J.J COLLEGE OF ARTS AND SCIENCE (Autonomous)

Re-Accredited by NAAC with Grade 'A' in 3rd Cycle

SIVAPURAM, PUDUKKOTTAI-622422

DEPARTMENT OF CHEMISTRY

UG - PROGRAMME - B.Sc CHEMISTRY

(2019-2020)

PROGRAMME OBJECTIVES FOR B.Sc

- To provide a detailed knowledge of the concepts, methodologies, principles and experimental techniques involved in various fields of Chemistry
- To develop student skill in problem solving, critical thinking, analytical reasoning and explore new areas of research
- To prepare the students with a working knowledge of experimental techniques and instrumentation required to work independently in research or industrial environment
- To prepare them to pursue higher studies and to develop sustainable innovative solutions for the development or welfare of the nation

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UG - PROGRAMME – B.Sc CHEMISTRY

Course Structure under **CBCS** for the candidates admitted from the academic year **2019-2020**

Sem	Part	Course Code	Course Title	Hrs/Week	Credit	Exam Hrs	Marks		Total Marks
							Int	Ext	
I	I	U1R1TL1/HL1/ FL1/SL1/ABL1	Language Course-I	6	3	3	25	75	100
	II	U1R1EL1	English Language Course –I	6	3	3	25	75	100
	III	U1R1CHCC1	General Chemistry-I	6	5	3	25	75	100
			Volumetric Analysis Practical	3	*	*	*	*	*
		U1R1MTAC1	Allied Mathematics-I	6	3	3	25	75	100
			Allied Mathematics-II	3	*	*	*	*	*
			TOTAL	**30**	**14**	**-**	**-**	**-**	**400**
II	I	U2R1TL2/HL2/ FL2/SL2/ABL2	Language Course-II	6	3	3	25	75	100
	II	U2R1EL2	English Language Course –II	6	3	3	25	75	100
	III	U2R1CHCC2P	Volumetric Analysis Practical	3	5	3	40	60	100
		U2R1CHCC3	General Chemistry-II	6	5	3	25	75	100
		U2R1MTAC2	Allied Mathematics-II	3	3	3	25	75	100
		U2R1MTAC3	Allied Mathematics-III	4	3	3	25	75	100
	IV	U2R1ES	Environmental Studies	2	2	3	25	75	100
			TOTAL	**30**	**24**	**-**	**-**	**-**	**700**
III	I	U3R1TL3/HL3/ FL3/SL3/ABL3	Language Course-III	5	3	3	25	75	100
	II	U3R1REL3	English Language Course –III	5	3	3	25	75	100
	III	U3R1CHCC4	General Chemistry-III	5	5	3	25	75	100
		U3R1CHCC5	General Chemistry-IV	5	5	3	25	75	100
		U3R1PHAC4	Allied Physics-I (Second Allied course-I)	5	3	3	25	75	100
			Allied Physics-II Practical (Second Allied course-II)	3	*	*	*	*	*
	IV	U3R1VE	Value Education	2	2	3	25	75	100
			TOTAL	**30**	**21**	**-**	**-**	**-**	**600**

Sem	Part	Course Code	Course Title	Hrs/ Week	Credit	Exam Hrs	Marks		Total Marks
							Int	Ext	
IV	I	U4R1TL4/HL4/ FL4/SL4/ABL4	Language Course-IV	5	3	3	25	75	100
	II	U4R1EL4	English Language Course –IV	5	3	3	25	75	100
	III	U4R1CHCC6P	Semimicro Qualitative Inorganic Analysis Practical	5	5	3	40	60	100
		U4R1CHCC7	General Chemistry-V	5	5	3	25	75	100
		U4R1PHAC5P	Allied Physics-II Practical	3	3	3	40	60	100
		U4R1PHAC6	Allied Physics-III	5	3	3	25	75	100
	IV	U4R1CHSBE1	Skill Based Elective Course-I	2	2	3	25	75	100
TOTAL				**30**	**24**	**-**	**-**	**-**	**700**
V	III	U5R1CHCC8	Organic Chemistry-I	5	5	3	25	75	100
		U5R1CHCC9	Inorganic Chemistry	5	5	3	25	75	100
		U5R1CHCC10	Physical Chemistry-I	5	5	3	25	75	100
		U5R1CHCC11P	Physical Chemistry Practical	6	5	3	40	60	100
		U5R1CHMBE1	Major Based Elective Course –I	5	4	3	25	75	100
	IV	U5R1CHSBE2	Skill Based Elective Course-II	2	2	3	25	75	100
		U5R1CHIDC1	Inter Disciplinary Course-I	2	2	3	25	75	100
TOTAL				**30**	**28**	**-**	**-**	**-**	**700**
VI	III	U6R1CHCC12	Organic Chemistry-II	5	5	3	25	75	100
		U6R1CHCC13	Physical Chemistry-II	5	5	3	25	75	100
		U6R1CHCC14P	Gravimetric and Organic Analysis Practical	6	5	6	40	60	100
		U6R1CHMBE2	Major Based Elective Course –II	5	4	3	25	75	100
		U6R1CHMBE3	Major Based Elective Course -III	4	4	3	25	75	100
	IV	U6R1CHSBE3	Skill Based Elective Course –III	2	2	3	25	75	100
		U6R1CHIDC2	Inter Disciplinary Course-II	2	2	3	25	75	100
	V	U6R1GS	Gender Studies	1	1	3	25	75	100
			Extension Activities	-	1	-	-	-	-
TOTAL				**30**	**29**	**-**	**-**	**-**	**800**
GRAND TOTAL					**140**				**3900**

*Carried Over Paper

I. List of Major Based Elective Course (Any three)

1. Analytical Chemistry
2. Polymer Chemistry
3. Industrial Chemistry
4. Green Chemistry
5. Material Chemistry and Nanotechnology

II. List of Skill Based Elective Course (Any three)

1. Food Chemistry and Technology
2. Agricultural Chemistry
3. Basic Clinical and Pharmaceutical Chemistry
4. Soil, Dairy and Leather Chemistry
5. Chemistry of Every Day life

III. List of Inter Disciplinary Course (IDC offered)

1. Nutrition and Food Science
2. Medicinal Chemistry

SEMESTER-I: CORE COURSE-I: GENERAL CHEMISTRY-I

Course Code : U1R1CHCC1	**Max. Marks : 100**
Hours/Week : 6	**Internal Marks : 25**
Credit : 5	**External Marks : 75**

Objectives: To make students

- *Learn the dualism of electrons and verify their properties through experiments*
- *The principles of quantum numbers and periodicity of elements*
- *The concepts of bonding and shapes of molecules by VSEPR theory*
- *Nomenclature of simple aliphatic compounds and types of bonding*
- *The preparations, reactions and stability of alkanes, cycloalkanes*

Unit - I: Atomic Structure and Basic Quantum Mechanics (15 Hrs)

1.1 Dualism of light–Wave nature of radiation classical theory of electromagnetic, radiation and classical expression for energy in term of amplitude. Particle nature of radiation–black body radiation and Planck's quantum theory, photo electric dualism electric effect and Compton effect of matter – de Broglie hypothesis and Davisson and Germer experiment.

1.2. Heisenberg's uncertainty principle, Schrödinger wave equation– derivation of Schrödinger wave equation, physical significance of (Ψ) function-properties of function–well–behaved function.

1.3. Wave picture of electron – Concept of atomic orbitals, Shapes of *s*, *p* and *d* orbitals, Nodal planes and nodal points in atomic orbitals *g* and *u* character of atomic orbitals.

Unit -II: Quantum Number and Periodic Properties (14 Hrs)

2.1. 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,stability of half-filled and fully filled orbitals.

2.2. Periodicity- Periodic law and arrangement of elements in the periodic table, IUPAC nomenclature and group number, horizontal,vertical and diagonal relationship in the periodic table.

2.3 General Properties of atom-Size of atoms and ions-atomic and ionic radii ionisation potential, electron affinity and electronegativity along periods and groups, electronegtivity – Pauling,Mulliken-Jaffe, Allred-Rochow Methods.

Unit -III: Chemical Bonding (15 Hrs)

3.1.Ionic bond-Properties of ionic compounds-factors affecting formation of ionic compound, Lattice Energy – Born – Haber Cycle – Polarizing power and Polarisability – partial ionic character from electro negativity – Transitions from ionic to covalent character and vice versa– Fajan's rule.

3.2.Covalent bond-Lewis Theory, Octet rule and its exception,electron dot structure formula,Sidgwick-Powel theory,Prediction of molecular shape.

3.3.VSEPR Theory-Shapes of simple inorganic molecules($BeCl_2$, NH_3, H_2O, PCl_3, XeF_4, SF_4, BrF_5, PCl_5, IF_7). Principles of hybridization – Intermolecular forces – Non-covalent interaction, van der Waals forces and hydrogen bonding.

Unit -IV: Introductory Organic Chemistry (Models Oriented) (13 Hrs)

4.1. IUPAC nomenclature- Naming of organic compounds (up to 20 carbon systems) – Hydrocarbons – mono and bi-functional compounds–alkanes, cycloalkanes, alkenes, alkynes, halogen compounds, alcohols, ethers, aldehydes, ketones and carboxylic acids. Isomerism-types of isomerism (structural and stereoisomerisms) with appropriate examples.

4.2. Hybridization and geometry of molecules-methane, ethane, ethylene, acetylene;

4.3.Electronic Displacement: Inductive, resonance, hyperconjugation and steric effect; Cleavage of bonds: Homolytic and heterolytic C-C bond fission.

4.4 .Reaction intermediates and stability- Carbocations, carbanions and free radicals.

Unit -V: Chemistry of Alkanes and Cycloalkanes (12 Hrs)

5.1.Petroleum source of alkanes–Methods of preparing alkanes and cycloalkanes - Chemical properties– Mechanism of free radical substitution in alkanes by halogenations –Uses.

5.2.Conformational study of ethane and *n*-butane-relative stability of cycloalkanes from cyclopropane upto cyclohexanane–Bayer's Strain theory–limitations.

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- Predict the atomic structure and use standardized names and symbols to represent atoms
- Understand the concept of periodic properties and their importance
- Predict the chemical bonding or molecular geometry based on the molecular structure
- Understand the naming of hydrocarbons, electronic effects and
- Learn about chemistry of alkane

Text Books

1. B. R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry,23rd Ed., New Delhi, Shoban Lal Nagin Chand & Co.(2013).
2. P.L. Soni., Text book of Inorganic Chemistry, 20th Ed., S Chand & Sons Publications.
3. B. S. Bahland Arun Bahl, Advanced Organic Chemistry, 12th Ed., New Delhi, Sultan Chand &Co., (2014).
4. B. R. Puri, L.R. Sharma, M. S. Pathania,Principles of Physical Chemistry,47th Ed.,New Delhi, Shoban Lal Nagin Chand & Co., (2017).
5. S. Glasstone, D. Lewis, Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.
6. B.S.Bahl, Arun Bahl and G.D Tuli,Essentialas of Physical Chemistry, S.chand & Company Pvt.Ltd.(2014).

Reference Books

1. J. E. Huheey, E. A. Kieter and R. L. Keiter, Inorganic Chemistry, 5th Ed., Harper Collins, New York, 2003.
2. J. D. Lee, Concise Inorganic Chemistry, UK, Black well science (2008).
3. R. T. Morrison and R. N. Boyd, Organic Chemistry 7th Ed., New York, Allyn& Bacon Ltd., (2012).
4. S.K.Dogra and S.Dogra, Physical Chemistry Through Problems, New age international, 4thEd. 1996.
5. P.W. Atkins, Physical Chemistry, 7th Ed., Oxford university press, 2001.

SEM: I	B.Sc. PHYSICS/ CHEMISTRY/ INDUSTRIAL ELECTRONICS	ALLIED COURSE:1
Credit:3	ALLIED MATHEMATICS – I (FIRST ALLIED COURSE)	Int.Marks:25
Hours/Week:6	CODE: U1R1MTAC1	Ext.Marks:75
Total Hours:72		Max.Marks:100

Objectives:

- *To find the derivatives of the functions using the limit definition*
- *to Evaluate of integrals of some standard types.*
- *To discuss about definite integrals and its properties.*
- *To represent a periodic signal with continuous time Fourier series*
- *To Evaluate of Double and Triple integrals*

Unit I: Successive Differentiation **[13 Hours]**

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

Unit II: Evaluation of integrals **[14 Hours]**

Evaluation of integrals of types

$$\int \frac{px+q}{ax^2+bx+c}dx, \int \frac{px+q}{\sqrt{ax^2+bx+c}}dx, \int \frac{dx}{a+b\cos x}, \int \frac{dx}{a+b\sin x}$$

Integration by trigonometric substitution and by parts of the integrals (Problems only)

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

Unit III: Definite Integral **[15 Hours]**

General properties of definite integrals - Evaluation of definite integrals of types

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

Reduction formula (when n is a positive integer) for

$$\int_a^b e^{ax}x^n dx, \int_a^b \sin^n x dx, \int_a^b \cos^n x dx, \int_0^x e^{ax}x^n dx, \int_0^{\pi/2} \sin^n x dx, \int_0^{\pi/2} \cos^n x dx, \int_0^{\pi/2} \sin^n x \cos^m x dx$$

Unit IV: Multiple Integrals **[14 Hours]**

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

Unit V: Fourier series **[14 Hours]**

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

Unit –VI: **[02 Hours]**

Latest development related to the course during the semester concerned. [For continuous CIA Assessment only]

Text Books:

[1] "Calculus, Vol. I", S.Narayanan, T.K.ManichavasagamPillai, S.Viswanathan Pvt. Limited, 2003.

[2] "Calculus, Vol. II", S.Narayanan, T.K.ManichavasagamPillai, S.Viswanathan Pvt. Limited, 2003.

[3] "Allied Mathematics" - S.G.Vengatachalapathy, Marghum Publications

Unit I : Chapter 3 – Fully and Chapter 10 - 2.1, 2.3 [1]

Unit II : Chapter 1 - Sec. 7.3 (ii), Sec. 8 (ii), 1, 2, 3 (v), Sec. 9, fully [2]

Unit III : Chapter 1 - Sec. 11 - fully, sec. 13, 13.1, 13.3, 13.4, 13.5 [2]

Unit IV : Chapter 5 - Sec. 2.1, 2.2 & Sec. 4 [2]

Unit V: Chapter 12 - 12.1 to 12.40 [3]

Reference Book:

1) "Engineering Mathematics" - Babu Ram - Pearson Publication

Outcomes:

The Learners would have the ability to

- *Solve problems on successive differentiation and Leibnitz theorem.*
- *Understand and apply the definite integral formula.*
- *Understand the general properties of definite integrals*
- *Develop Fourier series for different types of functions.*

SEM: II	B.Sc. PHYSICS/ CHEMISTRY/ INDUSTRIAL ELECTRONICS	ALLIED COURSE:2
Credit:3	ALLIED MATHEMATICS – II (FIRST ALLIED COURSE)	Int.Marks:25
Hours/Week:5	CODE: U2R1MTAC2	Ext.Marks:75
Total Hours:60		Max.Marks:100

Objectives:

- *To derive Binomial, Exponential and logarithmic series.*
- *To carry out the basic operation of matrix algebra*
- *to Find the shortest distance between two skew lines*
- *To synthesize all the mathematical presentation of Expansion*
- *To analyze situations, check for limitations, examine appropriate methods of solution using trigonometry.*

Unit I - Binomial, Exponential and Logarithmic Series [12 Hours]

Important expansions - summation & approximation related problems only - limits and approximations.

Unit II – Matrix [10 Hours]

Non-singular, Symmetric, Skew Symmetric, Orthogonal, Hermitian, Skew Hermitian and Unitary matrices - Characteristics equation, eigen values, eigen vectors - Cayley Hamilton's theorem (proof not needed) - Simple applications only.

Unit III - Analytical Geometry (3D) [14 Hours]

Finding the shortest distance between two skew lines and the equation of the plane containing them - Condition of 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 [12 Hours]

Expansion of Sin $n\theta$, cos $n\theta$, tan $n\theta$ (n being a positive integer) - Expansion of $Sin^n\theta$, $Cos^n\theta$, $Sin^n\theta Cos^m\theta$ in a series of sines & 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 [10 Hours]

Euler's formula for $e^{i\theta}$ - Definition of Hyperbolic functions - formulae involving Hyperbolic functions - Relation between Hyperbolic & circular functions - Expansion of sinh x, cosh x, tanh x in power of x-Expansion of Inverse hyperbolic function $\sinh^{-1}x$, $\cosh^{-1}x$ and $\tanh^{-1}x$ - Separation of real & imaginary parts of sin(x+iy), cos (x+iy), tan (x+iy), sinh(x+iy), cosh(x+iy), tanh(x+iy).

Unit –VI: [02 Hours]

Latest development related to the course during the semester concerned. [For continuous CIA Assessment only]

Text Books:

[1] T.K.ManicavachagamPillai, T.Natarajan, K.S.Gnanapathy, "Algebra, Vol. I, algebra, Vol. II", S.Viswanathan Pvt. Limited, Chennai, 2004.

[2] S.NarayananT.K.ManichavasagamPillai, "Trignometry" S.ViswanathanPvt.Limited, and Vijay Nicole Imprints Ptvt Ltd, 2004.

[3] T.K.ManickavasagamPillai, Analytical Geometry (3D) and Vector Calculus, New Gamma Publishing House.

Unit I: Chapter III, IV - Simple problems only in [1] Vol. [1]

Unit II: Chapter II - fully in [1] vol. [2]

Unit III: Chapter I - Sec. 1, 2, Chapter IV, Sec. 35 to 41 [3]

Unit IV: Chapter III, fully [2]

Unit V: Chapter IV, fully [2]

Reference Books:

1) "Analytical Geometry", Duraipandian & Chaterjee
2) "Trigonometry"- Arumugam &others - New Gamma publications.

Outcomes: The Learners would have the ability to

- Find the approximate solution of roots of polynomials by suitable methods and problems based on exponential and logarithmic series.
- Know the applications of Cayley Hamilton's Theorem.
- Find the equation of the system of planes and the length of perpendiculars to planes and the angles between the lines.
- Expand$Cos^m\theta, sin^n\theta, cos^m\theta sin^n\theta$, for different values of n & m.
- Solve problems involving hyperbolic functions.

SEM: II	B.Sc. PHYSICS/ CHEMISTRY/ INDUSTRIAL ELECTRONICS	ALLIED COURSE:3
Credit:3	ALLIED MATHEMATICS – III (FIRST ALLIED COURSE)	Int.Marks:25
Hours/Week:5	CODE: U2R1MTAC3	Ext.Marks:75
Total Hours:60		Max.Marks:100

Objectives:

- *To learn the techniques of calculus and its applications*
- *To provide the standard methods for solving differential equations as well as methods based on the use of Laplace transforms*
- *To understand the idea of Inverse Laplace Transforms*
- *To give a systematic study of Vector Calculus..*
- *To understand the basic concepts of vector differentiation and integration.*

Unit I - Linear equations with constant coefficients [12 Hours]

Definition – The operator D – Complementary function of a Linear equation 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(only problems) in all the above - No proof needed for any formula.

Unit II - Laplace Transforms [10 Hours]

Definition - L(e^{at}), L(Cos(at)), L (sin (at)) L(t^n), where n is a positive integer - Laplace Transforms of periodic functions some general theorems.

Unit II – Inverse Laplace Transforms [10 Hours]

The Inverse Laplace Transforms - Solving second order ODE with constant coefficients using Laplace Transforms.

Unit IV - Vector differentiation [14 Hours]

Vector function – limits and continuity of a Vector function– Derivative of a Vector function with respect to a scalar – Integration of Vector functions – Partial derivatives of vectors – The Vector Differential operator Del - Gradient of a Scalar field – Directional derivative of a scalar point function - Tangent plane and normal to a level surface – Divergence of a Vector function - Curl of a Vector point function.[No proof is needed for theorems, only statement and related problems.

Unit V - Vector Integration [12 Hours]

Line integrals - surface integrals - volume integrals – The divergence theorem of Gauss, Green's theorem - Stoke's Theorem (No proof needed, Problems only).

Unit –VI: [02 Hours]

Latest development related to the course during the semester concerned. [For continuous CIA Assessment only]

Text Books:

[1] "**Differential Equations and its Applications"** S.Narayanan, T.K. ManikavachagamPillay Publishers, 2011.

[2] "**Vector Calculus**" by J. N. Sharma and A.R. Vasishtha published by Krishna Prakashanmedia (P) Ltd

Unit I: Chapter 5, Sec 1 – 4 [1]

Unit II: Chapter 9, Sec. 1 - 5 [1]

Unit III: Chapter 9, Sec. 6 – 9 [1]

Unit IV: Chapter 1-1, 2, 3, 6 Chapter 2- 1,2,3,5,6,7,8 [2]

Unit V: Chapter 3 (2, 4, 5, 7, 8, 9) [2]

Reference Books:

1. "Ordinary and partial differential equation", M.D. Raisinghania - S. Chand & Co.
2. "Mathematical physics" -B.D.Gupta - Vikas Publications.

Outcomes:

The Learners would have the ability to

- Understand the concepts of linear equations.
- *Evaluate* Laplace Transforms of periodic functions.
- *Apply the Inverse Laplace Transform to solve second order ODE with constant coefficients.*
- *Acquire the knowledge of Vector Differentiation and Integration.*
- *Use the vector identities, directional derivatives and divergence of a vector point function are evaluated easily.*

SEMESTER-II: CORE COURSE-II: GENERAL CHEMISTRY-II

Course Code : U2R1CHCC3	**Max. Marks : 100**
Hours/Week : 6	**Internal Marks : 25**
Credit : 5	**External Marks : 75**

Objectives: To help students

- *Understand acid, base and Tritrimetric analyses*
- *Learn the chemistry of s-block elements*
- *Study the preparations and reactions of alkenes, alkynes and dienes*
- *Understand the chemistry of benzene and non-benzenoid compounds*
- *Understand the basic idea of gases*

Unit- I: Acid–Base Theory and Tritrimetry (Analysis Oriented**) (13 Hrs)**

1.1.Acids and Bases: Arrhenius, Protonic and Lewis Theories of Acids and Bases – Usanovich's generalized definition – Relative strengths of Acids and Bases – Dissociation constant of Acids and Bases – Levelling effect of water, Hard and soft acids and bases (HSAB).

1.2.Titrimetry: Definitions of Molality,Normality, Molarity and mole fraction – Primary and Secondary standards – Types of titrimetric reactions – acid-base, redox, precipitation and complexometric titrations – Indicators – Effect of change in *p*H – Neutralization, redox, adsorption and metal ion indicators.

Unit -II: Chemistry of *s*-Block Elements (12 Hrs)

2.1.General characteristics of s-Block elements: Hydrogen in the Periodic Table, atomic hydrogen, nascent hydrogen, occluded hydrogen, uses of hydrogen.

2.2.General characteristics of Group IA – diagonal relationship between Li and Mg – Extraction of Lithium,Sodium,Pottassium – Physical and Chemical properties – Uses – Preparation of NaOH, Na_2CO_3 (Laboratory), Properties – Uses .

2.3.General characteristics of Group IIA – diagonal relationship between Be and Al – Extraction of Beryllium,Magnesium,Calcium– Physical and Chemical properties,Uses.

Unit -III: Chemistry of Alkenes, Alkynes and Dienes (15 Hrs)

3.1. Alkene-Petroleum source of alkenes and aromatics – General methods of preparation of alkenes – Chemical properties – Elimination mechanisms (E1,E2,E1cB**)** Electrophilic, Free radical additions–Ziegler–Natta catalytic polymerization of ethylene.

3.2.Alkyne-General methods of preparation of alkynes–physical and chemical properties.

3.3.Diene-Types of alkadienes, general methods of preparation of dienes-physical and chemical properties,mechanisms of electrophilic and free radical addition reactions.

Unit-IV: Chemistry of Aromatic Compounds (15 Hrs)

4.1.General methods of preparation of benzene–Chemical properties.Electrophillic substitution mechanism–Orientation and reactivity in substituted benzenes.

4.2.Polynuclear Aromatic compounds – Naphthalene, Anthracene and Phenanthrene from coal tar and petroleum – Laboratory preparation-Molecular Orbital structures–Aromatic Characters–Mechanism of aromatic Electrophillic substitution, Physical and Chemical properties–Uses.

4.3.Preparation of biphenyls – Physical and Chemical properties–Uses.

Unit -V: Gaseous State (14 Hrs)

5.1. Maxwell's distribution of Molecular velocities (Derivation not required). Types of Molecular velocities – Mean, Most probable and root mean square velocities.

5.2. Graphical representation and its significance – Collision diameter, Mean free path and collision number – Transport properties – Thermal conductivity, Viscosity and Diffusion – Law of equipartition of energies – Degree of freedom.

5.3. Molecular basis of Heat capacity – Real gases – vander Waals equation of states – derivation – significance of critical constants – Virial equations of state – Law of corresponding states – Compressibility factor.

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes:

At the end of the course, the learners will be able to

- ❖ Know the concepts of acid, base and tritrimetry principles
- ❖ Learn the s-block elements and their compounds
- ❖ Learn the synthetic methodology and chemical modification of alkene, diene
- ❖ Understand the aromatic compounds and their properties
- ❖ Use accepted models to describe the reaction between gaseous system and become aware of their physical properties

Text Books

1. B. R. Puri,L.R.Sharma, K. K. Kalia, Principles of Inorganic Chemistry, 33rd Ed., New Delhi, Shoban Lal Nagin Chand & Co., (2017).
2. P.L. Soni., Text book of Inorganic Chemistry.20th Ed., S .Chand &Sons Publications.
3. B. S. Bahi and Arun Bahl, Advanced Organic Chemistry, 12thEd., New Delhi, Sultan Chand & Co., (2014).
4. B. R. Puri,L. R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 46thEd., New Delhi, Shoban Lal Nagin Chand & Co., (2014).
5. B.S.Bahl, Arun Bahl and G.D Tuli, Essentials of Physical Chemistry, S.Chand & Company Pvt.Ltd.(2014).

Reference Books

1. J. D. Lee, Concise Inorganic Chemistry, UK, Black well science (2008).
2. F. A. Cotton, G. Wilkinson and P. L. Guas, Basic Inorganic Chemistry, 6th Ed.,John Wiley, 2013.
3. J. E. Huheey, E. A. Kieter and R. L. Keiter, Inorganic Chemistry, 4th Ed., Harper Collins, New York, 2003.
4. D. F. Shriver and P. W. Atkins, Inorganic Chemistry, 3rdEd., W. H. Freeman and Co, London, 2002.
5. R. T. Morrison and R. N. Boyd, Organic Chemistry 7thEd., New York, Allyn & Bacon Ltd., (2012).
6. P.W. Atkins, Physical Chemistry, 7th Ed., Oxford university press, 2003.

SEMESTER-III: CORE COURSE-IV: GENERAL CHEMISTRY-III	
Course Code : U3R1CHCC4	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 5	**External Marks : 75**

Objectives: Enable students

- *To learn the concepts of valence bond and molecular orbital theory*
- *To understand the chemistry of boron and carbon group elements*
- *To understand the chemistry of Alcohol, ether and epoxide*
- *To study the chemistry of active methylene compounds*
- *To know the concepts of solid states*

Unit-I: VB and MO Theories (Models Oriented) (12 Hrs)

1.1. Valence bond theory and hybridization-BeF_2, BF_3, CH_4, C_2H_4 and C_2H_2 (*sp*, sp^2, and sp^3 only) resonance and hyperconjucation.

1.2. MO Theory Bonding and antibonding orbitals, LCAO method, criteria of orbital overlap, types of molecular orbitals-σ, π- and δ-MOs; combination of atomic orbitals to give σ- and π-MOs and their schematic illustration; Application of MO Theory to H_2,He_2,N_2,O_2, HF and CO– Comparison of VB and MO Theories.

1.3. Weak bonds- hydrogen bonding-intra- and intermolecular hydrogen bonding.

Unit-II: Chemistry of Boron &Carbon family (12 Hrs)

2.1. General characteristics of p-block elements: General characteristics of elements of Group III A-diagonal relationship between B and Si-extraction of boron – Physical and chemical properties of B- uses.

2.2. Chemistry of some compounds of boron: Boric acid, Borax, Diborane, Boron nitride – Extraction of Al – physical and chemical properties – uses – chemistry of some compounds of Al: Al_2O_3, $AlCl_3$, Alums – Alloys of aluminum.

2.3. General characteristics of elements of Group IVA- difference of carbon and silicon form the rest of the family- allotropic forms of carbon – chemistry of charcoal – chemistry of oxides of carbon (CO & CO_2) – use of CO_2 in fire extinguishers – fuel gases – preparation of silicon–physical and chemical properties of Si – uses.

2.4. Manufacture of glass – type of glasses – extraction of lead – physical and chemical properties – uses – lead pigments.

Unit III: Chemistry of Alcohol, Ether and Epoxide (12 Hrs)

3.1. Aliphatic alcohols-Preparation by hydroboration, oxidation, Reduction of carbonyl compounds, epoxidation, and Grignard synthesis. Reactions with reference to C-OH bond cleavage and O-H bond cleavage, iodoform test.

3.2. Phenol-Nomenclature, physical properties, hydrogen bonding. Preparation: Industrial source, preparation from diazonium salts and sulphonic acids.

3.3.Reactions- acidity, ether formation, ester formation, mechanism of ring substitution, nitration, sulphonation, halogenation, Friedel-Craft's reaction, nitrosation, coupling reactions, Kolbe's reaction and Riemer-Tiemen reaction.

3.4. Ethers and Epoxides (oxiranes): Nomenclature,preparation, properties, uses.

Unit – IV Active-Methylene Compounds (10 Hrs)

4.1. Introduction- Preparation of malonic ester – Physical and Chemical properties – Synthetic applications – Preparation of ethyl acetoacetate – Physical and Chemical properties – Synthetic applications.

4.2. Introduction to ~, -unsaturated carbonyl compounds–Electrophilic and Nucleophilic addition mechanisms across the –C=C–, Nucleophilic addition mechanism across the –C=O – Michael addition- synthetic uses.

Unit V – Solid States (11 Hrs)

5.1. Definition of solids -Classification of solids–Isotropic and anisotropic crystals. Laws of crystallography–representation of planses–Miller indices, space lattice, crystal systems– seven primitive, unit cells, Bravious lattices – X – ray diffraction – derivation of Bragg's equation – determination of structure of NaCl by Debye Scherrer (powder method) and rotating crystal method – determination of Avogadro's number – discussion of structure of KCl & CsCl.

5.2. Defects in crystals – stoichiometric and non stoichiometric – packing of ions in crystals – radius ratio rules and its limitations.

5.3. Metallic bond: crystal structure of metals-*ccp*, *hcp*, metallic properties, band theory of metals.

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course outcomes: At the end of the course, the learners will be able to

- ❖ Describe the hybridization and structure of molecule by VB and MO theory
- ❖ Know the boron and carbon family and their importance of compounds
- ❖ Understand the applications of alcohols and ether in synthetic applications
- ❖ Learn about ester and its applications
- ❖ Know the nature of solids and their structure

Text Books

1. B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., Delhi, 2017.
2. B. S. Bahl and Arun Bahl, Organic Chemistry, S. Chand and Sons, New Delhi, 2005.
3. S. Glasstone, D. Lewis, Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.
4. B. R. Puri, L.R. Sharma, M.S. Pathania, Principles of Physical Chemistry, 46th Ed, New Delhi, Shoban Lal Nagin Chand & Co., (2014).
5. P.L. Soni., Text book of Inorganic Chemistry. 20th Ed., S .Chand & Sons Publications.
6. B.S.Bahl, Arun Bahl and G.D Tuli,Essentials of Physical Chemistry, S.Chand & Company Pvt.Ltd.(2014).

Reference Books

1. R. T. Morrison And R. N. Boyd, Organic Chemistry, 6thEd, Printice-Hall Of India Limited, New Delhi, 2012.
2. J. D. Lee, Concise Inorganic Chemistry, 5th Ed., UK Blackwell Science, London, 2008.
3. J. E. Huheey, E. A. Kieter and R. L. Keiter, Inorganic Chemistry, 5th Ed. Harper Collins, 2013.
4. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry, 6thEd., John Wiley, New York, 2013.
5. Jerry March, Advanced Organic Chemistry, 6thEd, John Wiley and Sons, New York, 2013.
6. Francis A. Carey, Organic Chemistry, 3rd Ed, Tata-McGraw Hill Publications, New Delhi, 2015.
7. P.W. Atkins, Physical Chemistry, 7th Ed, Oxford university press, 2003.

SEMESTER-III: CORE COURSE-V: GENERAL CHEMISTRY-IV

Course Code : U3R1CHCC5	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 5	**External Marks : 75**

Objectives: To make students

- *Understand the chemistry of nitrogen*
- *Know the compounds of oxygen group elements*
- *Understand the chemistry of heterocyclic compounds.*
- *Learn the basic concept of stereochemistry*
- *Know the basic ideas on liquid crystals and colloids*

Unit-I: Chemistry of Nitrogen Group (12 Hrs)

1.1.General characteristics of elements of VA Group – the unique features of nitrogen from the rest of the family – preparation of nitrogen – physical and chemical properties of N_2 – uses – industrial preparation of ammonia – physical and chemical properties – uses.

1.2.Chemistry of some compounds of nitrogen-Hydrazine, Hydroxylamine, Nitric acid– nitrogen cycle – artificial fixation of nitrogen – preparation of phosphorous compounds – physical and chemical properties – uses.

1.3.Chemistry of some compoundsof phosphorous -PH_3, PCl_5, P_2O_5 and oxyacids of phosphorus

Unit-II: Chemistry of Oxygen Group (12 Hrs)

2.1.**Anomalous behaviour of oxygen** – paramagnetic nature of oxygen, Preparation, properties, structure and uses of oxides of sulphur-SO_2,SO_3.

2.2. Oxyacids of sulphur-thionic acid series,peroxoacid series, classification of oxides based on their chemical behaviour – acidic oxide, amphoteric oxide and neutral oxides.

2.3.Classification of oxides based on oxygen content – normal oxides, peroxides, super oxides, dioxides, sub oxides and mixed oxides. Chemistry of selenium and tellurium.

Unit-III: Chemistry of Heterocyclic Compounds (10 Hrs)

3.1. Classification- Five membered ring compounds: Preparation of Furan, pyrrole and thiophene. Reactions: electrophilic and nucleophilic substitutions, oxidation and reduction reactions.

3.2. Six membered rings- Pyridine, Quinoline and isoquinoline: Preparation by ring closing reactions.

3.3. Reactions- Mechanism of electrophilic and nucleophilic substitutions, oxidation and reduction reactions

Unit-IV: Stereo Chemistry (Models Oriented) (11 Hrs)

4.1. Stereoisomerism-types–optical isomerism– chirality based on symmetry elements (C_n, sigma, i) – idea of asymmetry and dissymmetry – optical activity – measurement of optical activity – concept of enantiomerism, diastereomerism–axial chirality in substituted allenes and spiranes–atropisomerism in substituted biphenyls.

4.2. R,S and D, L notations to express configurations – erythro, threo conventions – meso and dl – forms of tartaric acid -resolution of racemic mixture using chiral reagent–Walden inversion – asymmetric synthesis – asymmetric induction.

4.3.Geometrical isomerism-cis-trans and E-Z isomerism-examples(C=C,di substituted cyclohexane)

Unit-V– Liquid Crystals and Colloids (12 Hrs)

5.1.Liquid crystals – types, theories and applications.Colloids-Definitions – types of colloids – sols – preparation, purification and properties – Kinetic, Optical and electrical stability of colloids, gold number, associated colloids.

5.2.Emulsion – types of emulsions, preparation, properties and application, Gels – types of gels, preparation, properties and applications. Donnan membrance equilibrium –osmosis, reverse osmosis, dialysis and desalination –

5.3.Macromolecules – molecular weight of macro – molecules – determination of molecular weight by osmotic pressure method and light scattering methods.

Unit -VI: Latest Learning's (For CIA only) (3 Hrs)

Latest development related to the course during the semester concerned

Course outcomes: At the end of the course, the learners will be able to

- Identify the periodic trends and properties of nitrogen and oxygen families
- Understand the compounds of oxygen group elements
- Learn the reactions and applications of heterocyclic compounds
- Understand stereochemistry and conventional methods of describing organic molecule
- Know about liquid crystal and their importance

Text Books

1. P.L. Soni., Text book of Inorganic Chemistry. 20th Ed., S.Chand & Sons Publications.
2. B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,23rd Ed Shoban Lal Nagin Chand and Co., Delhi, 2013.
3. R. T. Morrison And R. N. Boyd, Organic Chemistry, 7th Ed., Printice-Hall Of India Limited, New Delhi, 2012.
4. B. S. Bahl and Arun Bahl, Organic Chemistry, S. Chand and Sons, New Delhi, 2005.
5. B. R. Puri, L. R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 46th Ed., New Delhi, Shoban Lal Nagin Chand & Co., (2014)
6. B.S.Bahl, Arun Bahl and G.D Tuli, Essentials of Physical Chemistry, S.Chand & Company Pvt.Ltd.(2014).

Reference Books

1. J. E. Huheey, E. A. Kieter and R. L. Keiter, Inorganic Chemistry, 5th Ed., Harper Collins, 2003.
2. D. F. Shriver and P. W. Atkins, Inorganic Chemistry, 7th Ed., W. H. Freeman and Co, London, 2003.
3. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry, 6thEd., John Wiley, New York, 2013.
4. Jerry March, Advanced Organic Chemistry, 5th Ed., John Wiley and Sons, New York, 2000.
5. P.W. Atkins, Physical Chemistry, 7th Ed., Oxford university press, 2003.

SEM – III: ALLIED COURSE – IV: ALLIED PHYSICS – I (Second Allied Course)		
Course Code : U3R1PHAC4		**Max. Marks : 100**
Hours/Week : 5		**Internal Marks : 25**
Credit : 3		**External Marks : 75**

OBJECTIVES: To make students

- Understand centre of Gravity and stability of floating bodies.
- Understand the concepts of acoustics and properties of sound waves
- Learn the basic concepts of osmosis and diffusion
- Study the basic concepts of Heat.
- Study the concepts of spectroscopy and fibre optics

UNIT-I: MECHANICS (11 Hrs)

Centre of Gravity–Centre of Gravity of a solid hemisphere–hollow hemisphere and Solid Cone. StabilityofFloatingbodies:Metacentre–DeterminationofaMetacentric height of a Ship.

UNIT-II: SOUND (12 Hrs)

Simple Harmonic Motion–Composition of two simple harmonic motion(1) along a straight line and(2)at right angles to each other–Lissa Jou's figures and their applications. Acoustics of buildings Reverberation - Reverberation time – Sabine's formula conditions for good acoustics. Decibel–Phon–Intensity measurement by hotwire microphone method.

UNIT-III: PROPERTIESOF MATER (12 Hrs)

Diffusion:Ficks'sLaw–Coefficientofdiffusion–ExperimentalDeterminationof Coefficient of Diffusion–Application. Osmosis: Laws of osmotic pressure – Berkeley and Hartley Method of determining Osmotic pressure–Elevation of Boiling point and depression of Freezing point–Application.

UNIT-IV: THERMALPHYSICS (11 Hrs)

Newton's law of cooling–Verification–Specific Heat Capacity of a liquid by Cooling-Bomb Calorimeter. Conduction: Coefficient of thermal conductivity–Good and bad Conductor

Stefan's law of radiation–Solar Constant–Angstrom's Pyroheliometer– Temperature of the Sun.

UNIT-V: OPTICS (11 Hrs)

Electromagnetic Spectrum –Spectral response of human eye–UV and IR spectroscopy – Raman Effect – Experimental Arrangement – Application of Raman Effect. Fiber Optic communication: Introduction–Optic Fiber –Numerical Aperature – Coherent bundle – Fiber optic communication System and its advantage–multimode fibre optic sensors.

UNIT-VI: LATEST LEARNING (03 Hrs)

Latest development related to the course during the semester concerned (CIA purpose only, not for question setting)

TEXT BOOKS:

1. Statics, Hydrostatics and Hydrodynamics Narayanamoorthy and Nagarathinam. (1990)
2. Sound–Saigal –S. Chand&Co. Delhi.(2000)
3. Properties of matter–D.S. Mathur. S. Chand & Co (2008)
4. Heat and Thermodynamics–Brijlal and Subramaniam-S.Chand & Co Pvt limited((1999)

REFERENCE BOOKS:

1. Optics–Brijlal and Subramaniam S.Chand Publishing (2010)
2. Optics–Ajoy Ghatak –Tata Mc Graw Hill, Delhi. (2004)
3. Allied Physics–I–A. Sundaravelusamy. priya publications. (2015)

COURSE OUT COME:

On completion of this course, the students will have

- ❖ become proficient in basic concepts of elasticity and its applications
- ❖ Ability to study viscosity and its practical applications in industry
- ❖ Understood the concept of good and bad conductor
- ❖ Become aware of applications of ultrasonic waves in diverse fields.
- ❖ acquired the basic knowledge of optics and optical fiber communication

SEM – III: ALLIED COURSE – V: ALLIED PHYSICS – II (ANY15 EXPERIMENTS ONLY) **(Second Allied Course – Carried Over Paper)**		
Course Code : U41RPHAC5P		**Max. Marks : 100**
Hours/Week : 3		**Internal Marks : 40**
Credit : 3		**External Marks : 60**

Objective: To motivate and educate the students to acquire skill in physics Experiments.

1. Non uniform bending–Pin and Microscope Method
2. Surface Tension and Interfacial Tension–Drop Weight Method
3. Coefficient of Viscosity of Liquid using graduated burette.
4. Specific heat capacity of liquid by Cooling Method.
5. Lee's Disc –Thermal Conductivity of Bad Conductor.
6. Spectrometer–Grating–Normal incidence method.
7. Spectrometer–Refractive index of Solid Prism(A,Dandμ)
8. Newton's Rings–Radius of curvature of a convex lens
9. Sonometer –Verification of Three laws.
10. Carey Foster's Bridge–Specific Resistance.
11. Carey Foster's Bridge–Temperature Coefficient
12. EMF of thermocouple–Direct Deflection method
13. Characteristics of a junction diode
14. Construction of a full wave rectifier.
15. Meter Bridge –Determination of Specific Resistance.
16. AND, OR and NOT logic gates–verification of truth table using Discrete components.
17. De Morgan's theorem and Boolean Algebra
18. Air Wedge – Thickness of Insulation

REFERENCE BOOKS:

1. A text book of practical Physics–M.N. Srinivasan and others–Sultan Chand & Sons, NewDelhi.
2. Practical Physics, S. Somasundaram, V. Balachandran, S. Padmanathan, Apsara Publications, Tiruchirapalli.
3. Practical Physics– A.DhanaLakshmi and K.R. Paramasivam-Apsara Publication,Tiruchirapalli.

COURSE OUT COME: On completion of this course, the students will

- be able to understand the concepts of mechanics, properties of matter and sound through different experiments.
- have acquired the basic trouble shooting skills in the use of simple laboratory experiments.

SEMESTER-IV: CORE COURSE-VII: GENERAL CHEMISTRY-V	
Course Code:U4R1CHCC7	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 5	**External Marks : 75**

Objectives: Enable students

- *To understand the chemistry of halogens and inert gases*
- *To understand the chemistry of d-block elements*
- *To study the chemistry of organometallic compounds*
- *To know about the nature of carbohydrates*
- *To understand the principles of radioactivity and nuclear chemistry*

Unit-I: Chemistry of Halogen and Inert Gases (Models Oriented) (12 Hrs)

1.1. General characteristics of halogen with reference of electro negativity, electron affinity, oxidation states and oxidizing power. Group 17(halogens):Types:ionic, covalent, bridging halides.

1.2. **Preparation and properties structure of Halogen oxides-** oxygen difluoride, dioxygen difluoride, dichlorine monoxide, chlorine dioxide, bleaching powder-estimation of available chlorine; bromine dioxide, iodine pentoxide.

1.3. Oxoacids of halogens- hypohalous acid HOX, halous acid HXO_2, halic oxide HXO_3, perhalic acid HXO_4, strength of oxoacids. Structure of Interhalogen compounds: ClF_3, BrF_3, IF_3,ClF_5, BrF_5, IF_5.Preparation,properties,and structure of ICl.

1.4. Noble gases- Position in the periodic table – isolation from atmosphere – General characteristics – structure and shape of xenon compounds – XeF_4, SeF_6, XeO_3 and $XeOF_4$ – uses of noble gases

Unit-II: Chemistry of d-Block Elements (12 Hrs)

2.1. Occurrence of transition metals- Concentration of ores – froth floatation, magnetic separation, calcinations, roasting, smelting, flux, aluminothermic process–purification of metals–electrolysis, zone refining, van Arkel de Boer methods.

2.2. Important uses of transition metals and their alloys- differences between the first and the other rows, horizontal comparison with Fe, Co, Ni groups; toxicity of Cd and Hg. Variable oxidation states, lower oxidation states and stabilization, catalytic properties. M-M bonding and cluster compounds.

2.3.Synthesis and reactivity of vanadates, chromates, dichromate, molybdates, tungstates, tungsten bronzes, manganate, permanganate.

Unit -III: Chemistry of Organometallic Compounds (12 Hrs)

3.1. Introduction to organometallic reagents–Definition,Classification based on nature of metal-carbon bond,

3.2. Preparation of organometallic reagents with metals like – organolithium Compounds, organomagnesium compounds (magnesium dimethyl, magnesium diphenyl), Organoaluminium compounds, organocopper compounds – physical, chemical properties,structure and their synthetic applications.

Unit-IV: Chemistry of Carbohydrates (11 Hrs)

4.1. Carbohydrate - classification, properties of mono saccharide (glucose and fructose),structure and configuration of mono saccharide, muta rotation, epimerization - cyclic structure - determination of size of sugar rings. Interconversion-ascending and descending series.

4.2. Disaccharide-Sucrose, maltose - structure elucidation.

4.3. Polysaccharide-Structure and properties of starch (elementary treatment).Uses of cellulose derivatives.

Unit - V: The Nuclear Chemistry (10 Hrs)

5.1.Nuclear chemistry: subatomic particles, forces in the nucleus-mesons; stability of nucleus-n/p ratio, binding energy,mass defect,types of nuclear reaction,Fission and fusion – Hydrogen bomb,steller energy-nuclear power station in India. Structure of the nucleus-shell model, liquid drop model.

5.2. Radiochemistry: natural and induced radioactivity; radioactive decay-α-decay, β-decay, γ-decay- unit of radioactivity (Curie); half life period- carbon dating,Geiger-Nuttal rule. Application of radio isotopes(Industry medicine,Agricaltural only)

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- ❖ know the halogen compounds and noble gases
- ❖ know the structure of d-block elements and their biological importance
- ❖ learn about organometallic compounds and its importance
- ❖ understand the chemistry of carbohydrates and their uses
- ❖ understand the basic concepts of nuclear chemistry

Text Book

1. B. R. Puri, L. R. Sharma and K. K. Kalia, Principles of Inorganic Chemistry,23rd Ed., Shoban Lal, Nagin Chand & Co., New Delhi, (2013)
2. P.L. Soni., Text book of Inorganic Chemistry. 20th Ed., S.Chand & Sons Publications.
3. B. S. Bahl and Arun Bahl, Advanced Organic Chemistry,12th Ed.,Sultan Chand and Co., New Delhi,(2014)
4. B. R. Puri, L. R. Sharma and M. S. Pathania, Principles of Physical Chemistry,46th Ed., Shoban Lal, Nagin Chand & Co., New Delhi, (2014)
5. B.S.Bahl, Arun Bahl and G.D Tuli, Essentials of Physical Chemistry, S.Chand & Company Pvt.Ltd., (2014).

Reference Book

1. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry, 6th Ed., John Wiley, New York, 2013.
2. J. D. Lee, Concise Inorganic Chemistry, Black well science, UK, (2008).
3. Jerry March, Advanced Organic Chemistry, 6thEd., John Wiley & Sons, New York, 2013.
4. Francis A. Carey, Organic Chemistry, 3rd Ed., Tata-McGraw Hill Publications, New Delhi, 1999.
5. P.W. Atkins, Physical Chemistry, 7th Ed., Oxford university press, 2003.
6. H. J. Arnikar, Essentials of Nuclear Chemistry, 4th Ed., New Age International, New Delhi, 1995.

SEM – IV: ALLIED COURSE – VI: ALLIED PHYSICS – III (Second Allied Course)		
Course Code : U4R1PHAC6		**Max. Marks : 100**
Hours/Week : 5		**Internal Marks : 25**
Credit : 3		**External Marks : 75**

OBJECTIVES: To help students

- ❖ Study the static character of electric charges
- ❖ Understand the atomic behavior of electric and magnetic field
- ❖ Understand the basic concepts of nuclear physics
- ❖ Study the basic concept of atomic physics.
- ❖ Understand the electronics and digital electronics

UNIT-I: ELECTROSTATICS (11 Hrs)

Coulomb's Law–Gauss Theorem and it's application- intensity due to charged sphere and cylinder. Capacitors – Principles of a Capacitor – Capacity of a capacitor – CapacityofanisolatedSphereandCylinder–EnergyofachargedCapacitor–sharingof charges and loss of energy.

UNIT-II: ELECTRICITY (12 Hrs)

Krichoff'sLaw'sandtheirapplicationstoWheatstone'snetwork–Conditionfor bridge balance– Carey Foster's bridge–Variation of resistance with temperature– Laws of electromagnetic Induction–Expression for induced EMF–Co-efficient of coupling–Determination of co-efficient of self inductance by Rayleigh's Method–Eddy Current and its applications.

UNIT-III: ATOMIC PHYSICS (11 Hrs)

Atom models–Summer field's and Vector atom Models–Pauli's exclusion Principle –various quantum numbers and quantization of orbits. X-rays–Continuous and Characteristic X-rays– Mosley's Law and its importance –Bragg's Law –Miller indices–determination of Crystal Structure by Laue's Powder photograph method.

UNIT-IV: NUCLEAR PHYSICS (11 Hrs)

Nucleus–Nuclear Size–Charge– Mass and Spin–Liquid drop and shell models. Nuclear Radiations and their properties -Particle Detectors: Cloud Chamber and Bubble Chambers. Four types of reactions–Elementary particles and their classifications.

UNIT-V: DIGITALELECTRONICS (12 Hrs)

Number systems− Decimal–Binary –Octal and Hexa Decimal number systems and theirMutualConversions-1'sand2'scomplementofaBinary number and Binary arithmetic (Addition, Subtraction, Multiplication and Division) – Binary Subtractionby1'sand2'scomplementmethods–Basiclogic gates–AND, OR, NOT, NOR, NAND and EXOR Gates – NAND and NOR as universal building gates–BooleanAlgebra–Laws of Boolean Algebra–De Morgan's Theorems–Their verifications using truth tables.

UNIT-VI: LATEST LEARNING (03 Hrs)

Latest development related to the course during the semester concerned (CIA purpose only, not for question setting)

BOOKS FORSTUDY:

1. Magnetism and Electricity–Khare and Srivastava – Atma Ram and Sons– New Delhi.(1976)
2. Modern Physics–R. Murughesan –S. Chand and Co.(2012)
3. Digital Principles and their applications – Malvino and Leach – Tata McGraw Hill. (2010)
4. Hand Book of Electronics–Gupta and Kumar–Pragati Prakasan. .(2016)
5. Allied Physics–II–A. Sundaravelusamy, priya publications. .(2015)

COURSE OUT COME: On completion of this course, the students will have

- ❖ the ability to apply knowledge of electricity and magnetism to explain natural physical processes and related technological advances.
- ❖ apply Gauss's law of electrostatics to solve a variety of problems.
- ❖ an ability to determine and describe static and dynamic electrical and magnetic fields .
- ❖ a fare know of atomic physics
- ❖ the ability ot understand the structure of various number systems and basic logic gates.

SEMESTER-V: CORE COURSE-VIII: ORGANIC CHEMISTRY-I

Course Code : U5R1CHCC8	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 5	**External Marks : 75**

Objectives: To make students understand

- *The chemistry of carbonyl compounds and their derivatives*
- *Nitrogen containing compounds*
- *Carboxylic acids their functional derivatives*
- *The chemistry of proteins and vitamins*
- *Alkaloids and terpenoids*

Unit- I: Aldehydes and Ketones (12 Hrs)

1.1.Nomenclature and classification-Preparation of aldehydes and ketones. Reactivity of carbonyl groups, acidity of alpha hydrogen. Reactions: Mechanism of enolization reactions, nucleophilic addition,addition reactions with Grignard reagents, cyanide, and bisulphate, preparation of derivatives of ammonia and alcohols.

1.2.Mechnism of aldol, cannizaro,Perkin, Knoevenagel reactions, Benzoin condensation, Claisen, Wittig, Reformatsky reactions. Mechanism of reduction with $NaBH_4$, $LiAlH_4$. Wolf-kishner reduction. Mechanism of haloform and Michael addition

Unit- II: Carboxylic Acids and their Functional Derivatives (10 Hrs)

2.1. Nomenclature and classification of aliphatic and aromatic carboxylic acids. Preparation and reactions. Acidity (effect of substituents on acidity) and salt formation Reactions: Mechanism of reduction, substitution in alkyl or aryl group.

2.2. Preparation and properties of dicarboxylic acids such as oxalic, malonic, succinic, adipic acids and unsaturated carboxylic acids such as acrylic, crotonic and cinnamic acids.

2.3. Preparation and reactions of acid chlorides, acid anhydrides, amides and esters. Acid andalkaline hydrolysis of esters, trans-esterification.

Unit- III: Nitrogen Containing Compounds (12 Hrs)

3.1. Nomenclature and classification of Nitrocompounds: aliphatic and aromatic nitro Compounds, classification, general properties, Preparation by nitration. Reactions: reduction by chemical and electrolytic methods.

3.2. di- and tri-substitution of aromatic nitro compounds: synthesis of *o*-, *m*-, *p*-dinitrobenzenes and trinitrobenzene. Amines: Preparation of primary, secondary and tertiary aliphatic amines, basicity of aliphatic amines, effect of substituents on basicity of aromatic amines.

3.3. Diazonium salts: Preparation, diazotisation reactions, replacement reactions (Sandmeyer, Gatterman and Gomberg reactions),coupling reactions. Synthetic application of diazomethane.

Unit - IV: Amino Acids,Proteins and Vitamins (Analysis Oriented) (12 Hrs)

4.1. Amino acids - classification, general methods of preparation and reactions of amino acids, zwitterion - isoelectric points, action of heat on α, β and ɣ amino acids. **4.2.Peptides and proteins:** Peptide linkage - polypeptide -synthesis ofpeptides - Merrifield synthesis. Primary structure - end group analysis - Dangyl chloride, Edman method - secondary structure - denaturation - color reactions of proteins.

4.3. Nucleic acids-Bilogical functions of DNA and RNA(elementary treatment).

4.4. Vitamins (structural elucidation not needed) - classification, biological importance of vitamins A, B_1, B_2, B_6, B_{12} and C.

Unit -V: Alkaloids and Terpenoids (11 Hrs)

5.1.Alkaloids-Definition, occurrence, extraction of alkaloids from plants, general properties, determination of the chemical constitution of the alkaloids, functional group analysis, estimation of groups, degradation and synthesis. Structural elucidation of Coniine, Piperine and nicotine.

5.2.Terpenoids-Classification, isoprene rule, isolation and general properties, Occurrence, general structure and physical properties of geraniol, citral and camphor.

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- ❖ Understand the nomenclature and mechanism in carbonyl compounds
- ❖ Know about carboxylic acids and its derivaties
- ❖ Learn the preparation and reaction of carboxylic acids and nitrogen compounds
- ❖ Know the synthesis and functions of amino acids,protein and vitamins
- ❖ Understand separation and structure of alkaloids and terpenoids

Text Books

1. R. T. Morrison, R. N. Boyd,Organic Chemistry, 7th Ed., New York, Allyn & Bacon Ltd., (2012)
2. B.S.Bahl, Arun Bahl Advanced Organic Chemistry, 12th Ed., New Delhi, Sultam Chand and Co., (2014)
3. I. L. Finar, Organic Chemistry, Vol I & II, 6th Ed., England, Addison Wesley Longman Ltd. (1996).
4. Gurdeep Chatwal & Anand, Chemistry of Natural Products, Himalayan Publishing Co, 2013.
5. O. P. Agarwal, Chemistry of Natural Products, Vol-1, 2 ,Goel Publishing House, 1997.

Reference Books

1. S. H. Pine, Organic Chemistry, 4th Ed., New Delhi, McGraw - Hill International Book Company (1986)
2. Seyhan N. Ege., Organic Chemistry, New York, Houthton Mifflin Co., (2004)
3. Francis A.Carey, Organic Chemistry, 3rd Ed., Tata-McGraw Hill Publications, New Delhi, 2015.

SEMESTER-V: CORE COURSE-IX: INORGANIC CHEMISTRY

Course Code :U5R1CHCC9	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 5	**External Marks : 75**

Objectives: To enable students to learn

- *the chemistry of lanthanides and actinides*
- *the nomenclature and theory of Coordination compounds*
- *the stability and effect of Coordination compounds*
- *he biological importance and applications of Coordination compounds*
- *about the nature of silicates and silicone*

Unit - I: Lanthanides and Actinides (12 Hrs)

1.1.Lanthanides: lanthanide series, occurrence, abundance and natural isotopes, similarity in properties, occurrence, oxidation states, chemical properties of Lanthanide(III) ions, magnetic properties,lanthanide contraction. Separation of lanthanides: solvent extraction, ion exchange method.

1.2.Actinides:actinide series, abundance and natural isotopes, occurrence, preparation of actinides, oxidation states, general properties, the later actinide elements. Uranium-occurrence, metallurgy, chemical properties of hydrides, oxides, and halides.

Unit- II: Coordination Chemistry- I (10 Hrs)

2.1.Types of ligands - IUPAC nomenclature - Isomerisms

2.2.Theories of coordination compounds – Werner, Sidgewick, valence bond, crystal field theory of octahedral complexes.

Unit- III: Coordination Chemistry- II (11 Hrs)

3.1.Stability of complexes - factors affecting the stability of complexes

3.2. unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square planar complexes - *trans* effect - magnetic properties of transition metal complexes.

Unit -IV: Application of Coordination Compounds (Analysis Oriented) (12 Hrs)

4.1.Estimation of nickel using DMG and aluminium using oxine - estimation of hardness of water using EDTA - biologically important coordination compounds:chlorophyll, haemoglobin-their structure and application.

4.2.**Metal carbonyls**: mono and poly nuclear carbonyls of Ni, Fe, Cr, Co and Mn - synthesis and structure.

4.3.**Nitrosyl compounds** - classification, structure and uses of nitrosyl chloride and sodium nitroprusside.

Unit - V: Silicates and Silicone (12 Hrs)

5.1.Introduction-types,chlorosilanes,preparation of linear,cyclic,cross linked silicones.

5.2.Preparation and uses of silicone fluid,polysiloxane gums,silicone rubber, silicone resins.General properties, uses of silicones.

5.3.Phosphonitrilic compounds-introduction-Phosphonitrilic chlorides($PNCl_2$)

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- Know the sources and reactions of lanthanoid and actinoids
- Learn the theories and naming of *Coordination compounds*
- *Know the* stability of coordination compounds
- Understand the biological functions of coordination compounds
- Know about importance of silicones and its uses

Text Books

1. P.L. Soni, Text Book of Inorganic Chemistry, S, Chand & Co, New Delhi (2006).
2. B.R. Puri, L.R. Sharma and Kalia, Principles of Inorganic Chemistry, New Delhi (2002).
3. R.D. Madan, G.D. Juli, and S. M. Malik, Selected Topics in Inorganic Chemistry, S. Chand & Co, New Delhi (2014)

Reference Books

1. J.E. Huheey, E.A. Keiter, R. L. Keiter, Inorganic Chemistry, Principles of Structure and Reactivity, 4th Ed., Harper Collins, 2013.
2. D. F. Shriver, P.W. Atkins,Langford, C. H. Inorganic Chemistry, 3rd Ed.,Oxford University Press, 2000.
3. F.A.Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry, 6th Ed., John Wiley, New York, 2013.
4. J.D. Lee,Concise Inorganic Chemistry, UK Black well science(2008).

SEMESTER-V: CORE COURSE-X: PHYSICAL CHEMISTRY-I

Course Code :U5R1CHCC10 **Max. Marks : 100**
Hours/Week : 5 **Internal Marks : 25**
Credit : 5 **External Marks : 75**

Objectives: To help students learn

- *the basic concept of chemical kinetics and*
- *the terminology involving in thermodynamics*
- *the second law of thermodynamics and its importance*
- *the applications of electrolytic conductance*
- *the UV-Visible,IR and Raman spectroscopy*

Unit- I: Chemical Kinetics (12 Hrs)

1.1.Rate of reaction- average and instantaneous rates, rate equation, order of reaction. Rate laws: rate constants – derivation of rate constants and characteristics for zero, first order, second and third order (equal initial concentration) – derivation of time for half change with examples.

1.2.Methods of determination of order of reactions – experimental methods of determination of rate constant of a reaction – volumetry, polarimetry. Effect of temperature on reaction rate.

1.3.Concept of activation energy- energy barrier Arrhenius equation, collision theory – derivation of rate constant of bimolecular gases reaction – failure of collision theory – Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – derivation of rate for a bimolecular reaction.

Unit- II: Thermodynamics - I (12 Hrs)

2.1.System and surrounding – isolated, closed and open systems - state of the system - Intensive and extensive variables. Thermodynamic processes - reversible and irreversible, isothermal and adiabatic processes - state and path functions - exact and inexact differentials. Work of expansion at constant pressure and free expansion.

2.2. First law of thermodynamics - statement - definition of internal energy (E), enthalpy (H) and heat capactiiy. Relation 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.

2.3.Definition of Joule - Thomson coefficient(μ_{JJ}), calculation of (μ_{JJ})for ideal and real gases - Inversion temperature.

Unit -III: Thermodynamics –II (10 Hrs)

3.1.Second law of thermo dynamics - need for the law - different statements of the law - Carnot's cycle and efficiency of heat engine - Carnot's theorem - thermodynamic scale of temperature –

3.2.Concept of entropy - definition and physical significance of entropy - entropy as a function of P, V and T - entropy changes during phase changes - entropy of mixing - entropy criterion for spontaneous and equilibrium processes in isolated system.

3.3.Gibb's free energy (G)-Helmholtz free energy (A) - variation of A and G with P, V and T- Gibb's - Helmholtz equation and its applications - thermodynamic equation of state - Maxwell's relations ΔA and ΔG as criteria for spontaneity and equilibrium - advantage ΔG over entropy change.

Unit-IV: Electrochemistry (12 Hrs)

4.1.Electrical transport and conductance in metal and in electrolytic solution.- specific conductance and equivalent conductance. Measurement of equivalent conductance-using Kohlraush's bridge. Arrhenius theory of electrolytic dissociation and its limitation. weak and strong electrolyte according to Arrhenius theory. Ostwald's dilution law - applications and limitation.

4.2.Variation of equivalent conductance with concentration- migration of ion- ionic mobility. Kohlrausch's law and its applications. The elementary treatment of the Debye – Huckel- Onsager equation for strong electrolytes. Evidence for ionic atmosphere. The conductance at high fields (Wein effect) and high frequencies (Debye-Falkenhagen effect).

4.3.Transport number and Hittorfs rule-determination by Hittorf's method and moving boundary method application of conductance measurements -determination of strong electrolytes and acids. Determination of Ka of acids. determination of solubility product of a sparingly soluble salt,common ion effect, conductometric titrations.

Unit-V:Spectroscopy (11 Hrs)

5.1.Electromagnetic spectra-The regions of various types of spectra. **UV-visible spectroscopy:** principle-theory of electronic spectroscopy - types of electronic transitions - Franck - Condon principle – predissociation.

5.2.Infrared spectroscopy-Vibrations of diatomic molecules - harmonic and anharmonic oscillators, zero point energy, dissociation energy and force constant, selection rules for

vibrational transition, fundamental bands, overtones and hot bands, diatomic vibrating rotator - P,Q, R branches.

5.3.Raman spectroscopy-Rayleigh scattering and Raman scattering. Stokes and antistokes lines in Raman spectra, Raman frequency, quantum theory of Raman effect- condition for a molecule to be Raman active Comparison of Raman and IR spectra- structural determination from Raman and IR spectroscopy, rule of mutual exclusion.

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- ❖ Identify the rate of reaction and methods for determining order of reaction
- ❖ Understand the terms of thermodynamics and laws of thermodynamics
- ❖ Understand the concept of entropy and free energy
- ❖ Learn about the electrical conductance and methods of determination
- ❖ Know the principle and instrumentation of IR and Raman spectroscopy

Text Books

1. B. R. Puri, L. R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 47th Ed., New Delhi, Shoban Lal, Nagin Chand & Co (2016)
2. S.H.Maron and J.B. Lando, Fundamentals of physical chemistry, Macmillan Ltd., New York, 1966.
3. Maron and Prutton, Physical Chemistry, London, Mac Millan.
4. G. V. Castellan, Physical Chemistry, New Delhi, Orient Longmans,17th Edn, 2004.
5. K. L. Kapoor, A Textbook of Physical chemistry, (volume-2 and 3) Macmillan, India Ltd, 2nd Edition 2011.
6. B.S.Bahl, Arun Bahl and G.D Tuli, Essentials of Physical Chemistry, S.Chand & Company Pvt.Ltd.(2014).
7. J. Rajaram and J.C. Kuriacose, Thermodynamics for Students of Chemistry – Classical, Statistical and Irreversible, Shobhan Lal Nagin, New Delhi, 3rd Edition 2013.

Reference Books

1. S.K.Dogra and S.Dogra,Physical chemistry through problems, New age international, 4th Ed.,1996.
2. Gilbert. W. Castellan, Physical Chemistry, Narosa publishing house, 3rdEd., 1985.
3. P.W. Atkins, Physical chemistry, Oxford university press, 2017.

SEMESTER-VI: CORE COURSE-XII: ORGANIC CHEMISTRY-II

Course Code:U6R1CHCC12	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 5	**External Marks : 75**

Objectives: To enable learners

- *To understand principle of Uv-Vis and IR spectroscopy*
- *To know the instrumentation of NMR, Mass and its application to organic compounds*
- *To study the organohalogen compounds*
- *To understand the molecular rearrangements*
- *To understand the basics of synthetic dyes*

Unit-I: UV - VIS and IR Spectroscopy (10 Hrs)

1.1.UV - VIS spectroscopy-Types of electronic transitions - Factors influencing the absorption–Some terms: Chromophore, Auxochrome, Bathochromic shift, Hypsochromic shift, Hypochromic shift, Hyperchromic shift- solvent effects on λ_{max} - Woodward - Fisher rules - calculation of λ_{max} : dienes and α, β unsaturated carbonyls.

1.2.IR spectroscopy-number and types of fundamental vibrations - modes of vibrations and their energies, position of IR absorption frequencies for functional groups like aldehyde, ketone, alcohol, acid and amide-factors affecting the frequency absorption- conjugation, inductive effect and hydrogen bonding.

Unit-II: NMR and Mass Spectroscopy (Analysis Oriented) (12 Hrs)

2.1.NMR spectroscopy: principle - equivalent and non equivalent protons - shielded and deshielded protons, anisotropy, chemical shift - TMS, tau(τ) and delta(δ) scales, integral, splitting of signals - spin -spin coupling, NMR spectrum of EtOH, n - propyl bromide and isopropyl bromide. spin-spin splitting of neighbouring protons in vinyl and allyl systems. Coupling constants and their use. Deuterium-labeling and its use in NMR.

2.2.Mass spectroscopy: Principle of mass spectrometry – simple instrumentation – Parent peak, Base peak and Meta stable peak, Fragmentation pattern – Nitrogen rule – McLafferty rearrangement - Interpreting the mass spectra of n-butane, n-nonane, dodecane organic molecules.

Unit- III: Organohalogen Compounds (11 Hrs)

3.1.Nomenclature–general methods of preparation of haloalkanes – physical and chemical properties – uses.

3.2. Nucleophillic substitution mechanisms-(S_N1, S_N2 and S_Ni) –evidences– stereochemical aspects of nucleophillic substitution mechanisms.

3.3. General methods of preparation of halobenzenes–physical properties–chemical properties – uses. Mechanisms of electrophillic reaction-theory of orientation and reactivity.

Unit -IV: Molecular Rearrangements (12 Hrs)

4.1.Molecular rearrangements-types of rearrangement (nucleophilic and electrophilic).Classification as anionotropoic, cationotropic, free radical, inter and intramolecular.

4.2. Mechanism with evidence for Pinacol-pinacolone, Beckmann, Hoffmann, Curtius, Benzilic-benzilic acid, Benzidine, Losen rearrangements. Claisen rearrangement (sigmatropic-evidence for inramolecular nature and allylic carbon attachment)-para Claisen, Cope, Bayer-villager and Fries rearrangement.

4.3. Photochemical reactions of ketones - Norrish type I and II.

Unit -V: Industrial Organic Chemistry (12 Hrs)

5.1.Dyes - theory of color and constitution - chromophore, auxochrome, classification according to application and structure - preparation and uses of nitro dyes - naphthol yellow, nitroso fast green O,

5.2.Azo dyes - methyl orange, triphenyl methane dyes - malachite green, indigo dyes - Indigotin, anthraquinone dyes - alizarin, phthalein dyes - fluorescein - sulphonic acid and derivatives.

5.3.Preparation and properties of benzene sulphonic acid - saccharin, chloramines –T, Pheylene diamine dye-Bismark brown.

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- ❖ Determine the functional group of organic compounds by using UV –Visible Spectroscopy
- ❖ Predict the structure of compounds through NMR and Mass spectra
- ❖ Know the synthetic applications of organohalogen compounds
- ❖ Easily identify the migration and types of rearrangements
- ❖ Know the basic theory of dying process

Text Books

1. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th Ed., Printice-Hall Of India Ltd, New Delhi, 2013.
2. William Kemp, Organic Spectroscopy, 3rd Ed., ELBS.
3. B. S. Bahl and Arun Bahl, Organic Chemistry, S. Chand and Sons, New Delhi, 2007.
4. F.W.Billmeyer, Jr., A Text Book of Polymer Science, John Wiley and Sons, New York, 3rd Edition 2007.
5. V.R.Gowariker, N.V. Viswanathan and Jayadev Sreedhar, Polymer Science, New Age Publishers,New Delhi, 1st revised Edition 2010.
6. B. S. Bahl, Arun Bahl, Advanced Organic Chemistry, 12th Ed., New Delhi, Sultam Chand and Co., Reprint (2003)

Reference Books

1. Jerry March, Advanced Organic Chemistry, 6th Ed., John Wiley And Sons, New York, 2013.
2. S.H, Pine, Organic Chemistry, 4th revised Ed., McGraw Hill International Edition, Chemistry Series, New York, 2009.
3. Francis A.Carey, Organic Chemistry, 3rd revised Ed.,Tata-McGraw Hill Publications, New Delhi, 2015.
4. I. L. Finar,Organic Chemistry, Vol I&II, 8th revised Ed., England, Addison Wesley Longman Ltd.(2008).
5. Seyhan N. Ege, Organic Chemistry, New York, Houghton Mifflin Co., (2004)
6. B. Y. Paula, Organic Chemistry, 3rd Ed., Pearson Education, Inc.(Singapore), New Delhi, 2002.
7. B. K. Sharma, Industrial Chemistry (Including Chemical Engineering) –10th Ed., 2011.

SEMESTER-VI: CORE COURSE-XIII:PHYSICAL CHEMISTRY-II

Course Code:U6RCHCC13	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 5	**External Marks : 75**

Objectives: To expose learners to

- *Photochemistry and group theory*
- *The properties of solutions*
- *The electrochemical and electromotive force*
- *Concept of Gibbs free energy and third law of thermodynamics*
- *The phase rule and its applications*

Unit -I: Photo Chemistry and Group Theory (10 Hrs)

1.1. Laws of photo chemistry - Lambert – Beer, Grothus - Draper and Stark – Einstein, quantum efficiency, Photo sensitization and quenching. Cosequences of light absorption-Jablonski diagram-radioactive and non radioactive transition.

1.2. Photo chemical reactions - rate law - kinetics of H_2-Br_2 reaction. Comparison between thermal and photochemical-Flourescence, Phosphorescence, chemiluminescence. Laser and its uses.

1.3.Group theory-symmetry elements and symmetry operation-Point groups of like HCl,H_2,CO_2,H_2O,NH_3,BCl_3.

Unit-II : Solutions (12 Hrs)

2.1.Ideal and non-ideal soultions-normality, molarity, molality, mole fraction. concept of activity and activity coefficients - completely miscible liquid systems - benzene and toluene. Raoult's law and Henry's law. deviation from Raoult's law and Henry's law. Duhem - Margules equation, theory of fractional distillation.

2.2.Azeotropes - HCl - water and ethanol - water systems - partially miscibe liquid systems - phenol - water, triethanolamine - water and nicotine - water systems. Lower and upper CSTs - effect of impunities on CST - completely immiscible liquids - principle and applications of steam distillation.

2.3.Nernst distribution law – derivation. Applications –determination of formula of a complex($KI+I_2 = KI_3$)solvent extraction-principle and derivation of a general formula of the amount unextracted.

2.4.Dilute solutions:colligative properties, relative lowering of vapour pressure, osmosis, law of osmotic pressure, abnormal molecular masses, molecular dissociation - degree of dissociation - molecular association.

Unit –III : Electrochemical Cells (12 Hrs)

3.1.Electrolytic and galvanic cells - reversible and irreversible cells. conventional representation of electrochemical cells. Electromotive force of a cell and its measurement- computation of E.M.F- calculation of thermodynamic quantities of cell reactions (ΔG. ΔH, ΔS and K)- application of Gibbs Helmholtz equation. concentration and E.M.F- Nernst equation, Types of reversible electrodes - gas/metal ion - metal/metal ion; metal/insoluble salt/ anion and redox electrodes.

3.2.Electrode reactions - Nernst equation – derivation of cell. E.M.F and single electrode potential- standard hydrogen electrode - reference electrodes - standard electrode potentials - sign convention - electrochemical series and its significance.

3.3.Concentration cell with and without transport- liquid junction potential. application of EMF of concentration cells. Valency of ion- solubility product and activity co-efficient.

3.4.Potentiometric titrations-Determination of pH using hydrogen and quinhydrone electrodes- determination of pKa of acids by potentiometric method.

Unit-IV: Thermodynamics –III (12 Hrs)

4.1.Equilibrium constant and free energy change - thermodynamic derivation of law of mass action - equilibrium constants in terms of pressure and concentration - NH_3, PCl_5, $CaCO_3$-thermodynamic interpretation of LeChatelier's principle (Concentration, temperature, pressure and addition of inert gases.)

4.2.Systems variable composition - partial molar quantities - chemical potential - variation of chemical potential with T, P and X (mole fraction) - Gibb's Duhem equation. Van't Hoff's reaction isotherm - van't Hoff's isochore - Clapeyron equation and Clausius– Clapeyron equation-applications-

4.3.Third law of thermodynamics –Nernst heat theorem- statement of III law and concept of residual entropy - evaluation of absolute entropy from heat capacity data. Exception to III law (ortho and para hydrogen, CO, N_2O and ice).

Unit -V: Thermodynamics of Phase Changes (11 Hrs)

5.1.Definition of terms in the phase rule - derivation and application to one component systems - water and sulphur - super cooling, sublimation.

5.2.Two component systems - solid liquid equilibria, simple eutectic (lead-silver, Bi-Cd), desilverisation of lead - compound formation with congruent melting point. (Mg-Zn) and incongruent melting point (Na-K).

5.3.Solid solutions - (Ag-Au) - fractional crystallisation. freezing mixtures - $FeCl_3$ - H_2O systems, $CuSO_4$-H_2O system.

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- ❖ Know the laws of photochemistry and photochemical reactions
- ❖ Understand the concepts involved in the study of solutions and Nernst distribution law
- ❖ Learn about electrochemical cells and its reactions
- ❖ Know the phase rule and its applications
- ❖ Know about solid solution and thermodynamics phase changes

Text Books

1. B.R. Puri, L.R. Sharma, M. S. Pathania,Principles of Physical Chemistry, 46th Ed., New Delhi, Shoban Lal, Nagin Chand & Co., (2016)
2. S.H. Maron and J.B. Lando, Fundamentals of physical chemistry, Macmillan Ltd., New York, 1966.
3. G. V. Castellan, Physical Chemistry, New Delhi, Orient Longmans.
4. Rajaram and Keeriacose, Thermodynamics for students of chemistry.

Reference Books

1. P. W. Atkins, Physical Chemistry, 7th Ed., Oxford Uiversity Press. (2002)
2. Maron and Prutton, Physical Chemistry, London, Mac Millan.
3. Castellan G.V,Physical Chemistry, New Delhi, Orient Longmans 17th Edition,2004.

SEMESTER-II: CORE COURSE-II:VOLUMETRIC ANALYSIS PRACTICAL

Course Code:U2R1CHCC2P	**Max. Marks : 100**
Hours/Week : 3	**Internal Marks : 40**
Credit : 5	**External Marks : 60**

Objectives:

- *To train students in volumetric analysis and learn the techniques*
- *To understand the concepts of indicators and equivalent weight*
- *To know about the estimation of total hardness of water*

Titrimetric Quantitative Analysis

Acid-Base Titration

1. Estimation of HCl by NaOH using a standard oxalic acid solution
2. Estimation of Na_2CO_3 by HCl using a standard $Na_2\ CO_3$ solution

Permanganometry

3. Estimation of oxalic acid by $KmnO_4$ 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) by $KmnO_4$ using a standard oxalic acid solution.

Iodometry

6. Estimation of $KmnO_4$ by 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

Complexometric titrations:

a. Estimation of calcium.

b. Estimation of magnesium.

Scheme of valuation: Record - 5 marks**,** Procedure writing - 10 marks

Results: 1-2% - 45 marks; 2-3% - 35 marks; 3-4% - 25 marks; >4% - 15 marks

Course Outcomes: At the end of the course, the learners will be able to

- Apply the principles of tritrimetry
- Apply the concepts of indicator and dilution
- Determine the concentration of different solution

Reference Books:

1. V. Venkateswaran, R. Veerasamy, A. R. Kulandaivelu, Basic principles of Practical Chemistry,2nd Ed.,New Delhi, Sultan Chand & sons (1997).
2. J. Bassett,et al., Vogel's Textbook of Quantitative Inorganic Analysis, 4th Ed., ELBS Longman, (1985).

SEMESTER-IV: CORE COURSE-VI: SEMICICRO QUALITATIVE INORGANIC ANALYSIS – PRACTICAL

Course Code:U4R1CHCC6P	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 40**
Credit : 5	**External Marks : 60**

Objectives:

- *To help students practice using chemicals and glassware without risk*
- *the applications of solubility products, common ion effect in group separation*
- *Identification of interfering and non interfering radicals*
- *the techniques of semi micro qualitative analysis with inorganic salt mixtures*

Semi micro Inorganic Qualitative analysis

Analysis of a mixture containing **two cations** and **two anions** of which one will be an **interfering ion.** Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

Cations to be analysed: lead, copper, bismuth, cadmium, tin, iron, zinc, manganese, cobalt, nickel, barium,calcium, strontium, magnesium and ammonium.

Anions to be analysed:carbonate, sulphide, sulphate, nitrate, chloride, bromide, fluoride, borate, oxalateand phosphate.

Scheme of valuation

Practical - 55 marks; Record - 5 marks ; Total - 60 marks

4 radicals correct with suitable tests : 55 marks; 3 radicals correct with suitable tests ; 40 marks; 2 radicals correct with suitable tests : 30 marks; 1 radical correct with suitable tests : 15 marks; Spotting : 5 marks

Course outcomes: At the end of the course, the learners will be well-versed with

- the fundamentals of qualitative analysis
- qualitative analysis of common metals and rare metals
- the application of the concepts of solubility product and common ion effect in separation of ions
- experiments and interpretation of their results

Reference Book:

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

SEM-V: CORE COURSE-XI-PHYSICAL CHEMISTRY-PRACTICAL

CourseCode:U5R1CHCC11P	**Max. Marks : 100**
Hours/Week : 6	**Internal Marks : 40**
Credit : 5	**External Marks : 60**

Objectives:

- *To train students the instrumental techniques*
- *In analyzing the colligative properties of organic compounds*
- *In understanding the concept of chemical equilibrium*
- *To study phase rule and its applications*

List of Experiments:

1. Critical Solution Temperature of Phenol –Water system.
2. Effect of impurity (NaCl) on Critical solution Temperature of Phenol –Water system.
3. Determination of Transition Temperature of a salt hydrate.
4. Determination of molecular weight by Rast´s macro method.
5. Determination of K_f by Rast´s macro method.
6. Phase diagram(Simple eutectic system)
7. Determination of rate constant of acid catalyst hydrolysis of an ester
8. Determination of Partition co-efficient of iodine between water and CCl_4
9. Potentiometric Redox titration
10. Determination of cell constant

Scheme of valuation

Procedure with formula: 10 Marks, Record :5 and Practicals: 45 Marks; Up to 10% - 45 marks; 10-15% - 35 marks; 15-20% - 25 marks; >20% - 15 marks

Course outcomes: At the end of the course, the learners will be able to

- apply phase rule to predict the eutectic composition temperature
- Identify the dependency of temperature on phase transition
- know the liphophilic and liphophopic character of compounds
- calculate the molecular weight of unknown entities

Reference Books:

1. V. Venkateswaran, R. Veerasamy, A. R. Kulandaivelu, Basic principles of Practical Chemistry,2nd Ed.,New Delhi, Sultan Chand & sons (1997).
2. Daniels et al., Experimental Physical Chemistry, 7th Ed., New York, McGraw Hill,(1970).
3. A. Findlay,Practical Physical Chemistry, 7thEd.,London, Longman (1959).

SEM-VI: CORE COURSE-XIV -GRAVIMETRIC AND ORGANIC ANALYSIS PRACTICAL

CourseCode:U6R1CHCC14P	**Max. Marks : 100**
Hours/Week : 6	**Internal Marks : 40**
Credit : 5	**External Marks : 60**

Objectives: To train students in

- *the techniques of gravimetric analysis*
- *the methods of organic preparations*
- *the techniques of organic qualitative analysis*
- *the determination of physical constants of organic compounds*

Gravimetric Analysis :

1. Estimation of Lead as lead chromate.
2. Estimation of Barium as barium chromate.
3. Estimation of Nickel as Nickel - DMG complex.
4. Estimation of Copper as copper (I) thiocyanate
5. Estimation of Magnesium as magnesium oxalate
6. Estimation Calcium as calcium oxalate monohydrate
7. Estimation of Barium as barium sulphate.
8. Estimation of Iron as Iron (III) oxide.

Organic Qualitative Analysis and Organic Preparation :

Organic Analysis : Analasis of Simple Organic compounds (a) characterization of functional groups (b) confirmation by preparation of solid derivatives / characteristic colour reactions. Note : Mon –functional compounds are given for analysis. In case of bi-functional compounds, students are required to report any one of the functional groups.

Organic Preparation :

Preparation of Organic Compounds involving the following chemical conversions 1. Oxidation 2. Reduction 3. Hydrolysis 4. Nitration 5. Bromination 6. Diazotization 7. Osazone formation

Determination of Physical Constants

Determination of boiling /melting points by semimicro method.

Internal : 40; Ext. Evaluation : 60;

Gravimetry : 30 Org. preparation & org .Analysis : 25

Org. analysis :15

Armatic/ Alphatic –2

Sat/Unsat – 2

Spl. Element –3

functinonal group –5

Derivatives – 3

Org. preparation : 6

Phy Contant : 4

Record :5

Course outcomes: At the end of the course, the learners will be able to

- Perceive the soluble nature of organic compounds of different functional group
- Identify the structural constituents of organic compounds
- detect the various functional group
- apply weighment procedures
- determine the boiling point and melting point of compounds

References Books

1. V. Venkateswaran, R. Veerasamy, A. R. Kulandaivelu, Basic principles of Practical Chemistry,2nd Ed.,New Delhi, Sultan Chand & sons (1997).
2. Sundaram, Krishnan, Raghavan, Practical Chemistry(Part III),S. Viswanathan Co. Pvt., 1996
3. B. S. Furniss, *et al*., Vogel's Textbook of Practical Organic Chemistry,7th Ed,, London, ELBS – Longman, (1984).

MAJOR BASED ELECTIVE COURSE-I: ANALYTICAL CHEMISTRY

Course Code:	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 4	**External Marks : 75**

Objectives: To help students learn

- *Methods of handling chemicals and techniques of chemical analysis*
- *The basic concepts of Chromatography*
- *The procedures of Titrimetric analysis*
- *Spectro analytical techniques*
- *Electro analytical techniques*

Unit-I : Handling Of Chemicals and Analysis (10 Hrs)

1.1. Storage and handling of chemicals-handling of acids, ethers, toxic and poisonous chemicals, antidotes, threshold vapour concentration and first aid procedure. Heating methods, stirring methods filtration techniques.

1.2.Error in chemical analysis: Accuracy, precision, types of error-absolute and relative error, methods of eliminating or minimizing errors.

1.3. Methods of expressing precision: mean, median, deviation, average deviation. Significant figures and its application with respect to the glassware used. Normal error curve and its importance.

Unit -II: Chromatography Techniques (12 Hrs)

2.1.Principle of adsorption and partition chromatography-Column chromatography: adsorbents, classification of adsorbents, solvents, preparation of column, adsorption and applications.

2.2. Thin Layer Chromatography-choice of adsorbent, choice of solvent, preparation of chromatogram, sample, R_f value and its applications. Paper chromatography, solvent used, R_f value, factors which affect R_f value. Applications.paper electrophoresis -separation of amino acids.

2.3. Ion exchange chromatography- resins used, experimental techniques, applications. Gas Chromatography, principle, detector (FID,TCD,ECD).

2.4.Ion - exchange chromatography - principle - types of resins -requirements of a good resin -action of resins - experimental techniques - separation of Co-Ni and chloride - bromide mixture.

Unit III: Titrimetric Methods of Analysis (12 Hrs)

3.1. General principles and types of titrations - Concentration systems: Molarity, molality, normality, wt% ppm, milli equalence and millimoles-problems. Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Limitation of volumetric analysis, endpoint and equivalence point.

3.2. Acid-base Equilibria: pH of strong and weak acid solutions. Buffer solutions, Henderson equations. Preparation of acidic and basic buffers. Relative strength of acids and bases from K_a and K_b values. Neutralisation-titration curve, theory of indicators, choice of indicators.Use of phenolphthalein and methyl orange.

3.3. Complexometric titrations-Stability of complexes, titration involving EDTA. Metal ion indicators and characteristics.

Unit IV: Spectro Analytical Techniques (Analysis Oriented) (11 Hrs)

4.1. Colorimetry and spectrophotometry-Beer–Lambert's law- principle of colorimetric analysis -visual colorimetry-standard series method-balancing method -estimatiion of Ni^{+2} and Fe^{+3} colorimetrically.

4.2. Photoelectric photometer method-spectro photometric determinaton of chromium and manganese in alloy steel.

4.3 .Infra red spectroscopy(Instrumentation only)-block diagram- source-monochromator-cell-detectors and recorders-sampling techniques-NMR spectroscopy(instrumentation only)

Unit -V: Thermo and Electro Analytical Techniques (10 Hrs)

5.1.Thermo analytical methods: Principle of thermo gravimetry, differential thermal analysis, differential scanning calorimetry - Instrumentation for TGA, DTA and DSC - Characteristics of TGA and DTA curves - factors affecting TGA and DTA curves. applications - TGA of calcium oxalate monohydrate DTA of calcium acetate monohydrate - determination of purity of pharmaceuticals by DSC.

5.2.Electro analytical techniques - electro gravimetry -theory of electro gravimetric analysis - determination of copper (by constant current procedure) - electrolytic separation of metals : Principle - separation of copper and nickel,

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- ❖ Understand the storage and handling of chemicals
- ❖ Perform chromatography techniques by which complex mixtures can be separated
- ❖ Identify the concentration of solutions through tritrimetric analyses
- ❖ handle the TGA and DTA instruments and interpret the TGA curves
- ❖ Identify elements using spectro analytical techniques

Text Books

1. B. K. Sharma, Instrumental Methods of Chemical Analysis, coel Publishing House, Merrut, (1997)
2. R. Gopalan, P. S. Subramaniam, and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand and Sons.
3. S. Usharani, Analytical Chemistry, Macmillian.
4. U.N. Dash, Analytical Chemistry: Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 1995.
5. R.A. Day Jr. A.L. Underwood, Quantitatives Analysis, 5th Ed., Prentice Hall of India Private Ltd., New Delhi, 1988.

Reference Books

1. D. A.Skoog and D. M. West, F.J. Holler,Fundamentals of Analytical Chemistry, 7th Ed.,Harcourt College Publishers.
2. J. Mendham, R. C. Denney, J. D .Barnes, M. Thomas, Vogel's Text book of Quantitative Chemical analysis 6th Ed., Pearson education.
3. D.A. Skoog, D.M. West and F.J. Holler, Analytical Chemistry: An Introduction, 5th Ed., Saunders college publishing, Philadelphia, 1990.
4. U.N. Dash, Analytical Chemistry: Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 1995.

MAJOR BASED ELECTIVE COURSE-II: POLYMER CHEMISTRY

Course Code:	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 4	**External Marks : 75**

Objectives: To help students understand

- *the basic concepts of polymer chemistry*
- *the reactions of polymers*
- *the polymerization processes*
- *about commercial polymers and their applications*
- *about modern polymer materials*

Unit -I: Introduction to Polymers (12 Hrs)

1.1. Importance of polymer:basic concept-monomers and polymers-definition.Classification of polymers on the basis of microstructures, macrostructures and applications (thermosetting and thermoplastics).

1.2.Distinction among plastics,elastomers and fibers. Homo and heteropolymers. Copolymers.

1.3.Chemistry of polymerization- chain polymerization, free radical, ionic, coordination step polymerization, Polyaddition and polycondensation- miscellaneous ring-opening & group transfer polymerization.

Unit –II: Physical Properties and Reactions of Polymers (12 Hrs)

2.1. Properties: Glass transition temperature(Tg)–Definition–Factors affecting $T_g$relationships between T_g and molecular weight and melting point. Importance of T_g.

2.2. Molecular weight of polymers: number average, weight average, sedimentation and viscosity average molecular weights. Molecular weights and degree of polymerization.

2.3. Reactions:hydrolysis-hydrogenation–addition–substitutions,cross-linking vulcanization and cyclisations reaction. Polymer degradation, Basic idea of thermal, photo and oxidative degradation of polymers.

Unit-III: Polymerization Techniques and Processing (12 Hrs)

3.1. Polymerisation techniques:Bulk, solution, suspension, emulsion, melt condensation and interfacial polycondensation polymerizations.

3.2.Polymer processing: Calendering–diecasting, rotational casting–compression, injection moulding.

Unit-IV: Chemistry of Commercial Polymers (11 Hrs)

General methods of preparation, properties and uses of the following Polymers: Teflon, polymethylmethacrylate, Polyethylene,polystyrene, rubber –styreneand neoprene rubbers, Phenol – formaldehydes and urea-formaldehyde resins.

Unit-V: Advances in Polymers (10 Hrs)

5.1. Biopolymers-biomaterials. Polymers in medical field. High temperature and fire resistant polymers.

5.2. Silicones-Conducting polymers-carbon Fibers. (basic idea only).

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of course, the learners will be able to

- Understand the basic concepts of polymer chemistry
- Know the various polymerization technique and characterization
- Understand the various polymer processing techniques
- Know the commercial uses of polymers
- Learn about biopolymer and silicones

Text Book :

1. F. W. Billmeyer , Text book of polymer science, Jr. John Wiley and Sons, 3rd Edition,2007.

Reference Books :

1. V. R. Gowariker, V. N. Viswanathan, and Jayader Sreedhar, Polymer Science,Wiley Eastern Ltd., New Delhi, 1st revised Edition 2010.
2. B.K.Sharma, Polymer Chemistry, Goel Publishing House, Meerut, 1989.
3. M. G. Arora, M. Singh and M. S.Yadav, Polymer Chemistry, 2nd Revised Ed.,anmol Publications Private Ltd., New Delhi, 1989.

MAJOR BASED ELECTIVE COURSE-III: GREEN CHEMISTRY

Course Code:	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 4	**External Marks : 75**

Objectives: To enable students learn

- *the basics of green chemistry*
- *about green reagents in synthetic chemistry*
- *microwave green synthesis*
- *the importance of PTC*
- *the synthetic application of catalysis and biocatalysts*

Unit-I: Introduction to Green Chemistry (12 Hrs)

1.1. Green chemistry- General introduction – need of green chemistry – principles of green chemistry – planning a green synthesis in chemistry lab – choice of starting material, reagents, catalysts and solvents.

1.2. Green chemistry in day today life–dry cleaning of clothes, versatile bleaching agents – environmental pollution.

Unit- II: Green Reagents and Catalysts (12 Hrs)

2.1. Green reagents: Dimethyl carbonate, Polymer supported reagents – Polymer supported chromic acid, Poly N-Bromo succinamide, Polystyrene Wittig reagent, Polystyrene anhydride.

2.2. Green catalyst:Acid catalyst , Base catalyst, Oxidation catalyst, Polymer supported catalyst- Polystyrene Aluminium chloride, Polymeric super acid catalyst.

Unit-III: Microwave induced Green Synthesis (12 Hrs)

3.1. Microwave method-General introduction,Microwave assisted reaction in water : Hydrolysis, Oxidation of alcohol, sopanification reaction.

3.2. Microwave assisted reaction in organic solvents: Esterification, Diels-Alder reaction, Claisen rearrangement.

3.3.Microwave assisted solvent free reaction(Solidstate): Deacetylation, Saponification of ester, reductions, synthesis of heterocyclic compounds.

Unit-IV : Phase Transfer Catalysis in Green Chemistry (11 Hrs)

4.1. Introduction-Application of PTC in organic synthesis – Elimination reactions,N-Alkylation, C-Alkylation, Wittg reaction, Darzen reaction. Crown ethers: Esterification, Aromatic substitution reaction, Alkylation reactions, Elimination reactions, Displacement reactions.

Unit-V: Bio Catalysis in Organic Chemistry (10 Hrs)

5.1. Introduction-Biochemical oxidation, Reduction Enzyme catalysed hydrolytic process – Enantio selective hydrolysis of meso, di ester, hydrolysis of N-acyl amino acids ,Green chemistry in pharmaceuticals – Synthesis of Ibuprofen, Paracetamol, Benzimidazole.

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course outcomes: At the end of the course, the learners will be able to

- *appreciate the application of green chemistry in everyday life*
- *understand the applications of green reagents*
- *apply techniques microwave-induced green synthesis*
- *understand PTC in green chemistry*
- *Understand the synthetic applications of catalysis and biocatalysis*

Text Books:

1. V.K. Ahluwalia, Green chemistry, Anees Books India, New Delhi, 2nd edition 2015.
2. V.K. Ahluwalia, M. Kidwai, New Trends in Green chemistry, 2nd Ed., Anamaya Publication, New Delhi, 2008.
3. Dr.K.R.Desai, Green Chemistry-Microwave synthesis, Himalaya publication House, Mumbai, 2nd revised Edition 2014.

MAJOR BASED ELECTIVE COURSE-IV: INDUSTRIAL CHEMISTRY

Course Code :	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 4	**External Marks : 75**

Objectives: To enable students

- *To understand the glass, refractories and ceramics*
- *To know the Chemical composition, of paints,varnishes and Pigments*
- *To understand the types and methods of preparation cement, Pulp and paper*
- *To understand the properties of corrosion and types of batteries*
- *To identify the composition of fertilizers and fuels*

Unit – I: Glass, Ceramics, Refractories (11Hrs)

1.1.Glass and Ceramics- Glass – General properties of glass – types of glasses – manufacture of glass – Ceramics – classification – clay products – white wares – chemical store wares – plasticity of clay – manufacture of white pottery, glazing, Earthen wares.

1.2 Refractories- Definition – classification, properties of refractories – manufacture of refractories, fire clay bricks manufacture, uses of fire clay refractories – High alumina refractories – uses – silicon carbide refractories – properties and uses.

UnitII:Paints,Varnishes,Pigments (12Hrs)

2.1 Paints -Paint – definition – classification of paints based on their applications– constituents – Requisites of a good paint – emulsion paints.

2.2 Varnishes - Definition –constituents of varnish – characteristics of a good varnish – uses – Japans varnish- Ingredients and uses.

2.3 Pigments: Definition – composition, characteristics and uses of white lead, Zinc oxide, Lithopone and TiO_2 – Blue pigments – Ultra marine blue – characteristics – uses. Red pigments – characteristics and uses. Green pigments – chrome green and chromium oxide – characteristics and their uses.

Unit–III:Cement,Pulp, Paper (12Hrs)

3.1 Portland Cement: Introduction – types of cements – High alumina cement, Portland cement- manufacture and quantitative requirements, Setting of Cement and uses.

3.2 Pulp and Paper: Introduction – manufacture of pulp – mechanical process – chemical process – sulphate, sulphite, soda, rag pulp. Beating, Refining, filling, sizing and colouring, manufacture of paper, types of paper and uses.

Unit –IV: Corrosion and Batteries (12 Hrs)

4.1.Corrosion: Introduction – Dry and Wet Corrosion – Electrochemical theory of Corrosion- Mechanism – Galvanic corrosion, Concentration cell, corrosion Waterline Attack – Pitting – passivity – stress corrosion - Corrosion control methods.

4.2 Batteries: Fundamentals of Batteries – Classification of Batteries – Sizes of Batteries –Primary Batteries – Le'clanche dry cell – Magnesium dry cell – Secondary batteries –Lead-acid battery – Alkaline Storage Batteries.

Unit –V: Fertilizers and Fuels (10 Hrs)

5.1 Fertilizers – Requisites of fertilizers, Organic and Inorganic fertilizers, Preparation and uses.

5.2 Fuels – Energy resources - Industrial gases, Water gas, Producer gas, Oil gas, natural gas, coal gas, Gobar gas, Indane gas, Petroleum products and coal products.

Unit -VI: Latest Learning's (For CIA only) (03 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- *apply knowledge on glass,ceramics and refractories*
- *take up employment in chemical industries*
- *explore anticorrosion techniques*
- *advise people on fertilizers and fuels*
- *appreciate the role of chemistry in daily life*

Text Books:

1. B.K. Sharma "Industrial Chemistry", 1st Ed., Goel Publishing House– Meerut.,2011.
2. P.L. Soni, H.M. Chawla "Text Book of Organic Chemistry", Sultan Chand and Sons,New Delhi, 2000.
3. Arun Bahl and B.S. Bahl "Text Book of Organic Chemistry", 11th and 18th Ed., S.Chand, New Delhi, 2006.

MAJOR BASED ELECTIVECOURSE-V

MATERIAL CHEMISTRY AND NANOTECHNOLOGY

Course Code :	**Max. Marks : 100**
Hours/Week : 5	**Internal Marks : 25**
Credit : 4	**External Marks : 75**

Objectives: To make students learn

- *ionic crystals and solid electrolytes*
- *about magnetic materials and insulating material*
- *about metallic glasses and biomaterials*
- *nanophase materials*
- *the applications of nanomaterials*

Unit-I: Ionic Conductivity and Solid Electrolytes (12 Hrs)

1.1.Types of ionic crystals–alkali halides – silver chloride-alkali earth fluovider –simple stoichiometric oxides. Types of ionic conductors – halide ion conductors – oxide ion conductors – solid electrolytes – applications of solid electrolytes.

1.2.Electrochemical cell – principles – batteries, sensors and fuel cells – crystal defects in solids – line and plane defects – point defects - schottky and frenkel defects.

1.3.Electronic properties and band theory;metals, semiconductors – Inorganic solids – colour, magnetic and optical properties, luminescence

Unit II: Magnetic Materials (11 Hrs)

2.1.Introduction – types of magnetic materials – diamagnetism – paramagnetism, ferromagnetism. Ferrites : Preparation and their applications in microwave –floppy disk – magnetic bibble memory and applications.

2.2.Insulating Materials: Classification on the basis of temperature – Blymer insulating materials and ceramic insulating materials. Ferro electric materials: examples – applications of ferroelectries.

Unit III: Modern Engineering Materials (12 Hrs)

3.1.Metallic glasses-introduction –composition, properties and applications. Shape memory alloys:introduction–examples–application of SMA–advantages and disadvantages.

3.2.Biomaterials: Introduction –metals and alloys in biomaterials –ceramic biomaterials, composite biomaterials-polymer biomaterials.

Unit IV : Nanophase Materials (12 Hrs)

4.1.Introduction–techniques for synthesis of nanophase materials –sol-gel synthsis-electrodeposition –inert gas condensation-mechanical alloying.

4.2.Properties of nanophase materials–applications of nanophase materials, composite materials: Introduction –types.

Unit V: Nano Technology (11 Hrs)

5.1.Introduction–importance –various stages of nanotechnology –nanotube technology –nanoparticles –fullerenes-nanodendrimers –nanopore channels, fibres and scaffolds –CVD dismond technology –FCVA technology and its applications – nanoimaging techniques.

Unit -VI: Latest Learning's (For CIA only) (02 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- *Know about the solid electrolytes and their applications*
- *understand magnetic material and their properties*
- *understand modern nanotechnology and its application*
- *Get knowledge on preparatory methods of nanophase material*
- *appreciate the commercial potential of nanomatrial*

Reference Books:

1. A. R. West, Solid state chemistry and its applications, John wiley and sons, 2nd Edition (2014).
2. V. R. Raghavan, Materials Science and Engineering, Printice Hall (India) Ltd.,5th Edition (2011).
3. K. J. Klabunde, Nanoscale materials in chemistry, A. John Wiley and Sons Inc. Publication,1st Edition, (2001).

SKILLBASED ELECTIVECOURSE-I
FOOD CHEMISTRY AND TECHNOLOGY

Course Code:	**Max. Marks : 100**
Hours/Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objectives: To impart knowledge about

- *the basics of food chemistry and adulteration*
- *food poisoning causes and prevention*
- *food additives and their control*
- *beverages and their constituents*
- *edible oils-sources, extraction and analysis*

Unit -I: Food Adulteration (05 Hrs)

1.1. Food adulteration: Definition, classification – Common adulteration in food, Sources of food, types, advantages and disadvantages. Contamination of Wheat, Rice, Alial, Milk, Butter etc. with clay stones, water and toxic chemicals.

1.2. Common adulterants - Ghee adulterants and their detection. Practical rules for good sanitation of food: Food laws and standards – Bureau of Indian Standards, AGMARK – Consumer Protection act.

Unit-II: Food Poison (05 Hrs)

2.1. Food poisons – natural poisons (alkaloids – nephrotoxing) – pesticides. (DDT, BHC, Malathion) – Chemical poisons. Food Spoilage – Causes of food spoilage – Fermentation, rancidity,autolysis.

2.2. Food Preservation: principle and importance-method of freezing, canning, pickling, salting, smoking, bottling, sterilization, refrigeration, dehydration, heating, radiation and preservative agents.

Unit-III: Food Additives (04 Hrs)

3.1. Food additives –artificial sweetners – saccharin – cyclomate and aspartate. Food flavours –esters, aldehydes and heterocyclic compound.

3.2. Food colours – nestricte use spurious colours – Emulsifying agents – preservatives learning agents. Baking powder yeast – taste makers – MSG vinegar.

Unit-IV: Beverages (04 Hrs)

4.1. Beverages – Soft drinks –Composition- soda – fruit juices – alcoholic beverages.

4.2. Examples- Carbonation – addiction to alcohol – cirrhosis of liver and social problems.

Unit-V: Edible Oils (04 Hrs)

5.1.Sources of oils – production of refined vegetable oils – preservation. Saturated and unsaturated fatty acids – iodine value – role of MUFA and PUFA in preventing heart diseases.

5.2. Determination of iodine value and R_M value- saponification values and their significance. Estimation of iodine and R_M values in edible oils.

Unit -VI: Latest Learning's (For CIA only) (02 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- Understand aboutfood adulteration and various methods of detecting it
- identify the causes of food poisoning
- Get knowledge on food additives
- identify the composition of beverages
- Know about Edible oils and their quality

Reference Books:

1. M. Swaminathan., Text book on food chemistry,printing and publishing CO., Ltd.,Bangalore,(2010).
2. Jayashree Ghosh, Fundamental concepts of appliced chemistry, S. Chand & Co. Publishers. (2010)
3. M. Swaminathan M. Advanced Text Book on Food and Nutrition , volume I and II Printing and Publishing CO., Ltd.,5th Edition, Bangalore. 2007.
4. Lillian Hoagoland Meyer, Food Chemistry, CBS publishers and distributors, New Delhi. 2004.
5. B. Srilakshmi, Food Science, New Age International Pvt. Ltd. Publishers, 7th Ed., 2018.

SKILL BASED ELECTIVECOURSE-II: CHEMISTRY OF EVERY DAY LIFE

Course Code:	**Max. Marks : 100**
Hours/Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objectives: To make students understand

- *the characteristics of water*
- *properties the essential oils,perfumes,flavours*
- *cosmetics and their applications*
- *the components of soap and their properties*
- *the action of detergents*

Unit-I: WATER CHEMISTRY (05 Hrs)

1.1 Water- Characteristics of water – Surface water- Ground Water- Atmospheric water - Soft water and Hard water.

1.2. Hardness of Water- Temporary Hardness- Permanent Hardness- Removal of hardness- Ion exchange and reverse osmosis method

1.3 **Water Quality Parameters and determination** - pH-Electrical Conductivity-Dissolved Oxygen- Chemical Oxygen demand-Biological oxygen demand-Total Dissolved Solids-Alkalinty-SAR

1.4 Heavy Metals: Definition- Mercury- Cadmium- Zinc- Copper-Nickel-Aluminium-Chromium- Health Impacts of Metal.

Unit-II: Essential oils, Perfumes and Flavours (05 Hrs)

2.1. Essential oils – definition – occurrences – methods of production plants – steam distillation and expression method.

2.2.**Perfumes:** Formulations, Requirements of a good perfume, composition of perfumes, classification of perfumery materials – animals - synthetic – formulations Manufacturing and Packaging processes of Perfumes.

2.3. Flavours: Definition of flavours – classification, chemical composition, common characteristics, formulation, uses and hazards.

Unit-III: Cosmetics (04 Hrs)

3.1. Face cream, sun screen lotion, shaving cream-composition-formulation - uses and their hazard.

3.2. Sprayer, hand lotion, nail lacquers; nail bleaches, hair oil, hair dyes – Composition, formulation-uses and their hazards.

Unit-IV: Soaps (04 Hrs)

4.1. Definition- Types of Soap- Medicated soaps, Herbal soaps. Soft soaps. Shaving soaps - Mechanism of action of soap.- Manufacture of soaps- Saponification of oils and fats- Formulation of toilet soaps. Different ingredients used and their functions.Shaving soap and creams- ISI specifications. Testing procedures/limits.

Unit-V: Detergents (04 Hrs)

5.1. Anionic Detergents: Manufacture of LAB (linear alkyl benzene). Sulphonation of LAB – preparation of acid slurry. Different ingredients in the formulation of detergent powders and soaps. Liquid detergents. Foam boosters. AOS (alpha olefin sulphonates.

5.2.Cationic detergents: examples. Manufacture and applications. **Non-ionic detergents**: examples. Manufacture of ethylene oxide condensater. **Mechanism of action of detergents**. Comparison of soaps and detergents. Biodegradation – environmental effects. ISI specifications / limits.

Unit -VI: Latest Learning's (For CIA only) (02 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- *learn about in chemistry in everyday life*
- *set up as small entrepreneurs*
- *Get awareness on effect of cosmetics, understand more about cosmetics and their uses*
- *Understand the importance of fuels and fire protection*
- *appreciate the medicinal uses of chemical products*

Text Books:

1. Thangammal Jacob, A textbook of applied chemistry, Mcmillan Company Ind. Ltd, 1997.
2. K.Bagavathi Sundari, Applied Chemistry, MJP publishers Chennai, 1st Ed., 2006.

Reference Books:

1. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 2011.
2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 1st Ed., S.Chand Company Ltd – New Delhi, 2010.

SKILLBASED ELECTIVECOURSE-III
SOIL,DAIRY AND LEATHER CHEMISTRY

Course Code:	**Max. Marks : 100**
Hours/Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objectives: To enable students to learn

- *about different types of soil*
- *the composition of fertilizers*
- *the various processes of water chemistry*
- *about leather and dairy chemistry*
- *various industrial processes involved in manufacturing processes*

Unit – I: Soil Chemistry (04 Hrs)

Soil Chemistry: Introduction - soil classification, physical and chemical properties of soil,soil water, soil air, soil temperature, soil minerals, soil colloids, soil reaction and buffering – soilpH, soil acidity, soil salinity and alkalinity, soil fertility and soil formation.

Unit– II: Fertilizers (05 Hrs)

Fertilizers: Organic Manures - Farmyard Manure - compost - oil cakes - bone meal – meatmeal - fish meal - blood meal and green manures - Fertilizers - classification of fertilizers -requisites of a good fertilizers – preparation properties and uses of nitrogenous fertilizers, urea,CAN - phosphatic fertilizers - super phosphate of lime - triple super phosphate - NPK fertilizers – ill effects of fertilizers -Micronutrients – definition - role of micronutrients in plants .

Unit – III: Water Chemistry (05 Hrs)

Water Chemistry: Water – types of water – soft and hard water – hardness, degree of hardness, temporary and permanent hardness, removal of hardness - Reverse osmosis and ionexchange methods – principle and techniques. Water analysis - Determination of TDS, Totalhardness by EDTA, BOD and COD.

Unit – IV: Leather Chemistry (04 Hrs)

Leather Chemistry: Introduction, chief process used in leather manufacture, structure ofhide and skin, leather processing-process before tannage - tanning process- vegetable tanning and chrome tanning, Tannery effluent and by product problems and treatment .

Unit – V: Dairy Chemistry (04 Hrs)

Dairy Chemistry: Milk - Definition, physicochemical properties of milk, constituents of milk, chemical change taking place in milk - boiling, pasteurization, sterilization and homogenization. Definition and composition of creams, butter, ghee and ice creams. Milk powder, definition, need for making powder. Principles involved in drying process - spray drying and drum drying.

Unit -VI: Latest Learning's (For CIA only) (02 Hrs)

Latest development related to the course during the semester concerned

Course outcomes: At the end of the course, the learners will be able to

- *apply their knowledge on soil and fertilizers, water, leather and dairy in practical life*
- *advise formers on the use of fertilizers*
- *Take up employement in leather processing and dairying*
- *set-upMSME'S in the fields studied*

Reference Books:

1. B.K.Sharma, Industrial Chemistry, 13th Ed., Goel Publishing House, Reprint 2011.
2. Dilip Kumar Das, Introductory Soil Science, 1st Ed., Kalyani Publishers, Reprint 2002.
3. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol. 2, Himalaya Publishing House, 3rd Edition, 2013.
4. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 1stEd., S.Chand & Co Ltd,2010.
5. Clarence Henry Eckles, Willes Barnes Combs, Harold Macy, Milk and Milk Products, 4th Ed., Tata McGraw Hill Publishing Company Ltd, Reprint 2002.
6. G.R. Agarwal, Kiran Agarwal and O.P. Agarwal, Agarwal's Text Book of Biochemistry, 11th Ed., Goel Publishing House, 2014.

SKILLBASED ELECTIVECOURSE-IV: AGRICALTURAL CHEMISTRY

Course Code :	**Max. Marks : 100**
Hours/Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objectives: To make students learn

- *the origin of soils*
- *the chemical composition of soils*
- *about plant nutrients*
- *about their composition and uses*
- *the action of pesticides and fungicides*

Unit –I: Origin of Soil (04 Hrs)

Origin of soils, their properties, acid, alkali and saline soils- diagnosis – remediation of acid and salt affected soils – methods of reclamation and after care.

Unit – II: Chemistry Aspects of Soil (04 Hrs)

Soil testing – concept, objectives and basis – soil sampling, tools, collection processing, despatch of soil samples – soil organic matter – its decomposition and effect on soil fertility.

Unit – III: Plant Nutrients (05 Hrs)

Plant nutrients – macro and micro nutrients – their role in plant growth – sources - forms of nutrient absorbed by plants – factors affecting nutrient absorption - deficiency symptoms in plants – corrective measures – chemicals used for correcting nutritional deficiencies – nutrient requirement of crops – their availability fixation and release of nutrients.

Unit – IV: Fertilizers (05 Hrs)

Fertilizers – classification of NPK fertilizers – sources - natural and synthetic – straight – complex – liquid fertilizers, their properties, use and relative efficiency secondary and micronutrient fertilizers – mixed fertilizers.

Unit – V: Pesticides and Fungicides (04 Hrs)

Pesticides: definition – Classification – organic and inorganic pesticides – mechanism of action – characteristics safe handling of pesticides – impact of pesticides on soil, plants and environment. **Fungicides:** Definition – Classification – mechanism of action – sulphur, copper, mercury compounds, dithanes, dithiocarbamate.

Unit -VI: Latest Learning's (For CIA only) (02 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- ❖ advise formers on soil chemistry
- ❖ recommended the kind of fertilizers they could use in their fields
- ❖ see the role of various nutrients in plant growth
- ❖ take up jobs in agro-chemical industries
- ❖ instruct formers on entomological matters

Reference Books

1. T. D. Biswasand S. K. Mukherjee, Text book of soil science 2017.
2. J . Daji, A text book of soil science, Asia publishing House, Madras – 1972.
3. S. L. Tisdale, W.L. Nelsonand J. D. Beaton, Soil fertility and fertilizers, Macmillon Pub Co New York 1990.
4. P. R. Hesse, A text book of soil chemical analysis John Murray, NewYork, 1971.
5. K. H. Buchel,Chemistry of Pesticides, John Wiley & Sons New York 1983.
6. V. S. Sree Ramulu, Chemistry of Insecticides and Fungicides, Oxford and IBH Publishing Co., New Delhi 1998.

SBE-V: BASIC CLINICAL AND PHARMACEUTICAL CHEMISTRY

Course Code :	**Max. Marks : 100**
Hours/Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objectives: To make learns aware of

- ❖ the basic concepts of drug chemistry
- ❖ the important drugs and their uses
- ❖ antibiotics and their mechanism
- ❖ antiseptics and anasthetics
- ❖ the organic diagnostic agents and their applications

UNIT – I: DRUGS TERMINOLOGY (04 Hrs)

1.1. Drugs – Definition - source of drugs - important terminologies – pharmacy - chemotherapy- Pharmacology – pharmacodynamics – pharmacophore – metabolites – antimetabolites – virus – bacteria - fungi.

1.2. Causes, symptoms, prevention and treatment of common diseases-Tuberculosis-asthma-jaundice, leprosy and typhoid.

UNIT – II: ANTIBIOTICS (04Hrs)

2.1. Antibiotics –Definition - structure and uses of penicillin, chloramphenicol, ampicillin, streptomycin, tetracycline and erythromycin.

2.2. Sulphadrugs-Definition-preparation and uses of sulphadiazine, sulphapyridine, sulphathiazole and sulphafurazole.

UNIT – III: ANTISEPTICS AND ANASTHETICS (05 Hrs)

3.1. Antiseptics and Disinfectants–Definition-Differences between antiseptics and disinfectants-structure and uses of alkyl substituted phenols and chlorinated phenol - crystal violet -brilliant green-methylene blue-cationic surface active agent-benzalkonium chloride cetrimide - properties and uses.

3.2. Anasthetics–Definition– classification - general volatile anaesthetics - ethers, nitrous oxide, chloroform, halothane-advantages and disadvantages. Intravenous anaesthetics - thiopental sodium, methohexitone - local anaesthetics - cocaine, procaine, benzocaine -uses– advantages- disadvantages.

UNIT – IV: BLOOD (05 Hrs)

4.1. Blood – definition – composition - blood grouping - Rh factor - clotting of blood -mechanism - coagulants-vitamin K and protaminsulphate – anticoagulants - coumarine and heparin.

4.2. Blood pressure – definition – hypertension - types and treatment.

UNIT – V: ORGANIC DIAGNOSTIC AGENTS (04 Hrs)

5.1. Organic diagnostic agents – definition - X-ray contrast media (radio opaque) - Iodipamide, Evan's blue, histamine and xylose - advantages.

5.2. Qualitative test of blood samples- carbohydrates - Benedict's test- anthrone test and Fehling test. Proteins – ninhydrin and Biuret test. Fat - translucency – emulsification-iodine absorption and sudan III tests.

Unit -VI: Latest Learning's (For CIA only) (02 Hrs)

Latest development related to the course during the semester concerned

Course Outcomes: At the end of the course, the learners will be able to

- Understand the important drugs and their functions
- Know the constituents of blood and its analysis
- understand the surface active mechanism of antiseptics and anesthetics
- handle organic diagnostic agents
- set up analytical laboratories

TEXT BOOKS:

1. Mathew George and Lincy joseph , Text book of pharmaceutical chemistry, 2009.
2. Jayashree Ghose – Text book of Pharmaceutical chemistry, 2nd Edn., 2003.
3. Lakshmi.S., Pharmaceutical Chemistry, III Edn., Sulthan Chand and Sons, New Delhi,2004.
4. R. S. Satoskar and S.R.Bandarkar – Pharmocolgy and Pharmotherapeutics, popular prakashnan.

UNIT I: Text Book 1,2,3
UNIT II: Text Book 1,2,3
UNIT III: Text Book 1,2,3
UNIT IV: Text Book 4
UNIT V: Text Book 4

REFERENCES:

1. Aleg Gringaur, Introduction to Medicinal Chemistry, Sharma Printers, Delhi, 2011.
2. D.Sriram and P.Yogeshwari, Medicinal Chemistry, 2nd edition-2008.
3. Ashutoshkar , Medicinal chemistry, revised and expanded edition, International Publishers,2010.
4. V.N. Rajasekaran, Vol. I and Vol.II, Pharmaceutical Chemistry, Sun publications Chennai. 4th Edn., 2003.
5. V. K.Ahluwalia and Madhu Chopra, Medicinal chemistry, Ane books private Ltd., New Delhi,1stEdition, 2008.
7. J.C. Kuriacose, J.Rajaram –"Chemistry in Engineering and Technology – Vol– 2. Tata McGraw- Hill Publishing Company Limited – New Delhi – 1994.

INTER DISCIPLINARY COURSE-I
BASIC CONCEPTS IN BIO- CHEMISTRY

Course Code:	**Max. Marks : 100**
Hours/Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objectives: To make students learn

- *the importance of amino acids and proteins*
- *about enzymes and their mechanism*
- *lipids and their analysis*
- *about carbohydrates*
- *the types of nucleic acids*

Unit -I: **Amino Acids and Proteins** **(05 Hrs)**

1.1. Amino acids – classification – Synthesis of amino acids and their identification, peptide bond.

1.2. Proteins –Introduction-occurrence and function-general properties of protein, classification –simple protein and derived proteins. Hydrolysis of proteins: denaturation, precipitation and coagulation.

Unit –II: Enzymes **(04 Hrs)**

2.1.Introduction-classification and properties- factors influencing enzyme action. Mechanism of enzyme action – Lock and Key model and induced fit models.

2.2.Coenzymes –mechanism of coenzyme Micelis Mentens,enzymes of clinical interest

Unit -III: Lipids **(05 Hrs)**

3.1.Classification –simple, complex and derived lipids, biological function of lipids-difference between oil and fats-extraction of fats-physical and chemical properties of lipids

3.2.Analysis of oil and fats; Acid value,saponification value,iodine value and Recihert – Meissel value.

Unit -IV: Carbohydrates (04 Hrs)

4.1.Classification: Monosaccharides.Glucose-Straight chain and ring structure for glucose-Mutarotation-Frutose,Galactose and Glycosides.

4.2.Disaccharides-Maltose,Lactose and sucrose,proertis and reaction of sugars.

4.3.Polysaccharides-Starch-structure of Amylose and Amlopectin,hydrolysis of starch,glycogee,Dextrin,Cellulose,Dextran and Inulin.

Unit -V:Nucleic Acids (04 Hrs)

5.1.Classification-Nucleoside and nucleodites, purine and pyrimidine bases-isolation,component and constitution of nucleic acids-sequence of nucleic acids Difference between DNA and RNA.

5.2. Structure of DNA and RNA, types of RNA

Unit -VI: Latest Learning's (For CIA only) (02 Hrs)

Latest development related to the course during the semester concerned

Course outcomes: At the end of the course, the learners will be able to

- ❖ know the chemistry of amino acids and protein
- ❖ understand the mechanism of enzyme action
- ❖ know the about analysis of oil and fats
- ❖ understand the chemistry of natural products and nucleic acids
- ❖ get trained as dieticians in hospitals

Text Books:

1. Ambikashanmugam,fundamentals of Biochemistry for Medical students,7th Ed.,Reprint 2004
2. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol.1 and 2, Himalaya Publishing House, 3rd Reprint, 2013.
3. T.N.Pattabiraman,Text book of biochemistry,4th Ed., All India puplishers and Distributor 2011.
4. S.P.Butani,Chemistry of Biomolecules,Ane Books Pvt.Ltd.,2010.

INTER DISCIPLINARY COURSE-II: MEDICINAL CHEMISTRY

Course Code :	**Max. Marks : 100**
Hours/Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objectives: To enable students to learn in detail about

- *the basic concepts of drugs*
- *about the diseases and their causes*
- *antibiotics and sulpha drugs*
- *anesthetics and antiseptics*
- *Psychopharmacology*

Unit –I **(05 Hrs)**

1.1.Drugs: source of drugs - important terminologies - molecular pharmacology,pharmacodynamics, pharmacophore, metabolites, virus, antimetabolites, bacteria, fungi -actinomycetes.

1.2.Indian medicinal plants and trees –Adathoda, tulsi, thoothuvalai, neem, mango, and kizhanelli.**Causes and symptoms of common diseases**: Tuberculosis, asthma, jaundice, leprosy,typhoid, malaria, cholera and filaria.

Unit – II **(04 Hrs)**

2.1.Antibiotics: Definition, structure - uses of chloramphenicol, ampicillin, streptomycin, tetracycline, Rifamycin – Erythromycin – Properties, uses.

2.2.Sulpha drugs: Definition and drug action of sulpha drugs.Preparation and uses ofsulphadiazine, sulphapyridine, sulpha thiazole and sulpha furazole.

Unit – III **(05 Hrs)**

3.1.Antiseptics and Disinfectants: Definition - standardization – use of phenols – dyes – chloramines – organo mercurials – formaldehyde - cationic surface active agents - uses.

3.2.Anasthetics: Definition – classification – general volatile anaesthetics – ethers, nitrousoxide, chloroform, trichloro ethane, storage – advantages – disadvantages – intravenousanaesthetics – thiopental sodium, methohexitone – local anaesthetics – cocaine, procaine,benzocaine – uses – advantage – disadvantages.

Unit– IV (04 Hrs)

4.1.Antipyretic Analgesics: Salicylic acid derivatives, aminophenol derivatives, mechanism of action – uses. Anti-Inflammatory Drugs: Indolyl derivatives – indomethacin – ibubrufen – properties and uses.

4.2. Blood: Composition of blood, blood graphics – Rh factor, Blood clotting, Mechanism. **Haematological agents:** Coagulants and anticoagulants, definition-examples.Qualitative test for urea, bile, ketone, Protein in urine sample and urea, glucose in blood sample.

Unit-V (04 Hrs)

5.1.Psychopharmacology, antipsychotic drugs, anti anxiety drugs, anti depressant drugs,sedatives and hypnotics – definition – examples.**Diabetes and Hypoglycemic Drugs:** Types-causes- symptoms – control methods insulin - oral hypoglycemic agents - sulphonyl urea – adverse effects.

5.2. Anticonvulsant agents: Definition, types, barbiturates, hydantoins, succinimides – acetyle urea derivatives -uses.

Unit -VI: Latest Learning's (For CIA only) (02 Hrs)

Latest development related to the course during the semester concerned

Course outcomes: At the end of the course, the learners will be able to

- Understand the concepts of drugs and their preparation
- take up employment in the pharmaceutical industry
- they will be able to set up pharmacies and drug
- they will be able analyze blood samples as paramedics
- understand various diseases and their cure

Text Books:

1. Mathew George and Lincy joseph,Text book of pharmaceutical chemistry, 2009.
2. Jayashree Ghose, Text book of Pharmaceutical chemistry, 2nd Ed., 2012.
3. S. Lakshmi, Pharmaceutical Chemistry, 3rd Ed., Sulthan Chand and Sons, New Delhi,2004.

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2. D.Sriram and P.Yogeshwari, Medicinal Chemistry, 2nd Ed.,-2010.
3. Ashutoshkar, Medicinal chemistry, 7th Ed.,, International Publishers, 2018.

4. V.N.Rajasekaran, Vol.I and Vol.II, Pharmaceutical Chemistry, Sun publicationsChennai. 4th Ed., 2003.
5. V.K.Ahluwalia and Madhu Chopra, Medicinal chemistry, Ane books private Ltd.,New Delhi, 1st Ed., 2008.
6. Marlin Herbert, Pharmacology, Ashton Nany Darkson, Jones and Bartlett India Pvt.Ltd,11th Ed.,, 2010.

J.J COLLEGE OF ARTS AND SCIENCE (Autonomous)

Re-Accredited by NAAC with Grade 'A' in 3rd Cycle

SIVAPURAM, PUDUKKOTTAI-622422

DEPARTMENT OF CHEMISTRY

UG - PROGRAMME - B.Sc CHEMISTRY

(2019-2020)

PROGRAMME OUTCOMES FOR B.Sc

Students will be able to understand

- Human values, Ethics and Social responsibilities in the context of learning chemistry
- The Positive approach towards environmental and ecology from the Chemistry perspective
- Critical thinking, Analytical mind and in-depth knowledge in Chemistry
- Employability Skills which will enable them to find jobs in core- chemistry fields
- Entrepreneurial Skills will be developed in students so as to make them start their own industries/business in core-chemistry fields
- Analytical or Experimental skills doing research tasks in the field of Chemistry