thermodynamics - internal energy (E), enthalpy (H) and heat capacity. Relationship between Cp and Cv. Calculation of w, q, dE and dH for expansion of

ideal and real gases under isothermal and adiabatic conditions of reversible and irreversible processes, Joule – Thomson effect.

UNIT V QUALITATIVE AND QUANTITATIVE ANALYSIS (18 Hrs)

Principles of qualitative analysis- Solubility product-ionic equilibiria-common ion effect-Steps to reduce in consumption of chemicals and cost incurred, Less common but highly effective ecofriendly test -complexation reaction-spot test in qualitative analysis. Estimation of commercial samples- determination of percentage purity of samples-bleaching powder, washing soda- estimation of glucose and phenol.

Text Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publisher's Name
1.	B. R. Puri , L.R. Sharma, K.K. Kalia,	2016	Principles of Inorganic Chemistry"	32nd edition "New Delhi, Shoban Lal Nagin Chand & Co
2.	R.D. Madan	2000	Modern Inorganic Chemistry", 2nd edition	S. Chand & Company Ltd
3.	Puri B.R., Sharma L.R. and Pathania M.S.	2013	Principles of Physical Chemistry	35 th edition, New Delhi: ShobanLal Nagin Chand and Co.
4.	Morrison R.T, Boyd R.N, and Bhattacharjee S. K	2011	Organic Chemistry	7th edition, Pearson India
5.	B. R. Puri , L.R. Sharma, K.K. Kalia	2014	Principles of Inorganic Chemistry	32nd edition "New Delhi, Shoban Lal Nagin Chand & Co

Reference Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publisher's Name
1.	Lee, J.D	2000	Concise Inorganic Chemistry	20th revised edition Sultan Chand & Sons
2.	Gurdeep Raj	2000	Advanced Inorganic Chemistry	20th revised edition Sultan Chand & Sons

3.	Puri B.R., Sharma L.R. and Kalia K.C	2014	Principles of organic Chemistry	30th edition, New Delhi: Milestone publishers and distributors
4.	Glasstone S. and Lewis D	2009	Elements of Physical Chemistry	London, Mac Millan Co Ltd.
5.	Gopalan R	2012	Text Book of Inorganic Chemistry	2nd Edition, Hyderabad, Universities Press, (India)

Pedagogy

E-content, Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Mini project,Video / Animation

Course Designers

- **Dr. K. Uma Sivakami,** Assistant Professor, Department of Chemistry
- **Ms. N. Anusuya** Assistant Professor, Department of Chemistry

CORE PRACTICAL-III

SEMIMICRO ANALYSIS

Semester-III	SEMIMICRO ANALYSIS	Hours/Week-3	
Core Practical-III		Credit-3	
Course Code-19UCH3CC3P		Internal 40	External 60

Objectives

- To learn the techniques of semi micro qualitative analysis of inorganic salt mixtures.
- To study the acidic and basic radicals.
- To learn the separation of groups.

Course outcomes

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

CO	CO Statements	Knowledge Level
CO1	Recall the acidic and basic radicals	K1
CO2	Identify the cations and anions present in the mixture	K1
CO3	Demonstrate the experimental methods of group separation	K2

Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	M	S	M	S
CO3	S	S	S	S	M

S-Strong ; M- Medium

SEMESTER-III
SEMIMICRO ANALYSIS

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, cadmium, iron, aluminium, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium.

Anions to be studied:

Carbonate, Sulphide, Sulphate, nitrate, chloride, fluoride, borate, oxalate and phosphate.

Text Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publishers
1.	V. Venkateswaran, R.Veeraswamy and A.R Kuandaivelu	1997	Basic Principles of Practical Chemistry, 2nd edition	Sultan Chand & Sons, New Delhi

Course Designers

- **Dr. K. Uma Sivakami,** Assistant Professor, Department of Chemistry
- **Ms. P. Thamizhini,** Assistant Professor, Department of Chemistry

Semester-III	PHYSICS I	Hours/Week-4	
Second Allied Course-I		Credits-3	
Course Code – 19UCH3AC4		Internal 25	External 75

Objectives

- To know the basic concepts of properties of matter and mechanics
- To acquire the knowledge in thermodynamics, radiation and heat conduction
- To impart the ideas of semiconductors and the working functions of transistor

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
	Recall the basic concepts of properties of matter, laws of gravitation, heat, light and electronics.	K1
CO2	Outline the fundamental concepts of mechanics.	K2
CO3	Summarize the concepts of thermodynamics and recognize their applications in various real world problems.	K2
CO4	Explain the behavior of light and apply the concepts of light.	K2,K3
CO5	Identify the applications of electronics in modern gadgets.	K3
CO6	Make use of the knowledge of physics in day to day life.	K3

Mapping with program outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	S	M
CO2	S	S	M	M	S	M
CO3	S	S	S	M	S	M
CO4	S	S	S	M	S	M
CO5	S	S	S	S	S	M
CO6	S	S	S	S	S	M

S-Strong, M-Medium, L- Low

Syllabus

Unit–I: Elasticity, Viscosity & Gravitation **15 hrs**

Elasticity : Stress – Strain – Young's modulus – Relations between elastic constants & Poisson's Ratio –Bending of beams – Expression for the bending moment – Measurement of Young's modulus by bending of a beam – Non uniform bending and Uniform bending.

Viscosity: Streamline flow and Turbulent flow – critical velocity - Poiseuille's formula – Determination of coefficient of viscosity of a liquid (Stoke's Method)

Unit–II: Mechanics **10 hrs**

Basic concepts and definition in Mechanics – Newton's laws – Conservation laws.

Gravitation: Newton's laws of gravitation – Kepler's laws of planetary motion – Deduction of Newton's law of gravitation – Determination of G – Boy's method - Centre of Gravity of a solid hemisphere – Hollow hemisphere – Centre of Gravity of a solid cone – Centre of Gravity of a solid tetrahedron.

States of Equilibrium: Equilibrium of a rigid body – Examples for Stable, unstable and

Neutral equilibrium – Stability of Floating bodies – Metacenter – Determination of metacentric height of a ship**.**

Unit-III: Thermal Physics **12 hrs**

Thermodynamics: Laws of thermodynamics – Reversible and irreversible process– Second law of thermodynamics – Entropy – Heat engine – Carnot's theorem.

Radiation: Black body – Stefan's law – Newton's law of cooling – Newton's law of cooling from Stefan's law – Experimental determination of Stefan's constant – Wien's displacement law – Rayleigh – Jean's law – Planck's law – Angstrom Pyrheliometer.

Heat Conduction: Coefficient of Thermal Conductivity –Determination of Thermal Conductivity of a bad Conductor by Lee's disc method.

Unit-IV: Optics **12 hrs**

Geometrical Optics: Spherical aberration of a thin lens – Methods of reducing spherical aberration –Spectrometer – Determination of Refractive Index.

Interference: Introduction – Air wedge – Newton's rings – Colors of thin films.

Diffraction: Plane diffraction Grating – Theory of plane transmission Grating.

Polarization: Nicol Prism – Nicol Prism as Polarizer and Analyzer – Laurent's half Shade Polari meter.

Unit-V: Electronics **11 hrs**

Semiconductors: Intrinsic and extrinsic semiconductor.

Diodes : PN Junction diode – V-I characteristics of junction diode –Zener diode – Characteristics of Zener diode.

Transistor: Transistor – Characteristics of transistor – CB, CE mode Relation between α and β– Transistors as an amplifier.

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	R. Murugeshan	Properties of matter	S. Chand & Co. Pvt. Ltd	2012	Revised edition
2.	1.Narayanamoorthy 2.N. Nagarathinam	Dynamics Statics	The National Publishing Company , Chennai	1991	Reprint edition
3.	1.Brijlal 2.Subramaniyam	Heat and Thermodynamics	S. Chand & Co. Pvt. Ltd	2007	Revised color edition
4.	1.Dr.N.Subramaniyam , 2.Brijlal 3.Dr.M.N.Avathanulu	Optics	S. Chand & Co. Pvt. Ltd	2012.	Revised color (25^{th})edition

5.	1.Mehta V.K 2.RohitMetha	Principles of Electronics	S. Chand & Co. Pvt. Ltd	2014	9 TH Revised color edition

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	1.Brijlal 2.Subramanian	Properties of matter	S. Chand & Co. Pvt. Ltd	2005	Revised edition
2.	D.S.Mattur	Properties of matter	S. Chand & Co. Pvt. Ltd	2014	Revised edition
3.	1.Brijlal 2.Subramaniyam,	Thermal Physics	S. Chand & Co. Pvt. Ltd	2001	Revised edition
4.	1.Murugeshan& 2.Kiruthiga Sivaprasath	A Text Book of Optics	S. Chand & Co. Pvt. Ltd	2012.	9 TH Revised edition
5.	1.V.Vijayendran, 2.S.Viswanathan	Digital Fundamentals	S. Viswanathan Printers Pvt. Ltd	2004	Revised edition

Pedagogy

Lecture, Lecture with discussion, Power point Presentation, group discussion, seminar, Interaction, Problem solving, Demonstration, Debate, Quiz

Course Designer

Ms. P. Saranya

Semester-III & IV	**ALLIED PHYSICS PRACTICAL I**	**Hours/Week-3**	
Second Allied Course- I (AP)		**Credits-3**	
Course Code-19UCH3AC1P		**Internal** **40**	**External** **60**

Objectives

To acquire basic skills about modulus of elasticity and specific heat capacity of liquids.

- To study about light experiments involving Newtons rings and airwedge.
- To gain practical knowledge in gates and its applications.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Find applications of physics experiments in real world appliances.	K1
CO2	Build practical hands on experience by various techniques.	K2
CO3	Compare the experimental values with standard values.	K3
CO4	Apply the theory to design basic electrical circuits.	K3

Mapping with program outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	M	M
CO2	S	S	S	S	M	M
CO3	S	S	M	M	M	M
CO4	S	S	S	S	M	S

S-Strong**, M-**Medium**, L-** Low

List of experiments (Any Twelve Experiment)

1. Young's Modulus Non Uniform Bending – Pin & Microscope
2. Acceleration due to gravity – Compound Pendulum
3. Viscosity if highly viscous liquid – Stoke's Method
4. Surface Tension – Drop Weight Method
5. Specific Heat Capacity of liquid – Newton's law of Cooling
6. Refractive index of prism –Spectrometer
7. Refractive index of Liquid–Spectrometer
8. Concave lens – Determination of Focal length and Refractive index
9. Newton's Rings – Radius of curvature
10. Air wedge – Thickness of wire
11. Junction diode Characteristics
12. Zener diode Characteristics
13. Meter Bridge – Specific Resistance of a coil
14. Carey Foster's Bridge - Specific Resistance of a coil
15. Post office Box- Determination of Temperature Coefficient
16. Potentiometer – Low range voltmeter Calibration
17. Basic Logic Gates
18. Verification of NAND and NOR as universal gates
19. Verification of De – Morgan's Theorem
20. Verification of Boolean algebra (any five)

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	Dr.S.Somasundaram	Practical Physics	Apsara publications, Tiruchirappalli	2012	Revised
2.	R. Sasikumar	Practical Physics	PHI Learning Pvt. Ltd, New Delhi	2011	Revised

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	S.Srinivasan	A Text Book of Practical physics	S.Sultanch and publications	2001	Revised edition
2.	Department of Physics	Practical Physics,	St.Joseph's College, Tiruchirapalli	2011	Revised edition

Pedagogy

Demonstration and practical sessions

Course Designer

Ms. P. Saranya

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SEMESTER - III	BASICS IN NUTRITION	HOURS / WEEK - 2	
NON-MAJOR ELECTIVE I		CREDIT - 2	
COURSE CODE – 19UND3NME1		INTERNAL 25	EXTERNAL 75

Objectives

- To gain basic knowledge on nutrients
- To understand the classification of nutrients
- To get insight into the role of nutrients in maintaining health of the individual and community

Course Outcomes

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

CO Number	CO statement	Knowledge level
CO 1	Define principles in basic nutrition	K1
CO 2	Explain nutrient classifications and deficiency disorders of macro nutrients	K2
CO 3	Illustrate the sources, requirement and functions of micro nutrients	K2
CO 4	Interpret the assessment of nutritional status	K2
CO5	Apply techniques in nutritional education	K3

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5
CO1.	S	S	M	M	S
CO2.	S	S	M	M	S
CO3.	S	S	M	M	S
CO4.	S	S	M	M	S
CO5.	S	S	M	M	S

S- Strong; M-Medium

Syllabus

UNIT I **(4 Hours)**

Basics in Nutrition - Definition of Nutrition, Importance of nutrition for health, Basic five food groups, portion size of foods and the functions of food, Food pyramid, Definition and classifications of nutrients, RDA, factors affecting RDA.

UNIT II **(8 Hours)**

a. Carbohydrates – Nutritional classification, functions, Sources, requirement and deficiency effects. Role of fibre in human Nutrition

b. Protein – Nutritional classification, functions, sources, requirement and deficiency disorders.

c. Lipids – Classification, functions, sources, requirement, excess and deficiency effects.

UNIT III **(8 Hours)**

a. Vitamins – Fat soluble vitamins A, D, E and K - functions, sources, requirements and deficiency diseases, Water soluble vitamins – B vitamins like thiamine, Riboflavin, Niacin, Pyridoxin, Folic acid, B12 and Vitamin C - functions, sources, requirements and deficiency diseases.

b. Minerals – Calcium, phosphorus, Sodium, Potassium, Iron, Iodine, Flourine - functions, sources requirements and deficiency diseases.

c. Water – Need and Importance

UNIT IV **(6 Hours)**

Basics of assessing nutritional status – Anthropometric measurements (BMI, WHR, Broka's Index), Biochemical, Clinical and Dietary (24 hour recall method and Food Frequency Method)

UNIT V **(4 Hours)**

Nutrition Education –Tools, Steps, Nutrition education for Prevention of underweight, overweight, obesity, anaemia and diabetes mellitus

Text Books

S.No.	Author name	Year of Publication	Title of the book	Publisher name
1.	Srilakshmi B	2012	Nutrition Science	New Age International Publishers, New Delhi
2.	SwaminathanM	2012	Hand book of Food and Nutrition	Bangalore printing and publishing co., Ltd, Bangalore
3.	Raheena Begum M	2012	A Text Book of Foods, Nutrition and Dietetics	Sterling publishers private Limited,

Reference Books

S.No.	Author name	Year of Publication	Title of the book	Publisher name
1.	Gajalakshmi R	2014	Nutrition Science	CBS Publishers and distributors Pvt Ltd, New Delhi,
2.	Indrani T.K	2008	Nursing Manual of Nutrition and Therapeutic Diet,	Jaypee Brothers, Medical publishers (p) Ltd, New Delhi,
3.	Shubhangini Joshi A,	2014	Nutrition and Dietetics	MC Graw Hill Education (India) (P) Ltd, New Delhi,
4.	Srilakshmi B,	2014	Nutrition Science	New Age International Publishers, New Delhi

Journals:

- Journal of the Korean Society of Food Science and Nutrition, Korean Society of Food Science and Nutrition, South Korea.
- Food and Agricultural Immunology, Taylor & Francis, England.
- Nutrition and Food Science, Emerald Group Publishing Ltd, United Kingdom.

Web links:.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3995129/
http://www.tuscany-diet.net/carbohydrates/classification-functions/
https://www.nia.nih.gov/health/vitamins-and-minerals

Pedagogy: E-content, Lecture, Power point presentation, Seminar, Assignment

Course Designers

- Ms. E. Agalya
- Ms. S. Fathima

CORE COURSE – IV
GENERAL CHEMISTRY-IV

Semester-IV	GENERAL CHEMISTRY-IV	Hours/Week-6	
Core Course-IV		Credit-5	
Course Code-19UCH4CC4		Internal	External
		25	75

Objectives

- To compare the characteristics of d- and f- elements.
- To classify acids and bases and to learn about hydroxyl derivatives and thermodynamics laws.
- To understand the chemical kinetics.

COURSE OUTCOMES

CO	CO Statement	Knowledge Level
CO1	Compare the different characteristics of d- and f- block elements	K2
CO2	Classification of acids and bases	K2
CO3	Understand preparation, properties and reactions of hydroxyl derivatives.	K2
CO4	Apply the first and second law of thermodynamics	K3
CO5	Analyze the terms of chemical kinetics	K4

MAPPING WITH PROGRAMME OUTCOME

CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	M
CO2	M	M	S	M	S
CO3	M	M	M	S	S
CO4	M	M	S	S	M
CO5	M	M	M	M	M

S- Strong; M- Medium

SEMESTER -IV

GENERAL CHEMISTRY-IV

UNIT I: TRANSITION ELEMENTS AND INNER TRANSITION ELEMENTS (18 Hrs)

General characteristics of d-block elements-relative stabilities of their oxidation states - comparative treatment with their 3d analogues in respect of ionic radii - oxidation states - magnetic behavior- Lanthanides- position in the periodic table - characteristics of lanthanides- occurrence - electronic configuration - oxidation states - atomic and ionic radii - lanthanide contraction -causes & consequences - color - magnetic properties and complex formation - Actinides -characteristics occurrence - electronic configuration- oxidation states- ionic radii - color - magnetic properties and complex formation- comparison between lanthanides and actinides.

UNIT II: ACIDS, BASES & NON-AQUEOUS SOLVENTS (18 Hrs)

Acids and bases - Arrhenius - Lowry - Bronsted - Lewis concept of acids and bases - strengths -heterogeneous acid base reactions - hard-soft acids and bases (HSAB) classification Pearson's HSAB concept - acid base strength - hardness and softness - physical properties of solvent - types of solvents - their characteristics reactions in non-aqueous solvents with reference to liq NH_3 - liq SO_2 - THF.

UNIT III: HYDROXY DERIVATIVES (18 Hrs)

Aliphatic alcohols: preparation by hydroboration - oxidation - reduction of carbonyl compounds- epoxidation - Grignard synthesis - haloform reaction- reactions with reference to C-OH and O-H bond cleavage- phenol - preparation - physical properties -hydrogen bonding - reactions - acidity -ether and ester formation- mechanism of ring substitution - nitration - sulphonation – halogenation -Friedel-Craft’s reaction - Kolbe’s reaction - Riemer-Tiemann reaction

UNIT IV: THERMODYNAMICSII (18 Hrs)

Application of first law of thermodynamics -standard state - standard enthalpy of formation - Hess's law of constant heat summation - enthalpy of solution - enthalpy of dilution - enthalpy of neutralization - enthalpy of ionization and enthalpy of formation - bond dissociation energy - Kirchoff's equation - relation between ΔH and ΔU spontaneous processes - heat engine - Carnot cycle and its efficiency - statements of second law - refrigeration cycle - thermodynamic scale of temperature -entropy as a state function

UNIT V: CHEMICAL KINETICS **(18 Hrs)**

Rate of reaction- rate equation- order - molecularity of reaction - rate laws - rate constants: derivation of first order rate constant - characteristics of zero order - first order, pseudo first order and second order reactions - derivation of time for half change ($t_{1/2}$) - methods of determination of order of reactions: experimental methods and determination of rate constant of a reaction by volumetry - colorimetry - polarimetry - effect of temperature on reaction rate- concept of activation energy- energy barrier - Arrhenius equation

TEXT BOOKS

S. No	Author name	Year of Publication	Title of the book	Publisher name
1.	B.R. Puri, L.R. Sharma, K.K. Kalia	1993	Principles of Inorganic Chemistry	23rd edition, New Delhi, Shoban Lal Nagin Chand & Co.,
2.	M.K Jain, S.C. Sharma	2017	Modern organic Chemistry	Vishal Publishing Co; Golden Jubilee Year edition
3.	Gurtu J. N. and Amit Gurtu	2016	Physical Chemistry-I	Pragati Prakashan, Meerut
4.	Morrison R.T. and Boyd R.N., Bhattacharjee S. K	2017	Organic Chemistry	7th edition, Pearson India
5.	Puri B.R. Sharma L.R. and Pathania M.S.	2013	Principles of Physical Chemistry	35th edition, New Delhi: Shoban Lal Nagin Chand and Co.

REFERENCE BOOKS

S.No	Author name	Year of Publication	Title of the book	Publisher name
1	J.D. Lee	2000	Concise Inorganic Chemistry	20th revised edition Sultan Chand & Sons
2	Gurdeep Raj	2000	Advanced Inorganic Chemistry	20th revised edition Sultan Chand & Sons
3	Glasstone S. and Lewis D	2009	Elements of Physical Chemistry	London, Mac Millan Co Ltd.
4	Samuel Glasstone	1974	Thermodynamics for Chemists	(3rd printing), East-West Edn.
5	Paula Yurkanis Bruice	2001	Organic Chemistry	Eighth Edition

Pedagogy

Lecture, Lecture with discussion, Demonstrations, Group discussion, Debate, Seminar, Quiz, Video clippings, Flip learning, and E-Content

Course Designers

- **Dr. M. Letticia**, Assistant Professor, Department of Chemistry
- **Ms. A. Sharmila**, Assistant Professor, Department of Chemistry

CORE COURSE – IV

ORGANIC QUALITATIVE ANALYSIS

Semester-IV	ORGANIC QUALITATIVE ANALYSIS	Hours/Week-3	
Core Course-IV		Credit-3	
Course Code-19UCH4CC4P		Internal	External
		40	60

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

COURSE OUTCOMES

CO	CO Statement	Knowledge Level
CO 1	Differentiate the aromatic and aliphatic nature of organic sample	K4
CO 2	Identification of special element in organic compound	K2
CO 3	Analyze the functional group of organic compounds	K4
CO 4	Demonstrate the derivative for functional group	K3

MAPPING OF CO WITH PO

CO	PO1	PO2	PO3	PO4
CO1	**S**	**S**	**S**	**S**
CO2	**S**	**S**	**M**	**S**
CO3	**S**	**S**	**M**	**S**
CO4	**S**	**S**	**S**	**S**

S – Strong; M - Medium

SEMESTER -IV

ORGANIC QUALITATIVE ANALYSIS

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)

TEXT BOOKS

S. No.	Author Name	Year of Publication	Title of the Book	Publishers Name
1	Venkateswaran V, Veeraswamy R., KulandaivelyA.R	1997	Basic principles of practical chemistry, 2nd edition	Sultan Chand & sons, New Delhi
2	Gnanapragasam N.S and Ramamurthy G	1998	Organic Chemistry-Lab Manual	Viswanathan Co., PVT Ltd

REFERENCE BOOKS

S.No.	Author Name	Year of Publication	Title of the Book	Publisher Name
1	Gurtur .J.R and Kapoor, R	1997	Advanced Experimental Chemistry;	S. Chand and Co. Ltd, New Delhi,

Pedagogy

Hands on training

Course Designers

- **Dr. K. Uma Sivakami**, Assistant Professor, Department of Chemistry
- **Ms. S. Jeevitha**, Assistant Professor, Department of Chemistry

Semester-IV	**ALLIED-II PHYSICS - II**	**Hours/Week-3**	
Allied Course - II		**Credits-3**	
Course Code-19UCH4AC5		**Internal 25**	**External 75**

Objectives

- To introduce the basic concepts of electro statics & magneto statics.
- To import the knowledge in nuclear, atomic physics, fiber optics and digital electronics.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
	Recall the basic concepts of electrostatics, magneto statics, nuclear and atomic physics.	K1
CO2	Summarize about atom, nucleus and working of nuclear reactors.	K2
CO3	Explain the behavior of laser and fiber optic communication system.	K2
CO4	Apply the concepts of magnetism to day to day life	K3
CO5	Construct digital circuits for simple real world problems.	K3
CO6	Make use of the knowledge of physics in day to day life.	K3

Mapping with program outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	S	M
CO2	S	S	M	S	S	M
CO3	S	S	S	S	S	M
CO4	S	S	S	S	S	M
CO5	S	S	S	S	S	M
CO6	S	S	S	S	S	M

S-Strong, M-Medium, L- Low

Syllabus

Unit-I: Electrostatics **7 hrs**

Basic concepts - Coulombs inverse square law - Electric Dipole - Electric lines of force - Gauss theorem and its applications (Intensity at a point due to a charged sphere & cylinder) -Principle of a capacitor - Capacity of a spherical and cylindrical capacitors -Capacitance of Parallel Plate Capacitor-Capacitance of Parallel plate capacitor filled with dielectric Slab - Energy stored in a capacitor - Loss of energy due to sharing of charges - Types of capacitors.

Unit-II: Magnetism **7 hrs**

Intensity of magnetization - Susceptibility - Types of magnetic materials - Properties of para, dia and ferromagnetic materials -ferrimagnets and their applications- Hysteresis - B-H curve-Experiment to draw M-H curve (Horizontal Method) -energy loss in hysteresis -Applications of B-H curve.

Unit-III: Modern Physics **9hrs**

Wave Mechanics:

De Broglie concept of matter waves -Wave particle duality-Experimental verification of particle nature-Photoelectric effect-Experimental verification of wave nature- G.P.Thomson experiment.

Atomic & Nuclear Physics:

Fundamentals of Atom - Vector atom Models – Pauli's exclusion Principle - Various quantum numbers and quantization of orbits. Classification of Nucleus- Basic Properties of Nuclei - Nuclear Forces -Liquid drop model of Nucleus -Nuclear Fission & Fusion - Nuclear Reactor and its applications.

Unit-IV: Lasers and Fiber Optics **9 hrs**

Lasers:

Basics of Lasers- Stimulated Absorption-Stimulated Emission-Spontaneous Emission-Pumping-Ruby laser - He-Ne laser-applications of lasers.

Fiber Optics:

Construction of an optical fiber- Total internal reflection-numerical aperture -Acceptance Angle-Classification of Optical fibers-Advantages of fiber optic communication System.

Unit–V: Digital electronics **13 hrs**

Decimal - Binary - Octal and Hexa Decimal number systems and their Mutual Conversions - 1s and 2s complement of a Binary number and Binary arithmetic (Addition, Subtraction) - Binary Subtraction by 1s and2s complement method - Basic logic gates - AND, OR, NOT gates - NAND and NOR as universal building gates - Boolean Algebra - Laws of Boolean Algebra - De Morgan's Theorems - Their verifications using truth tables.

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	R. Murugeshan	Electricity and Magnetism	S. Chand & Co. Pvt. Ltd	2001	Third edition
2.	1.R. Murugeshan, 2.Kiruthiga Sivaprasath	Modern Physics	S. Chand & Co. Pvt. Ltd	2017	Sixteenth Revised color edition
3.	R. S. Sedha,	A text book of Digital Electronics	S. Chand & Co. Pvt. Ltd	2004.	First edition

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	R.Narayanamurthi	Electricity and Magnetism	The National Publishing Company	1988	First edition

2.	J. B. Rajam	Atomic Physics	S. Chand & Co. Pvt. Ltd	1990	First edition
3.	B. N. Srivastava	Basic Nuclear Physics,	S. Chand & Co. Pvt. Ltd	2005	Revised edition
4.	Albert Paul Malvino	Digital principles and Applications	McGraw-Hill International Editions, New York	2002.	Revised edition
5.	1.V.Vijayendran, 2.S.Viswanathan	Digital Fundamentals	S. Viswanathan Printers Pvt. Ltd	2004	Revised edition

Pedagogy

Lecture, Lecture with discussion, Power point Presentation, group discussion, seminar, Interaction, Problem solving, Demonstration, Debate, Quiz

Course Designer

Ms. P. Saranya

SEMESTER - IV	NUTRITION FOR THE FAMILY	HOURS / WEEK - 2	
NON-MAJOR ELECTIVE -II		CREDIT - 2	
COURSE CODE – 19UND4NME2		INTERNAL 25	EXTERNAL 75

Objectives

- To understand the role of nutrition in different stages of life cycle.
- To gain experience in planning menu for different stages of life cycle.
- To develop skills in organizing and evaluating nutrition projects in the community.

Course Outcomes

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

CO Number	CO statement	Knowledge level
CO 1	Identify the inter relationship between health and nutrition	K1
CO 2	Explain menu planning principles for different stages of life cycle	K2
CO 3	Explain importance of RDA	K2
CO 4	Interpret nutritional problems throughout life cycle	K2
CO 5	Apply basic therapeutic principles in menu planning	K3

Mapping with programme outcomes

Cos	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	S	M	M	S
CO3	S	S	M	M	S
CO4	S	S	M	M	S
CO5	S	S	M	M	S

S- Strong; M-Medium

Syllabus

UNIT I **(6 Hours)**

a) Principles of Nutrition–#Classification and functions of Nutrients#. Inter relationship between health and nutrition, malnutrition, over nutrition, under nutrition. Principles of meal planning, RDA.

b) Nutrition for Pregnancy - Physiological changes and complications during Pregnancy, food and nutritional requirements during pregnancy.

c) Nutrition for Lactation- Physiology of Lactation, food and nutritional requirements of lactating women.

UNIT II **(6 Hours)**

a) Nutrition for Infants -Importance of breast milk, food and nutritional requirements for infants, weaning and supplementary foods for infants.

b) Nutrition for Preschoolers Food habits of preschoolers, food and nutritional requirements for preschool children.

UNIT III **(6 Hours)**

a) Nutrition for School Age -Food and Nutritional requirements for school going children, nutritional problems.

b) Nutrition for Adolescents-Food and Nutritional requirements for adolescence and eating disorders.

UNIT IV **(6 Hours)**

a) Nutrition during Adulthood -Reference man and Reference woman, Food and nutritional requirements for adults.

b) Nutrition during Old age - Nutritional requirements, nutritional problems and dietary management.

UNIT V **(6 Hours)**

Basics in therapeutic menu planning – Characteristics of clear fluid, full fluid soft diet. Therapeutic dietary principles - Energy – High calorie and Low calorie, Carbohydrate – High carbohydrate and Low carbohydrate, Protein – High protein and Low protein, Fat – High fat and Low fat, Dietary fibre – High fibre and Low fibre.

#-# : Self study

Textbooks

No.	Author name	Year of Publication	Title of the book	Publisher name
1.	Srilakshmi B	2012	Nutrition Science	New Age International Publishers, New Delhi
2.	SwaminathanM	2012	Hand book of Food and Nutrition	Bangalore printing and publishing co., Ltd, Bangalore
3.	Raheena Begum M	2012	A Text Book of Foods, Nutrition and Dietetics	Sterling publishers private Limited

Reference Books

S.No.	Author name	Year of Publication	Title of the book	Publisher name
1.	Gajalakshmi R	2008	Nutrition Science	CBS Publishers and distributors Pvt Ltd, New Delhi,
2.	Indrani T.K	2008	Nursing Manual of Nutrition and Therapeutic Diet	Jaypee Brothers, Medical publishers (p) Ltd, New Delhi
3.	Shubhangini Joshi A	2014	Nutrition and Dietetics	MC Graw Hill Education (India)
4.	Srilakshmi B	2014	Dietetics	New Age International Publishers, New Delhi

Journals

- Nutrition, Elsevier Science Inc, United States.
- Journal of Youth and Adolescence, Springer/Plenum Publishers, United States.
- Journal of Food and Nutrition Research,Vup Food Research Inst, Bratislava, Slovakia.

Web links

https://www.ncbi.nlm.nih.gov/books/NBK209825/
https://www.who.int/nutrition/topics/nutrecomm/en/

Pedagogy: E-content, Lecture, Power point presentation, Seminar, Assignment, Quiz.

Course Designers

- Ms.B.Thanuja
- Ms.E.Agalya

SKILL BASED ELECTIVE-I
FORENSIC CHEMISTRY

Semester-IV	**FORENSIC CHEMISTRY**	**Hours/Week**	
Skill Based Elective – I		**Credit-2**	
Course Code-19UCH4SBE1A		**Internal**	**External**
		25	**75**

Objectives

- To introduces fundamental principles and functions of forensic science
- To covers concepts such as fingerprinting and forensic toxicology
- To provide various techniques involved in forensic science

COURSE OUTCOMES

CO	**CO Statement**	**Knowledge Level**
CO 1	Identify the fundamental principles and functions of forensic science	K3
CO 2	Explain the characteristic features of Indian currency notes, passports	K3
CO 3	Analyze the techniques involved in the field of forensics	K4
CO 4	Appraise the role of chemistry and other branches in forensics	K5
CO 5	Describe the study of Chromatographic techniques	K6

MAPPING OF CO WITH PO

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	S	M	M	M	S
CO2	S	S	M	M	S
CO3	S	M	S	S	S
CO4	S	M	M	M	S
CO5	S	S	S	S	S

S-Strong; M-Medium

SEMESTER -IV

FORENSIC CHEMISTRY

UNIT I: INTRODUCTION TO FORENSIC SCIENCE (6Hrs)

Definition - scope of forensic science - Historical aspects of Forensic Science - development of forensic science - basic principles of forensic science - branches of forensic science -Forensic science in Indian scenario

UNIT II: TECHNOLOGICAL METHODS (6Hrs)

Spectroscopic and chromatographic applications in forensic chemistry - identification and comparison of drugs - testing dyes and inks - using thin layer chromatography - applications of Gas chromatography in forensic pathology - crime scene testing - Arson investigation -forensic applications of Ultraviolet- visible spectroscopy (narcotics, drug testing) - infrared spectroscopy (crime prevention, paint, ink, sweat, fuels, and hair) - atomic absorption spectroscopy (toxicological examination) - atomic emission spectroscopy (trace elements detection)-colorimetric analysis and Lamberts-Beer law.

UNIT III: FINGER PRINTS EXAMINATION (6Hrs)

Fundamental principles of fingerprints - classification of fingerprints - automated fingerprint identification systems - methods of detecting fingerprints - document and voice examination - collection of handwriting exemplars – typescript comparisons - inks and papers - voice examination.

UNIT IV: COUNTERFEIT (6Hrs)

Forgery - Definition - types and sections involved - alterations in documents - including erasures - additions- over- writings and obliterations - characteristic features of Indian currency notes - passports - visas and stamp papers and their examination- detecting gold plated jewels.

UNIT V: EMERGING TRENDS IN FORENSICSCIENCE (6Hrs)

DNA as excellent polymorphic marker - basis of DNA typing - Narco analysis and its significance in forensic science - Polygraph analysis-toxicology of alcohol - breath test instruments (breath analyzer) - Forensic serology - blood typing - forensic characterization of bloodstains - detecting steroid consumption among athletes and race horses.

TEXT BOOKS

S.No	Author Name	Year of Publication	Title of the Book	Publishers Name
1	Eckert G. William	1996	Introduction to Forensic Sciences	Newyork, Washington, CRC, Press,
2	Richard. S	2018	Criminalistics An Introduction to Forensic Science	12th edition, Boston : Pearson Education
3	Jamieson A., and Moenssens A	2009	Encyclopedia of Forensic Science.	Wiley Encyclopedia
4	Tessarolo, A.A. and Marignani, A.,	1996	Forensic Science and the Internet	The Canadian Society of Forensic Science Journal

REFERENCE BOOKS

S.No.	Author's Name	Year of Publication	Title of the Book	Publisher Name
1	B.B. Nanda and R.K. Tiwari	2001	Forensic Science in India: A Vision for the Twenty First Century	Select Publishers, New Delhi
2	M.K. Bhasin and S.Nath	2002	Role of Forensic Science in the New Millennium	University of Delhi, Delhi.
3	S.H. James and J.J. Nordby	2005	Forensic Science: An Introduction to Scientific and Investigative Techniques	2nd Edition, CRC Press, Boca Raton

Pedagogy

E-content, Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Video / Animation

Course Designers

- Dr. P. Poornima Devi, Assistant Professor, Department of Chemistry
- Dr.G. Sivasankari, Assistant Professor, Department of Chemistry

SKILL BASED ELECTIVE-I
FOOD CHEMISTRY

Semester-IV	FOOD CHEMISTRY	Hours/Week	
Skill Based Elective -I		Credit-2	
Course Code-19UCH4SBE1B		Internal	External
		25	75

Objectives

- To attain knowledge on chemical properties of food materials
- To analyses the technological method in food process
- To enrich the importance of enzyme, protein & food preservatives

COURSE OUTCOMES

CO	CO Statement	Knowledge Level
CO1	Classify components of food by chemical structure.	K4
CO2	Describe the function of lipids, protein, cellulose in daily food intake	K3
CO3	Understand how the chemical components of a food impact the functionality of the overall food product	K2
CO4	Explain the major reactions that occur in foods.	K4
CO5	Apply the fundamental structure/function relationships to how they impact the overall food product quality, safety, and shelf life	K3

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	M	S
CO3	S	M	S	S	M
CO4	M	M	S	S	M
CO5	S	S	M	M	M

S-Strong; M-Medium

SEMESTER –IV

FOOD CHEMISTRY

UNIT I: FOOD AND WATER (6Hrs)

Defining food - classification – constituents of food -food processing - food preservation - food spoilage - food poisoning - food - borne intoxication & infection - Water's importance in food chemistry - role of waters as a solvent in food systems - solute effects on water: State of water in foods - kinetic principles - water activity: principles – measurement - control effects related concept.

UNIT II: LIPIDS (6Hrs)

Lipid classification and role in foods - analytical methods – physical - chemical - nutritional properties – processing of fats - oil - reactions of lipids (hydrogenation - oxidation) - lipids as emulsifiers - lipid processing: isolation - purification - modification – functionality of triacylglycerols in foods - food lipids and health.

UNIT III: CARBOHYDRATES AND PROTEINS (6Hrs)

Carbohydrate classification – carbohydrate reactions (isomerization, caramelization and Mail lard Browning) – starch gelatinization and staling process- modified starches and other polysaccharides used in foods - Amino acid and protein interaction - external factors that influence protein systems in foods egg, meat, milk and cheese – basic properties: hydration - ionization and colloidal behavior – amino acids in meat – silks.

UNIT IV: ENZYMES (6Hrs)

Enzyme kinetics - Important enzymes in food - role of the enzyme in the food system (role of enzymes in baking, brewing, HFCS production and cheese making) – deleterious enzymes in foods systems: phenoloxidase - reaction catalyzed by enzyme - non- enzymatic formation of melanin - effect and safety concerns of sulfating agent in foods.

UNIT V:FOOD PRESERVATION (6Hrs)

Food preservation - necessary - principle and methods food preservation - high temperature preservation - low temperature preservation - preservation by use of chemicals natural and

artificial colorants - acid base chemistry of foods and common additives - roles of commonly used food preservatives.

TEXT BOOKS

S. No.	Author's Name	Year of Publication	Title of the Book	Publisher's Name
1	S. Damordaran, K. Parkin, O. Fennema	2007	Fennema's Food Chemistry, 4th Edition,	Eds. CRC Press.
2	John deMan	1999	Principles of Food Chemistry, 3rd Edition.	Aspen Publishers, New York

REFERENCE BOOKS

S. No.	Author's Name	Year of Publication	Title of the Book	Publisher's Name
1	John W. Brady, Cornell University	2013	Introductory Food Chemistry, 1st Edition.	Press, Ithaca, NY. ISBN

Pedagogy

E-content, Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Video /Animation

Course Designer

- **Ms. S. Jeevitha**, Assistant Professor, Department of Chemistry
- **Dr. C. Rajarajeswari**, Assistant Professor, Department of Chemistry

CORE COURSE-V

INORGANIC CHEMISTRY-I

Semester-V	INORGANIC CHEMISTRY-I	Hours/Week-5	
Core Course-V		Credit-5	
Course Code-19UCH5CC5		Internal	External
		25	75

Objectives

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

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the process of metallurgy.	K1
CO2	Recognize the basic concepts of co-ordination chemistry.	K1
CO3	Compare the theories of bonding in coordination compounds.	K2
CO4	Relate the stability of metal complexes.	K3
CO5	Interpret the biological importance of coordination complexes.	K3

Mapping with Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	M
CO2	M	M	S	M	S
CO3	M	M	M	S	S
CO4	M	M	S	S	M
CO5	M	M	M	M	M

S- Strong; M- Medium

CORE COURSE-V
INORGANIC CHEMISTRY-I

Unit – I Metallurgy **(15 Hrs)**

Metallurgy - minerals and ores - process - ore dressing - gravity separation - froth flotation - magnetic separation - chemical separation- calcination - roasting. Extraction of metal - chemical reduction - auto reduction - electrolytic reduction - metal displacement- refining methods - Van Arkel method - electrolytic refining - vapour phase refining-ion exchange method. Thermodynamic principles of metallurgy-Ellingham diagram - observations - applications.

Unit - II Coordination Compounds –I **(15 Hrs)**

Introduction - types of ligands- coordination number - nomenclature of coordinationcompounds – isomerism - structural isomerism - stereo isomerism - bonding theories -Werner's theory - Sidgwick's concept of coordination - Valence bond theory – postulates of VBT- geometries of tetrahedral - square planar and octahedral complexes - limitations.

Unit - III Coordination Compounds –II **(15 Hrs)**

Crystal filed theory - shapes of d orbitals- assumptions- splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes -crystal field stabilization energy- factors affecting magnitude of 10 Dq - merits and demerits of crystal-field theory – spectro chemical series –Jahn -Teller effect– MOT – octahedral complexes.

Unit - IV Stability and Magnetic Properties of Metal Complex **(15 Hrs)**

Stability of metal complexes- thermodynamic stability and kinetic stability-factors affectingthe stability of metal complexes- chelate effect - determination of composition of complex byJob's method - mole ratio method -properties of metal complexes-types of magnetic behavior-spin-only formula - calculation of magnetic moments - experimental determination of magneticsusceptibility - Gouy method.

Unit -V Reactivity of Metal Complexes and Bio-Inorganic Chemistry **(15 Hrs)**

Reactivity of metal complexes-labile and inert complexes- ligand substitution reactions - SN1 and SN2 substitution reactions of square planar complexes - Trans effect – Theories - applications. Bioinorganic chemistry - essential elements - biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and Cl – metallo porphyrin’s – structure - functions of hemoglobin- myoglobin - chlorophyll.

Text Books

S.No.	Author Name	Year of Publication	Title of the Book	Publisher Name
1	PuriB.R.,. Sharma L.R, Kalia K.K.	1993	Principles of Inorganic Chemistry (23rd edition)	Shoban Lal Nagin Chand & Co., New Delhi
2	Gopalan R.	2012	Text Book of Inorganic Chemistry (2nd edition)	Hyderabad, Universities Press, India
3	Soni P.L.	1993	Text Book of Inorganic Chemistry (20th revised edition)	Sultan Chand & Sons
4	Gilreath,	1985	Fundamental Concepts of Inorganic Chemistry (18th Printing)	McGraw Hill International Book Company

Reference Books

S.No.	Author Name	Year of Publication	Title of the Book	Publisher Name
1	Madan R.D	2000	Modern Inorganic Chemistry (2nd edition)	S. Chand & Company Ltd.,
2	Wahid U.Malik TuliG.D, Madan R.D	2001	Selected topics in inorganic Chemistry (7th edition)	S.Chand and Company Ltd.,
3	Cotton F.A	2004	Advanced Inorganic Chemistry (6th edition)	John Wiley & Sons, Pvt. Ltd.,
4	Huheey J.E.	1993	Inorganic Chemistry (4th edition)	Pearson Education. Inc.,

Pedagogy

Lecture, Lecture with discussion, Demonstrations, Group discussion, Debate, Seminar, Quiz, Video clippings, Flip learning, and E-Content

Course Designers

Dr. V. Sangu, Assistant Professor, Department of Chemistry

Ms. P. Thamizhini, Assistant Professor, Department of Chemistry

CORE COURSE - VI

ORGANIC CHEMISTRY –I

Semester -V	ORGANIC CHEMISTRY –I	Hours/Week-5	
Core Course-VI		Credit-5	
Course Code -19UCH5CC6		Internal	External
		25	75

Objectives

- This course helps to learn the reactions of carboxylic acids, amines, carbonyl compounds and Heterocyclic compounds.
- To know the requirement of the oxidizing and reducing agents for synthesis

Course Outcomes

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

CO	CO Statement	Knowledge level
CO 1	Identify different types of carboxylic acids and to compare their relative strength	K1
CO 2	Discuss about reactions of carbonyl compounds	K2
CO 3	Explain various heterocyclic compounds and dyes	K2
CO 4	Utilization appropriate reagents for oxidization and reduction	K3
CO 5	Analyze the basicity and stability of aliphatic and aromatic amines	K4

Mapping with Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	M	S	M
CO2	S	S	M	S	S
CO3	S	S	S	M	S
CO4	S	S	S	S	M
CO5	S	S	S	S	M

S-Strong M-Medium

CORE COURSE - VI

ORGANIC CHEMISTRY –I

Unit –I Carboxylic Acid and Their Derivatives (15 Hrs)

Aliphatic acids: Saturated monocarboxylic acid – resonance structure – relative strength of carboxylic acids (effect of substituents). Reactive methylene compounds: Preparation- properties - uses of ethylacetoacetate and diethyl malonate. Aromatic acids: Monocarboxylic acids – general methods of preparation - properties and reactions of benzoic acid and salicylic acid. Dicarboxylic acid: Preparation - properties - uses of phthalic acid and terephthalic acid.

Unit -II Chemistry of Nitrogen Compounds (15 Hrs)

Amines: aliphatic and aromatic amines - classification – general methods of preparation- properties and reaction - 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.

Unit –III Carbonyl Compounds - Aldehydes and Ketones (15 Hrs)

Structure - acidity of α-hydrogen – methods of preparation- physical properties - chemical properties - nucleophilic addition - acid- base catalyzed reaction –. addition reactions – sodium bisulphate- hydrogen cyanide- ammonium ion. Oxidation reaction – Oxidation of aldehydes and ketones. Reduction reaction – reduction to alcohol and alkane using Grignard reagent and $LiAlH_4$. Aldol condensation - Benzoin condensation - Cannizaro reaction - Reformatsky and Wittig reaction.

Unit – IV Heterocyclic Compounds and Dyes (15 Hrs)

Heterocyclic Compounds: Nomenclature – Chemistry of furan- thiophene - pyrrole and pyridine. Fused ring heterocyclic compounds: Quinolone - isoquinoline and indole. Dyes: Introduction – colour and constitution - classification based on structure - application. Preparation and applications of the following dyes – methyl orange- congo red- malachite green and indigo.

Unit - V Oxidation and Reduction (15 Hrs)

Oxidation: Osmium tetroxide – chromyl chloride – ozone – DDQ –dioxiranes - lead tetraacetate - selenium dioxide – Dess - Martin reagent. Reduction: Catalytic hydrogenation using Wilkinson catalyst – reduction with LiAH- $NaBH_4$ – $AlH[O\ t\text{-}Bu]_3$ - $NaCNBH_3$ and NH_2-NH_2.

Text Books

S.No.	Author Name	Year of Publication	Title of the Book	Publisher Name
1	Bahl, B.S. and Bahl, A.	2010	Advanced Organic Chemistry (12^{th} 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

S.No.	Author Name	Year of Publication	Title of the Book	Publisher Name
1	Finar I.L.	1996	Organic Chemistry, Volume 1&2 (6^{th} edition)	Addison Wesley Longman Ltd., England
2	Morrison R.T. and Boyd R.N. and Bhattacharjee S. K.	2011	Organic Chemistry (7^{th}edition),	Pearson India
3	Tewari,K.S, Vishil N.K and Mehotra S.N.	2001	A text book of Organic Chemistry (1^{st} edition)	Vikas Publishing House Pvt Ltd., New Delhi
4	Pine S.H.,	1987	Organic Chemistry (5^{th} edition)	McGraw – Hill International Book Company, NewDelhi
5.	Seyhan N. Ege	2005	Organic Chemistry (5^{th} edition)	Houghton Mifflin Co.,New York

Pedagogy

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

Course Designer

Ms. Pungayee Alias Amirtham, Assistant Professor and Head, Department ofChemistry

Ms. A. Sharmila, Assistant Professor, Department of Chemistry

CORE COURSE - VII
PHYSICAL CHEMISTRY –I

Semester -V	PHYSICAL CHEMISTRY –I	Hours/Week-6	
Core Course-VII		Credit-5	
Course Code -19UCH5CC7		Internal	External
		25	75

Objectives

- After studying this course students can understand photochemical process and types of electronic transitions, behaviors of dilute solutions and colligative properties, colloids, adsorption phenomena, phase rule and its significances.

Course Outcomes

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

CO	CO Statement	Knowledge Level
CO1	Evaluate quantum yield and Identify types of electronic transition in organic molecules.	K4
CO2	Find equilibrium constant and enthalpy of equilibrium reaction at different temperature,	K1
CO3	Analyze thermodynamic conditions favoring chemical equilibrium.	K2
CO4	Discuss physical and chemical adsorption phenomenon	K2
CO5	Explain phase rule and law of dilute solution to predict composition, molecular weight	K2

Mapping with Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	M	M	S	S	S
CO4	S	S	S	S	S
CO5	S	M	M	S	S

S -Strong , M-Medium , L -Low

CORE COURSE - VII
PHYSICAL CHEMISTRY –I

Unit - I Electronic Spectroscopy and Photochemistry (18 Hrs)

Molecular spectra - Energy levels of molecular orbitals - electronic spectroscopy - selection rules - types of electronic transitions - concept of chromophore and auxochrome. Photochemistry: Difference between thermal and photochemical processes- laws of photochemistry - Grothus-Draper's law and 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 and photosensitized reactions.

Unit - II Chemical Equilibrium, Zeroth and Third Law Thermodynamics (18 Hrs)

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 and 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.

Unit -III Dilute Solutions (18 Hrs)

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 - relation between molecular weight and elevation in boiling point - depression in freezing point - osmosis - osmotic pressure – determination of osmotic pressure of a non-volatile solute from osmotic pressure - abnormal colligative properties – Van't Hoff factor

Unit - IV Surface Chemistry (18 Hrs)

Definition of colloids - solids in liquids (Sols) – preparation – purification - properties – kinetic, optical and electrical - stability of colloids - Hardy Schule law - protective colloids - liquids in liquids (emulsions) – preparation - properties - uses - liquids in solids (gels) – preparation- properties - uses

- adsorption - physical adsorption - chemisorption- Freundlich and Langmuir adsorption isotherms - applications of adsorption.

Unit – V Phase Rule **(18 Hrs)**

Concept of phase- component - degrees of freedom - Gibb's phase rule - phase equilibrium - one component system – water system and 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.

Text Books

S.No.	Author Name	Year of Publication	Title of the Book	Publisher Name
1	Puri B. R. ,Sharma L. R. and Pathania M. S.	2013	Principles of Physical Chemistry	Shoban Lal Nagin Chand & Co., New Delhi
2	Glasstone S and Lewis D	2014	Elements of Physical Chemistry	Mac Millon Ltd, London
3	Banwell C.N	1994	Fundamentals of Molecular Spectroscopy	Mc GrawHill Education , Noida

Reference Books

S.No	Author Name	Year of Publication	Title of the Book	Publisher Name
1.	Puri B.R., Sharma L.R., and Kalia K.K.	1993	Principles of Physical Chemistry (23^{rd} 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 (5^{th} edition)	Oxford Uiversity Press
4.	Gabor a Sobarjai and Yimin Li	2010	Introduction to Surface Chemistry and Catalysis (2^{nd} edition)	John Wiley & Sons, New Jersey

Pedagogy

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

Course Designers

Dr. V. Sangu, Assistant Professor, Department of Chemistry

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

CORE PRACTICAL –V
PHYSICAL CHEMISTRY (P)

Semester-V	PHYSICAL CHEMISTRY (P)	Hours/Week-3	
Core Practical V (CP)		Credit-3	
Course Code-19UCH5CC5P		Internal 40	External 60

Objectives

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

Course outcomes

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

CO	CO Statement	Knowledge Level
CO 1	Construct the phase diagram	K3
CO 2	Relate the effect of impurity on phenol water System	K2
CO 3	Identify the molecular weight of unknown compound	K3
CO 4	Examine the concentration of ions using Potentiometer	K4
CO 5	Inspect the concentration of ions using Conductometer	K4

Mapping with program outcomes

COs/POs	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	M	S
CO3	S	S	M	S
CO4	S	S	S	S
CO 5	S	S	S	S

S-Strong ; M- Medium

CORE PRACTICAL –V

PHYSICAL CHEMISTRY (P)

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. Conductometric Acid-Base Titration - (HCl vs NaOH).
9. Potentiometric Redox Titration – (FAS vs $KMnO_4$).
10. Determination of equivalent conductance of a strong electrolyte (NaCl/KCl).

MARK DISTRIBUTION :

Internal : 40

Ext. Evaluation :60

Record :5

Procedure Writing with formula : 10

Practicals :45

Text Books

S.No.	Author Name	Year of Publication	Title of the Book	Publisher Name
1	Yadav J. B	2001	Organic Analytical Chemistry-Theory and Practice Chemistry (20th edition)	GOEL Publishing House
2	Levitt B. P	1985	Findlay's Practical Physical Chemistry (9th edition)	Longman
3	Gurtur J. N and Kapoor R	1997	Advanced Experimental Chemistry (Volume 1)	S. Chand and Co.,
4	Shoemaker and Gerland	2009	Advanced Physical Chemistry Experiments	McGraw – Hill Higher Education

Reference Books

S.No.	Author Name	Year of Publication	Title of the Book	Publisher Name
1	Gurtur J.R and Kapoor R	1997	Advanced Experimental Chemistry	S. Chand and Co. Ltd., New Delhi

Pedagogy: Hands on training

Course Designer

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

Semester V	**NUCLEAR AND INDUSTRIAL CHEMISTRY**	**Hours/Week-5**	
Major Based Elective-I		**Credit-5**	
Subject Code- 20UCH5MBE1A		**Internal 25**	**External 75**

Objective

- This course helps to learn the principles of nuclear and radiation chemistry.
- To understand the importance chemicals used in industries.

Course Outcomes

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

CO	CO Statement	Knowledge level
CO 1	Discuss about nuclear chemistry	K1
CO 2	Explore about Fundamentals of Radio chemistry	K2
CO 3	Explore about leather techniques	K2
CO 4	Discussing about various chemical process in industries	K3
CO 5	Explore about essential cosmetics and cleansing agents	K3

Mapping with Programme Outcomes

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	S	M	S	M
CO3	S	M	M	S	M
CO4	S	S	M	S	M
CO5	S	M	S	M	S

S-Strong; M-Medium

SEMESTER V

NUCLEAR AND INDUSTRIAL CHEMISTRY

UNIT I Introduction to Nuclear Science (15 Hrs)

Introduction - composition of nucleus and nuclear forces (meson field theory) - nuclear stability - mass defect - binding energy - packing fraction - n/p ratio - magic numbers - nuclear models - liquid drop - shell and collective model – isotopes - detection (Thomson positive ray analysis, Dempster mass spectrograph)- separation (Thermal diffusion method, distillation method, gaseous diffusion method) - isobars, isotones and isomers.

UNIT II: Nuclear Reactions and Reactor (15 Hrs)

Nuclear reaction - comparison with chemical reaction - Types - fission (atom bomb) and fusion (hydrogen bomb) - photonuclear reactions – stripping, spallation and pick-up reactions - Stellar energy – nuclear reactor – atomic power projects in India.

UNIT III Radiation Chemistry (15 Hrs)

Radioactivity- Laws of radioactivity- the rate of disintegration –half-life and average life - group displacement law – radioactive decay process (alpha, beta, and gamma decay) - radioactive series – K capture – nuclear isomerism and isomeric transition– Detection and measurement of radioactivity (Geiger Muller counter, Cloud Chamber, ionization chamber) – radioisotopes applications- Hazards of radiation- radioactive waste disposal.

UNIT IV Common Chemicals in Industries (15 Hrs)

Gaseous fuels– Types (producer gas, water gas, natural gas, coal gas)–composition-manufacture and applications- cement manufacture – wet and dry processes, composition and setting of cement. Primary constituents of paints- Dispersion medium - binder- Pigments-formulation of paints and varnishes- requirements of good paint.

UNIT V Cosmetic Chemistry (15 Hrs)

Cosmetics– definition – types of cosmetics – composition of cosmetics – face powder,face creams sun screen lotion- nail polish- nail polish removers- deodorants-hair dye –shampoo- perfumes - their side effects-method of -preparation of soaps- synthetic detergents-alkyl aryl sulphonate and cleansing action of soaps.

Text Books

S.No.	Author's Name	Year of Publication	Title of the Book	Publisher Name
1.	H. J. Arnikar	2005	Essentials of Nuclear Chemistry	New Age International Publishers, New Delhi,
2.	S.Glasstone, D.Van Nostrand,	1987	Source Book on Atomic Energy	East-West press, New Delhi,
3.	P.Singh, T.M.Joesph, R.G.Dhavale.	1983	Industrial Chemistry,	Himalaya Publishing House, Bombay, 4th Ed.,
4	A. Kent, Riegel	2009	Handbook of Industrial Chemistry,	CBS Publishers, New Delhi.
5.	B. K. Sharma	2013	Industrial Chemistry	Goel Publishing House

Reference Books

S.No.	Author's Name	Year of Publication	Title of the Book	Publishers Name
1.	A.K. Srivatsava and P. Jain	1989	Essentials of Nuclear chemistry	S. Chand, New Delhi,
2.	M. Haissinsky, Addision	1964	Nuclear Chemistry and its applications	Wesley, New York.
3.	Bagavathi Sundari	2006	Applied Chemistry	MJP Publishers, Chennai
4.	P. C. Jain, M. Jain	2003	Engineering Chemistry	Dhanpat Rai & Sons, Delhi

Chemistry Teaching Pedagogy:

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

Course Designer:

Dr. K. Uma Sivakami, Assistant Professor, Department of Chemistry.

Semester V	Basics of Nanoscience and Nanotechnology	Hours/Week-5	
Major Based Elective-I		Credit-5	
Subject Code-20UCH5MBE1B		Internal 25	External 75

Course Objective

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

Course Outcomes

CO	CO Statement On the successful completion of the course, students will be able to	Knowledge Level
CO1	Recall the basic concepts macro, micro and nanoscale materials	K1
CO2	Explain the synthesis of nanomaterials	K1
CO3	Analyze the characterization techniques of nanomaterials	K2
CO4	Understand the nano catalyst and carbon based nanomaterials.	K2
CO5	Illustrate the applications of nanomaterials.	K3

Mapping with Programme Outcomes

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	S	M	S	M
CO3	S	M	M	S	M
CO4	S	S	M	S	M
CO5	S	M	S	M	S

S-Strong; M-Medium

SEMESTER V

BASICS OF NANOSCIENCE AND NANOTECHNOLOGY

UNIT –I Fundamentals of Nanoscience (15 Hrs)

Definition - nano – scale, materials, science - nano technology - scale of materials - natural and man-made - significance of nanoscale - optical, electrical, mechanical, and magnetic properties – nanomaterials - different types of nanomaterial and structures - quantum wells – quantum wires – quantum dots – nanoclusters – nanocrystals – nanowires and nanotubes(preliminary level).

UNIT-II Synthesis of nanomaterials (15 Hrs)

Physical methods - laser ablation- chemical vapour deposition (CVD) - solvated metal atom dispersion (SMAD) - Chemical methods - microwave irradiation -sol-gel process - precipitation technology - synthesis using microorganisms - precipitation method - thermal decomposition of complex precursors.

UNIT –III Characterization techniques of nanomaterials (15 Hrs)

Principle and Instrumentation techniques - X-ray diffraction technique, (XRD) - Ellipsometer, Confocal microscopy. Scanning Electron Microscopy (SEM) –Field Emission Scanning Electron Microscopy- Optical Absorption and Emission Spectroscopy.

UNIT –IV Carbon based nanomaterials (15 Hrs)

Structure and bonding in nano material – arm chair – zigzag – chiral patterns – theory of formation of different structures and growth process of CNT – single walled carbon nano tubes – multi walled carbon nano tubes – graphite – diamond – different types of carbon nano materials CNT, CNF, CNB - structure and properties.

UNIT-V Applications of nanomaterials (15 Hrs)

Molecular electronics – nano electronics – quantum electronic devices – CNT based transistor – field emission display – biological applications – cancer therapy - biosensor – membrane-based water purification – nano painting – nano coating – nano materials for renewable energy – nano carbon in lithium batteries.

TextBook

S.No	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	C. N. R. Rao, A. Muller and A. K. Cheetham	The Chemistry of Nanomaterials: (Eds),	Wiley-VCH; Germany, Vol. 1and 2	2004
2.	T. Pradeep	The Essentials in Understanding Nanoscience and Nanotechnology 1st Ed.,	Tata McGraw Hill, New York, 1st Ed.,	2007
3.	S. Thomas, N. Kalarikkal, A. Manuel Stephan, B. Raneesh	Advanced Nanomaterials thesis, Properties, and Applications	Apple Academic Press	2021.
4.	N. John Dinardo	Nanoscale Charecterisation of surfaces and Interfaces	Weinheim Cambridge, Wiley.	2000
7.	A. Lakhtakia	The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations	Prentice-Hall of India (P) Ltd, New Delhi	2007

ReferenceBooks

S. No	AUTHOR	TITLE OF THE BOOK	PUBLISHER /EDITION	YEAR OF PUBLICATION
1.	G. Timp	Nanotube Super fiber Materials: Science, Manufacturing, Commercialization (Micro and Nano Technologies)	2nd Edition, Kindle	2020
2.	T. Awan, A. Bashir, A. Tehseen	The Chemistry of Nanomaterials fundamentals and Applications	Elsevier, e-book	2020

Pedagogy

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

Course Designers

1. Dr. G. Sivasankari, Assistant Professor, Department of Chemistry
2. Ms. P. Thamizhini, Assistant Professor, Department of Chemistry
3. Dr. K. Uma Sivakami, Assistant Professor, Department of Chemistry

SKILL BASED ELECETIVE -II
CHEMISTRY OF CONSUMER PRODUCTS (P)

Semester-V	**CHEMISTRY OF CONSUMER PRODUCTS(P)**	**Hours/Week-2**	
Skill Based Elective-II		**Credit-2**	
Course Code-19UCH5SBE2AP		**Internal 40**	**External 60**

Objectives

This skill based course provides

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

Course outcomes

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

CO	CO Statements	Knowledge Level
CO1	Know about Chemistry and modern trends inthe industry.	K1
CO2	Identify the cations and anions present in the mixture	K1
CO3	Demonstrate the experimental methods of group separation	K2

Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	M	S	M	S
CO3	S	S	S	S	M

S-Strong ; M- Medium

SEMESTER-V

CHEMISTRY OF CONSUMER PRODUCTS(P)

01. Detection of adulterants in milk and milk products.

02. Detection of adulterants in oil

03, Detection of adulterants in spices and cardiments

04. Detection of adulterants in food products.

05. Estimation of food colors. (Colorimetric analysis)

06. Industrial visit – Report

Text Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publishers
1.	Sally A. Henrie,	2015	Green Chemistry Laboratory Manual for General Chemistry	Press Taylor & Francis Group, and Informa Business.

Course Designers

- **Dr. G. Sivasankari,** Assistant Professor, Department of Chemistry.
- **Dr. R. Subha,** Assistant Professor, Department of Chemistry

SKILL BASED ELECETIVE -II

DYE CHEMISTRY(P)

Semester-V	**DYE CHEMISTRY(P)**	**Hours/Week-2**	
Skill Based Elective -II		**Credit-2**	
Course Code- **19UCH5SBE2BP**		**Internal** **40**	**External** **60**

Objectives

This skill based course provides

- To enhance the basic knowledge in application of dyes in industries and water treatment.
- To provide the practical training to the students in preparation of dyes for fabrication.

Course outcomes

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

CO	**CO Statements**	**Knowledge Level**
CO1	Identify the usages of dyes in industries	K1
CO2	Quantify the presence of dyes in the samples	K1
CO3	Demonstrate the experimental methods of preparation of dyes.	K2

Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	M	S	M	S
CO3	S	S	S	S	M

S-Strong ; M- Medium

SEMESTER-V

DYE CHEMISTRY(P)

A. Preparation of Dyes

i) Azo dye preparation by coupling reaction

ii) Indigo dye preparation

B. Separation of given mixture by chromatographic method.

C. Quantitative analysis

i) Determination of microbial count in milk using dyes.

ii) Determination of photocatalytic activity of biomass using cationic dye.

iii) Determination of concentration of dyes in given sample using spectrophotometer.

Textbooks

S. No.	Author's Name	Year of Publication	Title of the Book	Publishers
1.	James Park and John Shore	1993	Practical Dyeing (Volume 1-3)	Textile Apparel and Fashion
2.	B.K. Sharma	2006	Analytical chemistry	Krishnan Praksham Median Meerut.

Course Designers

- **Dr. R. Subha,** Assistant Professor, Department of Chemistry
- **Dr. K. Uma Sivagami,** Assistant Professor, Department of Chemistry

SKILL BASED ELECETIVE -III
WATER ANALYSIS (P)

Semester-V	**WATER ANALYSIS (P)**	**Hours/Week-2**	
Skill Based Elective -III		**Credit-2**	
Course Code-20UCH5SBE3AP		**Internal 40**	**External 60**

Objectives

This skill based course provides

- Knowledge on the design of wastewater treatment.
- Maintain the outflow level of impurities from water and wastewater treatment plant
- Manage sewage disposal

Course outcomes

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

CO	CO Statements	Knowledge Level
CO1	Design the treatment unit for water treatment	K1
CO2	Identify the outflow level of impurities from water	K1

Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	M	S	M	S

S-Strong ; M- Medium

SEMESTER-V
WATER ANALYSIS (P)

1. Determination of alkalinity in water sample.

2. Determination of total, temporary & permanent hardness of water by EDTA Method

3. Determination of dissolved oxygen content of water sample by Winkler's method.

4. Determination of chemical oxygen demand (COD) of wastewater

5. Determination of chloride content of water sample by Argentometric method

6. Determination of oil and grease from wastewater.

Text Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publishers
1.	P. C. Jaiswal	2014	Soil, Plant and Water Analysis	Kalyani Publishers
2.	Dr. R. K. Trivedy and P. K. Goel.	1984	Chemical and Biological Analysis of Water	Environmental publications

Course Designers

- **Dr. G. Sivasankari,** Assistant Professor, Department of Chemistry.
- **Dr. K. Shenbagam,** Assistant Professor, Department of Chemistry

SKILL BASED ELECETIVE -III

BIOFUELS (P)

Semester-V	**BIOFUELS (P)**	**Hours/Week-2**	
Skill Based Elective -III		**Credit-2**	
Course Code-19UCH5SBE3BP		**Internal 40**	**External 60**

Objectives

This skill based course provides knowledge on

- Techniques to extract the oil from plant material.
- Identifying the different fuel viscosity.
- Calculating the yield of sugar

Course outcomes

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

CO	CO Statements	Knowledge Level
CO1	Know about the techniques to extract oil from plant	K1
CO2	Evaluate fuel viscosity	K1
CO3	Calculate the yield of sugar and types	K2

Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	S
CO2	S	M	S	M	S
CO3	M	S	M	S	M

S-Strong ; M- Medium

SEMESTER-V
BIOFUELS (P)

Any five from the following experiments

1. Extraction of oil from plant sources.
2. Determination of fuel viscosity.
3. Conversion of vegetable oil to biodiesel
4. Extraction of sugar from sugar beet
5. Identification of starch and determination of glucose concentration
6. Determination of non- reducing sugars.

Text Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publishers
1.	P. C. Jaiswal		Practical biofuel activities for school engagement and outreach	www.bbsrc.ac.uk
2.	Gerhard Knothe, Jürgen Krahl, Jon Van Gerpen	2015	The Biodiesel Handbook, 2nd Edition	Elsevier Science

Reference Books

S. No.	Author's Name	Year of Publication	Title of the Book	Publishers
1.	R. D. Tyagi, Song Yan, Tian C. Zhang, Xiaolei Zhang	2019	Biodiesel Production Technologies, Challenges, and Future Prospects 2019	American Society of Civil Engineers

Course Designers

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