

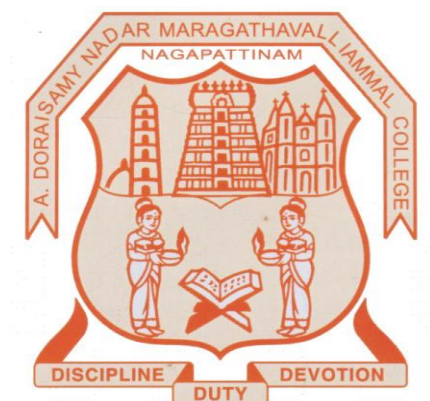
A.D.M.COLLEGE FOR WOMEN (AUTONOMOUS),

NAGAPATTINAM

(Nationally Re-accredited with “A” grade by NAAC-3rd Cycle)

PG & RESEARCH DEPARTMENT OF CHEMISTRY

(for the candidates admitted from the academic year 2019-2020 onwards)



B.Sc CHEMISTRY

SYLLABUS

A.D.M. COLLEGE FOR WOMEN (AUTONOMOUS), NAGAPATTINAM

B.Sc., CHEMISTRY

(for the candidate admitted from the Academic year 2019 – 2020 onwards)

PROGRAMME OBJECTIVE:

1. To develop the skill in problem solving, critical thinking and enhance the knowledge in chemistry.
2. To provide the students an in-depth understanding of the basic concepts of chemical sciences.
3. To provide a detailed knowledge of terms, concept, methodologies, principles and experimental techniques involved in various fields of chemistry.
4. To prepare the students to pursue higher studies and to develop sustainable innovative solutions for the nation.

STRUCTURE OF THE PROGRAMME 2019-2022

Part	Title of the Part	No. of Papers	Hours	Credit
I	Language - Tamil	4	24	12
II	English	4	24	12
III	Core Course	13	70	64
	Allied	6	28	18
	Major Based Elective	3	15	11
IV	Skill Based Elective	3	17	16
	Non-Major Elective	2	4	4
V	Extension Activities	0	0	1
	Value Education	1	2	2
	Environmental Studies	1	2	2
	Soft-Skill Development	1	2	2
	Gender Studies	1	1	1
	Total	39	180	140

Passing Minimum

A candidate shall be declared to have passed in each course if she secures not less than 40% marks out of 75 marks (i.e., 30 marks) in the End Semester Examination (SE) and 40% out of 25 marks (i.e., 10 marks) in the Continuous Internal Assessment.(CIA)

A.D.M. COLLEGE FOR WOMEN (AUTONOMOUS), NAGAPATTINAM
DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

Course Structure Under CBCS

(for the candidate admitted from the Academic year 2019 – 2020 onwards)

SEM	PART	COURSE	TITLE	INST HOURS/ WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL MARKS
							CIA	SE	
I	I	Language Course I (LC)	Tamil I	6	3	3	25	75	100
	II	English Language Course I (ELC)	English I	6	3	3	25	75	100
	III	Core Course I (CC)	General Chemistry I	6	6	3	25	75	100
		Core Course I (Practical) (CP)	Volumetric Analysis	3	-	-	-	-	-
		First Allied Course I (AC)	Zoology I/ Maths I	4	4	3	25	75	100
		First Allied Course II (AC)	Zoology II (P) / Maths II	3	-	-	-	-	-
	V	Value Education	Value Education	2	2	3	25	75	100
Total				30	18				500
II	I	Language Course II (LC)	Tamil II	6	3	3	25	75	100
	II	English Language Course II (ELC)	English II	6	3	3	25	75	100
	III	Core Course I (Practical) (CP)	Volumetric Analysis	3	3	3	40	60	100
		Core Course II (CC)	General Chemistry II	6	6	3	25	75	100
		First Allied Course II (AC)	Zoology II(P) /Maths II	3	3	3	40/25	60/75	100
		First Allied Course III (AC)	Zoology III / Maths III	4	2	3	25	75	100
	V	Environmental studies	Environmental Studies	2	2	3	25	75	100
Total				30	22				700
III	I	Language Course III (LC)	Tamil III	6	3	3	25	75	100
	II	English Language Course III (ELC)	English III	6	3	3	25	75	100
	III	Core Course III (CC)	General Chemistry III	6	6	3	25	75	100
		Core Course II (Practical) (CP)	Qualitative analysis (P)	3	-	-	-	-	-
		Second Allied Course I (AC)	Physics I	4	4	3	25	75	100
		Second Allied Course II (AC)	Physics II(P)	3	-	-	-	-	-
	IV	Non Major Elective I	Chemistry of Consumer Products /Chemistry in Every Day Life I/Clinical Lab Techniques	2	2	3	25	75	100
Total				30	18				700
	I	Language Course IV (LC)	Tamil IV	6	3	3	25	75	100
	II	English Language Course IV (ELC)	English IV	6	3	3	25	75	100
		Core Course IV (CC)	General Chemistry IV	5	4	3	25	75	100
		Core Course II Practical (CP)	Qualitative Analysis (P)	2	3	3	40	60	100

IV	III	Second Allied Course II (AC)	Physics Practical	3	3	3	40	60	100
		Second Allied Course III (AC)	Physics III	4	3	3	25	75	100
	IV	Non Major Elective II	Food Science/ Chemistry in Every Day Life II/Scientific Intellectual Property Rights	2	2	3	25	75	100
		Skill Based Elective I	Pharmaceutical Chemistry/ Forensic Science/Biochemistry I	2	2	3	25	75	100
Total				30	23				800
V	III	Core Course V (CC)	Inorganic Chemistry I	5	5	3	25	75	100
		Core Course VI (CC)	Organic Chemistry I	5	5	3	25	75	100
		Core Course VII (CC)	Physical Chemistry I	6	6	3	25	75	100
		Core Course III (Practical) (CP)	Physical Chemistry(P)	3	3	3	40	60	100
		Major Based Elective I	Analytical Chemistry/ Material and Nano Technology/Nano Chemistry and Bio Inorganic Chemistry	5	5	3	25	75	100
	IV	Skill Based Elective II	Applied Chemistry/ Industrial Chemistry/Biochemistry II	2	2	3	25	75	100
		Skill Based Elective III	Polymer Chemistry/ Green Chemistry/ BioChemistry Practical	2	2	3	25	75	100
	V		Soft Skill Development	2	2	3	25	75	100
Total				30	30				800
VI	III	Core Course VIII (CC)	Organic Chemistry II	6	6	3	25	75	100
		Core Course IX (CC)	Physical Chemistry II	6	6	3	25	75	100
		Core Practical IV (CP)	Gravimetric and Organic Analysis (P)	6	5	3	40	60	100
		Major Based Elective II	Nuclear, Industrial and Metallic State/Petroleum Chemistry/Food Chemistry and Technology	6	6	3	25	75	100
		Major Based Elective III	Agricultural Chemistry/Environmental Chemistry/Food Chemistry Practical	5	5	3	25	75	100
	V	GS	Gender Studies	1	1	3	25	75	100
			Extension Activities	-	1	-	-	-	-
Total				30	30				600
Grand Total				180	140				3900

PG & Research Department of Chemistry

Mark Allocation for Theory Papers

CIA	-	25 Marks
External	-	<u>75 Marks</u>
		<u>100 Marks</u>

CIA Component

Test	-	10 Marks
Assignment	-	2 Marks
Seminar	-	3 Marks
Quiz/Group Discussion	-	5 Marks
Attendance	-	<u>5 Marks</u>
		<u>25 Marks</u>

Pattern of question Paper (Theory)

Section – A	10 x 2 = 20 Marks	(No Choice)
Section – B	5 x 5 = 25 Marks	(Either / or)
Section – C	3 x 10 = 30 Marks	(Three out of Five)
Total	<u>75 Marks</u>	

NME for B.A./B.Sc./B.B.A. – III& IV Semester – Chemistry of consumer Products & Food Science.

Pattern of question Paper (Theory)

Section – A	50 x 1 = 50 Marks	(All Compulsory)
Section – B	5 x 5 = <u>25 Marks</u>	(Either / or)
Total	<u>75 Marks</u>	

PROGRAMME OUTCOME:

1. To develop interest in the study of chemistry as a discipline.
2. To appreciate the achievements in chemistry and to know the role of chemistry in nature and in society.
3. To be familiarized with the emerging areas of chemistry and their applications in various spheres of chemical sciences and to appraise the students of its relevance in future studies.
4. To develop skills in proper handling of apparatus and chemicals.
5. To be exposed to the different processes used in industries and their applications.

PROGRAMME SPECIFIC OUTCOME:

1. To gain knowledge of chemistry through theory and practicals.
2. The programme provides backbone of Physical, Inorganic, Organic and Analytical chemistry.
3. Positive approach towards Environment from the chemistry perspective.
4. Entrepreneurial skills are developed in students so as to make them start their own industries / business in core chemistry fields.
5. To explain nomenclature, stereochemistry, structures, reactivity and mechanism of the chemical reaction.
6. Creative thinking towards learning chemistry.
7. Identify chemical formulae and solve numerical problems.
8. The employment areas for the students include Pharmaceutical industries, Chemical manufactures, Polymer, Agro industries , Oil, gas and Power sectors.

CORE COURSE I

GENERAL CHEMISTRY-I

Internal : 25
External : 75
Exam Hours : 3

Semester : I
No. of Hours/ Week : 6
Credit : 6

Course Objectives:

- To study atomic structure, chemical bonding and molecular structure
- To understand the basic properties of alkali metals.
- To understand the basic properties and naming of organic compounds.
- To learn various methods of preparation and mechanism of reactions of Hydrocarbons.
- To study about colloidal state and macromolecules

UNIT I

1.1 Atomic Structure – Rutherford, Thomson-Review of Bohr's theory and its limitations – Dual behavior of matter and radiation – Debroglie's relation- Heisenberg uncertainty Principle – Hydrogen atom spectra.

1.2 Quantum Mechanics – Time independent Schrodinger equation and meaning of various term in it – significance Ψ and Ψ^2 , Schrodinger equation for hydrogen atom – significance of quantum numbers – Orbital angular momentum quantum numbers m_l and m_s . Shapes of s,p and d atomic orbitals, nodal planes. Spin quantum number(s) and magnetic spin quantum number (m_s)

1.3 Volumetric Analysis -Definitions of molality, normality, molarity and mole fraction- definition and examples for Primary and secondary standards. calculation of equivalent weights, theories of acid-base, redox, complexometric, Iodo and iodimetric titrations – indicators.

(Content – 15 Hrs, Assessment – 3 Hrs) (18 Hrs)

UNIT II

2.1. Alkali Metals – General characterization - Lithium diagonal relationship of Li and Mg. Comparison with other members of the family – justification of its position in the periodic table.

2.2. Alkaline Earth metals – General characterization - Beryllium – diagonal relationship of Be & Al. Justification of their position of Be and Mg in the periodic table – Beryl extraction and uses of Be.

2.3. p-Block Elements- Comparative study of boron family elements –Compounds of boron – borax, borazole, boron trioxide, orthoboric acid, boron halides, borazine and diborane (Structure only). Compounds of Aluminium – Aluminium Oxide, Aluminium Chloride, Sulphates - Alum.

(Content – 15 Hrs, Assessment – 3 Hrs) (18 Hrs)

UNIT III

3.1. Nomenclature of organic compounds – IUPAC naming of simple and substituted aliphatic, aromatic and alicyclic compounds.

3.2. Alkanes – Sources of alkanes, general methods of preparation, properties and reactions, Mechanism of free radical substitution in alkanes.

3.3. Cycloalkanes - Methods of preparation of cycloalkanes – Chemical Properties and reactions - Bayers strain theory and its limitations.

3.4. Alkenes – Preparation and Properties of alkenes – electrophilic and free radical addition, addition reactions with hydrogen bromide (peroxide effect), sulphuric acid, water, hydroboration, ozonolysis, hydroxylation with KMnO_4 – allylic substitution by NBS (with mechanism of all the above reactions)

Content – 15 Hrs, Assessment – 3 Hrs) (18 Hrs)

UNIT IV

4.1. Basic concepts in organic chemistry – Inductive, mesomeric, hyperconjugation and electromeric effects. Hybridization and geometry of molecules – methane, ethane, ethylene and acetylene (sigma and pi bonds, bond lengths, bond angles, bond energy)

4.2. Reaction intermediates – carbocations, carbanions, carbenes and free radicals– generation and their stability. Homolytic and Heterolytic cleavage of carbon – carbon bonds.

(Content – 15 Hrs, Assessment – 3 Hrs) (18 Hrs)

UNIT V

5.1. Colloids – types of colloidal system – true solution – colloidal solution and suspension – property of colloidal system – optical property- tyndall effect, Kinetic property– Brownian movement, electrical properties – Electrophoresis – Electro Osmosis – Gold number – Theories of protection – Stabilities of sols.

5.2. Gel and Emulsion – Preparation, Properties and Uses.

Macromolecules - Determination of Number average and weight average molecular weight of macromolecules.

(Content – 15 Hrs, Assessment – 3 Hrs) (18 Hrs)

Text Books:

1. A.K.De, “ A Textbook of Inorganic Chemistry” New age international publishers, 9th edition , 2002.
2. B.S. Bahl and Arun Bahl “Advanced Organic Chemistry, New Delhi, Sultan Chand and Co., (22th edition) (2016)
3. B.R.Puri,L.R. Sharma ,K.K. Kalia principles of Inorganic chemistry, New edition: Shoban Lal Nagin chand and co., 35th edition, 2013.

Reference Books:

1. J.D.Lee , “ Concise Inorganic Chemistry”, Sultan Chand and Sons, 20th revised edition, 2000.
2. F.A.Cotton, G.Wilkinson, “ Advanced Inorganic Chemistry”, Wiley Eastern Private Ltd., 3rd edition,
3. Huheey J. E., Keiter E. A. and Keiter R. L. and Medhi O. K., Inorganic Chemistry - Principles of Structure and Reactivity Pearson Education, , 4th edition, 2006.
4. R.T Morrison and R.N.Boyd , “ Organic Chemistry” New york, Allyn & Bacon Ltd., (6th edition) (2006).
5. Puri B.R.. Sharma L.R., Kalia K.K –“Principles of Inorganic chemistry” New edition: Shoban Lal Nagin chand and co. 35th edition , 2013.
6. Gilbert W.Castellan “Physical chemistry”, Narosa publishing House, New Delhi, (3rd edition), (2004)

Web-Resources:

1. <https://www.topfreebooks.org>.
2. <https://bookboon.com>.
3. <https://www.e-booksdirectory.com>

Course Outcome:

On completion of the Course, Students should be able to

- Understand the address of the electron and the concept of indicators and dilution.
- Know the physical and chemical properties and uses of alkali metals, alkaline earth metals
- Recognize the basic practical skills for the synthesis of alkenes, alkynes, and cycloalkanes.
- Predict the geometry and hybridization of molecules in organic chemistry.
- Apply the concept and uses of gels and colloids in the applied field.

CORE COURSE II

VOLUMETRIC ANALYSIS (P)

Internal : 25
External : 75
Exam Hours : 3

Semester : I & II
No. of Hours/ Week : 6
Credit : 6

Course Objectives:

- To know the estimation of several cations and anions.
- To know the estimation of total hardness of water.
- To carry out the saponification value of an oil

I Titrimetric Quantitative analysis

1. Estimation of HCl
2. Estimation of Na_2CO_3
3. Estimation of oxalic acid
4. Estimation of Iron (II) Sulphate
5. Estimation of Ca (II)
6. Estimation of KMnO_4
7. Estimation of Fe (II) solution using internal and external indicators
8. Estimation of Cu (II) sulphate by $\text{K}_2\text{Cr}_2\text{O}_7$ solution
9. Estimation of Mg (II) by EDTA Solution
10. Estimation of Ca (II) by EDTA Solution

II-Applied Experiments

1. Estimation of Total hardness of water
2. Estimation of Saponification value of an oil

Text Books:

1. V.Venkateshwaran, R.Veerarwamy, A.R.Kulandaivelu Basic Principles of Practical Chemistry 2nd edition 1997

Reference Books:

1. G.Svehla- Vogel's Quantitative Inorganic Analysis 7th edition Pearson education Ltd.
2. J.Mendham, R.C. Denney, J.D. Barnes & M.J.K.Thomas- Vogel's Textbook of quantitative chemical analysis 6th edition Pearson education Ltd.

Web-Resources:

1. <https://www.bookrix.com>.

Course Outcome:

On completion of the Course, Students should be able to

- Understand the basic chemistry skills through quantitative analytical experiments
- The learners able to know the techniques of titrimetric analysis.

CORE COURSE- III GENERAL CHEMISTRY –II

Internal : 25
External : 75
Exam Hours : 3

Semester : II
No. of Hours/ Week : 6
Credit : 6

Course Objectives:

- To learn the general characteristics of Periodic Table.
- To understand about shapes of inorganic molecules
- To learn about the chemistry of alkynes and alkyl halides.
- To Know about Liquid state.
- To acquire knowledge of gaseous state

UNIT I

1.1. Chemical Bonding - Lattice energy and Born – Haber Cycle - Pauling and Mullikan’s scales of electronegativity. Polarising power and Polarisability – Partial ionic character from electronegativity – Transition from ionic to covalent character and vice-versa – Fajan’s rules.

1.2. VSEPR Theory - Shapes of simple inorganic molecules (BeCl_2 , BF_3 , SiCl_4 , PCl_5 , SF_6 , IF_7 , H_2O , NH_3 , XeF_6) containing lone pair and bond pairs of electrons – Lewis structures.

(Content – 15 Hrs, Assessment – 3 Hrs) (18 Hrs)

UNIT II

2.1. Carbon Family- Comparative study of carbon family elements .Chemistry of Cyanogens, Hydrocyanic acid, Cyanic Acid, Thiocyanic acid, Ammonium Thiocyanate and Carbon Disulphide. Properties, Structures & uses of Graphite, Diamond and Fullerenes.

2.2 Nitrogen Family- Unique features of Nitrogen- Physical and Chemical properties of Nitrogen –Hydrazine, Hydroxyl amine, Hydrazoic acid and Nitric acid, Phosphatic Chemistry of PH_3 , PCl_3 , PCl_5 , POCl_3 , P_2O_5 and Oxyacids of phosphorous .

2.3 Oxygen Family- Group study – classification of oxides Preparation, Properties & Structure – sulphur – Acids H_2SO_3 , H_2SO_4 , H_2SO_5 , $\text{H}_2\text{S}_2\text{O}_8$, Thionic acids – and sulphur oxides, hydrides, halides.

(Content – 15 Hrs, Assessment – 3 Hrs) (18 Hrs)

UNIT III

3.1. Alkyne-preparation – properties and uses - Acidity of alkynes, formation of acetylides, addition of water with HgSO_4 catalyst, addition of hydrogen halides and halogens, oxidation, ozonolysis and hydroboration.

3.2. Dienes - types of dienes – Stability and chemical reactivity – 1,2 and 1, 4 additions, kinetic and thermodynamic controls of a reaction. Diels-Alder reaction.

3.3. Alkyl Halides – Preparation-properties – Vicinal and gem dihalides – Grignard reagent – preparation and synthetic applications.

3.4 Polymerisation – Types of polymerization – free radical, cationic and anionic polymerization including mechanism- preparation of polymers – addition and condensation polymers with examples.

(Content – 15 Hrs, Assessment – 3 Hrs) (18 Hrs)

UNIT IV

4.1. Liquid State: Properties of liquids, Vapour pressure, measurement of vapour pressure, heat of vaporization, Trouton’s rule, Surface tension, measurement of surface tension and vapour pressure, variation of surface tension with temperature.

4.2. Viscosity- Determination of viscosity, variation of viscosity with temperature and pressure, liquid crystals, definition of liquid crystals, classification, theory of liquid crystals.

4.3 Physical properties and chemical constitution – additive and constitution property, molar volume and chemical constitution – Kopp’s law, the parachor and chemical constitution – Parachor, atomic parachor, structural parachor and application of parachor in deciding structures.

(Content – 15 Hrs, Assessment – 3 Hrs) (18 Hrs)

UNIT V

5.1. Gaseous state – Kinetic molecular theory of gases – Kinetic gas equation – Derivation of the gas laws – Kinetic energy and Temperature – Maxwell's distribution of molecular velocity– Types of molecular velocities – Collision diameter – Collision cross section – Collision number – Collision frequency – mean free path.

5.2. The Gas constant “R” in different units - deviation from ideal behaviors - van der Waal's equation for real gases - Critical Phenomena – PV isotherms of real gases, critical temperature, continuity of state, relation between critical constants and vander Waals constants- Determination of critical volume – the law of corresponding states – reduced equation of state.

(Content – 15 Hrs, Assessment – 3 Hrs) (18 Hrs)

Text Books:

1. J.D.Lee , “ Concise Inorganic Chemistry”, Sultan Chand and Sons, 20th revised edition, 2000.
2. B.S. Bahl and Arun Bahl, “ Advanced Organic Chemistry , New Delhi, Sultan Chand and Co., (22th edition) (2016)
3. B.R.Puri,L.R. Sharma ,K.K. Kalia principles of Inorganic chemistry. New edition: Shoban Lal Nagin chand and co. 35th edition , 2013.

Reference Books:

- 1.J.E.Huheey., E.A.Keiter.,R.L.Keiter and O.K.Medhi., Inorganic Chemistry - Principles of Structure and Reactivity Pearson Education, , 4th edition, **2006**.
- 2.A.G.Sharpe, Inorganic Chemistry, Pearson, 3rd edition, **2010**
3. R.T Morrison and R.N.Boyd , “ Organic Chemistry” New york, Allyn & Bacon Ltd., (6th edition) (2006).
- 4.Gilbert W.Castellan “Physical chemistry” Narosa publishing House, New Delhi (3rd edition), (2004)
5. B.R Puri ,L.R.Sharma and M.S.Pathania , “ Principles of Physical Chemistry ,”

Web-Resources:

1. <https://www.topfreebooks.org>.
2. <https://bookboon.com>.
3. <https://www.e-booksdirectory.com>

Course Outcome:

On completion of the Course, Students should be able to

- The learners are able to predict the geometry of molecule.
- Understand the physical, chemical properties of C, N and O family elements.
- Recognize the basic practical skills for the synthesis of alkynes, dienes, alkyl halides.
- Apply the concept and uses of liquids in the applied field
- Understand the basics of colloids, gel and emulsion.

CORE COURSE III GENERAL CHEMISTRY - III

Internal : 25
External : 75
Exam Hours : 3

Semester : III
No. of .Hours/Week: 6
Credits: 6

Course Objective:

- To learn about structure, shape and compounds of Carbon and Nitrogen group elements.
- To learn about nature and formation of compounds of oxygen and Interhalogen compounds.
- To become aware of the fundamental aspects of stereochemistry and its influence on chemical properties.
- To acquire knowledge about qualitative analysis.
- To learn about properties, packing arrangement and structural determination of solids state.

UNIT I CHEMISTRY OF P – BLOCK ELEMENTS

1.1 General characteristics of p-block elements. Metallurgy : Occurrence of metals – concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process, purification of metals-electrolysis, zone refining, van Arkel de- Boer process.

1.2 Extraction of Al and Pb- alums, alloys of Al. Chemistry of oxides of carbon- CO, CO₂. Allotropic forms of carbon.

1.3 Compounds of nitrogen and phosphorous- NH₂.NH₂, H₂NOH, hydrazoic acid, N₂-Cycle, fixation of N₂, PH₃ and P₂O₅. **(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)**

UNIT II INTERHALOGEN COMPOUNDS

2.1 Peracids of sulphur, Thionic acids, sodium thiosulphate- preparation, properties, structure and uses.

2.2 Classification of oxides- acidic, amphoteric, neutral oxides, peroxides and superoxides.

2.3 Interhalogen compounds, Pseudohalogens, Oxyacids of halogens, Polyhalides and basic nature of iodine. **(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)**

UNIT III STEREOCHEMISTRY

3.1 Principles of symmetry- symmetry elements (C_n, C_i and S_n)- Asymmetry and dissymmetry- isomerism- constitutional isomers- stereoisomers-enantiomers- diastereomers- geometrical isomerism-meso and di compounds – conventions used in stereochemistry: Newman, Sawhorse and Fischer notations and their interconversions.

3.2 Nomenclature, correlation of configuration- Cahn-Ingold- Prelog rules for simple molecules-R,S and D,L notations to express configuration-chirality –optical isomerism-optical activity- polarimeter- specific rotation- stereochemistry of allenes and spiranes.

3.3 Atropisomerism- erythro and threo conventions- stereoselectivity, stereospecificity in organic reactions with examples. Resolution of racemic mixture-walden Inversion-conformational analysis of cyclohexane- asymmetric induction.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT IV ANALYTICAL METHODS

4.1 Qualitative Inorganic Analysis-Dry Test, flame test, cobalt nitrate test- wet confirmatory test for acid radicals, interfering acid radicals-elimination of interfering acid radicals.

4.2 Solubility product, common ion effect, complexation, oxidation-reduction reactions involved in identification of anions and cations- separation of cations into groups- Semi micro analysis of simple salts. (Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT V SOLID STATE AND LIQUID CRYSTALS

5.1 Classification of solids – Isotropic and anisotropic crystals – elements of symmetry – basic seven crystal systems -laws of crystallography – representation of planes – miller indices, space lattice and unit cell.

5.2 X-Ray diffraction – derivation of Bragg's equation – determination of structure - Sodium Chloride by Debye Scherrer (Powder method) and rotating crystal methods.

5.3 Types of Crystals, close packing of identical solid spheres, interstitial sites, limiting radius ratios (derivation not needed), radius ratio and shapes of ionic crystals, structures of NaCl, CsCl and ZnS.

5.4 Semiconductors – Intrinsic and extrinsic semiconductors – n and p-type semiconductors. Liquid crystals – types and applications.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

Textbooks

1. B.R.Puri,L.R.Sharma, K.K.Kalia, Principles of Inorganic Chemistry,23rd edition, New Delhi,Shoban Lal Nagin Chand & Co., (1993).
2. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry,(12th edition), New Delhi, Sultan Chand &Co., (2010).
3. Bahl B.S.,Arun Bahl and Tuli G.D.(2012).Essential of Physical Chemistry,New Delhi: Sultan Chand and sons.

References Books:

1. Gurdeep Raj, “Advanced Inorganic Chemistry”, 20th revised edition, Sultan Chand & Sons, 2000.
2. Morrison R.T. and Boyd R.N. Bhattacharjee S.K. “Organic chemistry”, 7th edition, Pearson India, 2011.
3. Puri B.R.,Sharma L.R.and Pathania M.S.Principles of Physical Chemistry,(35th edition),New Delhi: Shoban Lal Nagin Chand and Co.(2013)
4. Glasstone S. and Lewis D, “Elements of Physical Chemistry”, London, Mac Millan &Co Ltd.

Web Resources:

1. <https://www.topfreebooks.org>.
2. <https://bookboon.com>.
3. <https://www.e-booksdirectory.com>

Course Outcome:

On completion of the Course, Students should be able to

- Learn the chemical aspects of Metallurgy.
- Physical and chemical properties of Pseudo halogen and Interhalogen compounds.
- Aware of the fundamental aspects of stereochemistry.
- Learn the technique of semimicro qualitative analysis of inorganic salt mixture.
- Learn about solids, their properties, close packing in crystals, use of X-rays in crystal structure determination and Properties of Liquid Crystal.

**CORE PRACTICAL II
SEMIMICRO ANALYSIS (P)**

Internal : 40
External : 60
Exam Hours : 3

Semester :III & IV
No. of .Hours/Week: 3
Credits: 3

Course Objective:

- To learn the techniques of semi micro qualitative analysis of Inorganic Salt mixtures.
- To become familiar with elimination of interfering acid radicals.

SEMIMICRO INORGANIC QUALITATIVE ANALYSIS

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

Cations to be studied : Lead, Copper, Bismuth, Cadmium, Iron, Aluminium, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

Anions to be studied : Carbonate, Sulphide, Sulphate, Nitrate, chloride, Bromide, Fluoride, Borate, Oxalate and Phosphate.

Text Books:

1. V.Venkateshwaran,R.Veerawamy, A.R.Kulandaivelu Basic Principles of Practical Chemistry 2nd edition 1997

Reference Books:

1. G.Svehla- Vogel's Quantitative Inorganic Analysis 7th edition Pearson education Ltd.
2. J.Mendham, R.C. Denney, J.D. Barnes & M.J.K.Thomas- Vogel's Textbook of quantitative chemical analysis 6th edition Pearson education Ltd.

Web-Resources:

1. <https://www.bookrix.com>.

Course Outcome:

On completion of the Course, Students should be able to

- Familiarize the test involving identification of Cations and Anions.
- Know the techniques for elimination of acid radicals.

Marks Distributed for External:	Practical -	55 Marks
	Record -	05 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 Radicals correct with suitable tests	-	15 Marks
Spotting	-	05 Marks

NON MAJOR ELECTIVE I CHEMISTRY OF CONSUMER PRODUCTS

Internal : 25

Semester : III

External : 75

No. of .Hours/Week: 2

Exam Hours : 3

Credits: 2

Course Objective:

- To know the preparation and applications of different types of soap.
- To learn about the composition of Shampoos, Conditioners, Powder, Nail polish and Lipstick.
- To gain knowledge about constituents and functions of Paint and Varnish.
- To learn about preparation and applications of various dyes.
- To know the preparation and uses of synthetic plastics, Resins and Rubber.

UNIT I SOAPS AND DETERGENTS

Manufacture of soaps, formulation of toilet soaps – different ingredients used- Soft soaps, shaving soaps and creams. Anionic detergents – manufacture and applications - cationic detergents – manufacture and applications. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

UNIT II COSMETICS

Shampoos – different kinds of shampoos – anti – dandruff, anti – lice, herbal and baby shampoos hair dye – manufacture of conditioners - skin preparation – skin powder, nail polish, lipsticks. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

UNIT III PAINTS AND VARNISHES

Constituents and their function – types and applications. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

UNIT IV DYES

Classification – preparation and uses of alizarin, Indigo, Methyl orange, Phenolphthalein and Malachite green. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

UNIT V Plastics – Resins and Rubber

Synthetic resins and plastics, synthetic polymers – important basic plastics and uses - rubber, vulcanization. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

Textbooks:

1. Thangamma Jacob, A Text Book of Applied Chemistry for Home Science and Allied Sciences.
2. B.K.Sharma, Industrial Chemistry Goel Publishing House (1995).

References Books:

1. R. Norris Shreve, Chemical process Industries.
2. Jayashree Ghosh, Fundamental Concept of Applied Chemistry, 1st Edition (2006) S. Chand Company Ltd., New Delhi.

Web Resources:

1. <https://www.topfreebooks.org>.
2. <https://bookboon.com>.

Course Outcome:

Students will gain an understanding

- To learn depth knowledge about soap and detergent.
- How to manufacture cosmetics
- To know the applications of paint and varnishes.
- To acquire the basic knowledge of classification, preparation and uses of dyes.
- To make plastics and know about the properties and applications of plastics.

**CORE COURSE IV
GENERAL CHEMISTRY - IV**

Internal : 25
External : 75
Exam Hours : 3

Semester :IV
No. of .Hours/Week: 5
Credits: 5

Course Objective:

- To learn about the compounds of d- and f- block elements.
- To study about preparation, properties and uses of organometallic compounds.
- To know the chemical processes involved in the preparation, chemical conversion and application of alcohol, phenol and ethers.
- To learn the thermodynamic principle and thermochemistry aspects.
- To study about rate of chemical reaction and theories of reaction rates.

UNIT I d-BLOCK & f-BLOCK ELEMENTS

1.1 General characteristics of d-block elements, comparative study of zinc group elements. Extraction of Mo and Pt – Alloys of copper, amalgams and galvanization. Evidences for the existence of Hg^{2+} ions

1.2 General characteristics of f-block elements – Lanthanides Electronic configuration – oxidation states – ionic radii, lanthanide contraction. Colour and magnetic properties. Extraction of mixture of lanthanides from monazite sand and separation of lanthanides. Uses of lanthanides. Actinides Sources of actinides – preparation of transuranic elements - electronic configuration – oxidation states – ionic radii – colour of ions – comparison with lanthanides. Extraction of thorium from monazite sand. Production and uses of plutonium.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT II CHEMISTRY OF ORGANOMETALLIC COMPOUNDS

2.1 Introduction – Preparation of organomagnesium compounds – physical and chemical properties – uses. Organozinc compounds – general preparation, properties and uses.

2.2 Organolithium, Organcopper compounds – Preparation, properties and uses.

2.3 Organolead, Organophosphorous and organoboron compounds – Preparation, properties and uses.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT III CHEMISTRY OF ALCOHOLS, PHENOLS AND ETHERS

3.1 Nomenclature – Individual source of alcohols – preparation of alcohols: hydration of alkenes, oxymercuration, hydroboration, Grignard addition, reduction – Physical, chemical properties and uses- Glycols from dihydroxylation, reduction, substitution reactions and glycerols and their uses.

3.2 Preparation of Phenols including di- and trihydroxy phenols – Physical and chemical properties – uses- aromatic electrophilic substitution mechanism – theory of orientation and reactivity.

3.3 Preparation of ethers: dehydration of alcohols, Williamsons synthesis – silyl ether, epoxide from peracids – Sharpless asymmetric epoxidation – reactions of epoxides – uses – introduction to crown ethers – structures – applications.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT IV THERMODYNAMICS I

4.1 Definitions – System and Surround – isolated, closed and open system – state of the system- intensive and extensive variables. Thermodynamic processes – reversible and irreversible, isothermal and adiabatic processes – state and path functions.

4.2 Work of expansion at constant pressure and at constant volume, First law of thermodynamics – statement – definition of internal energy (E), enthalpy (H) and heat capacity. Relationship between C_p and C_v .

4.3 Calculation of w , q , dE and dH for expansion of ideal and real gases under isothermal and adiabatic conditions of reversible and irreversible processes.

4.4 Thermochemistry – relationship between enthalpy of reaction at constant volume (q_v) and at constant pressure (q_p) – temperature dependence of heat of reaction – Kirchoff's equation – bond energy and its calculation from thermochemical data-integral and differential heats of solutions and dilution.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT V CHEMICAL KINETICS

5.1 Rate of reaction -rate equation, order and molecularity of reaction. Rate laws – rate constants – derivation of first order rate constant and characteristics of zero order, first order and second order reaction – derivations of time for half change ($t_{1/2}$) with examples.

5.2 Methods of determination of order of reactions – experimental methods – determination of rate constant of a reaction by volumetry, colorimetry and polarimetry.

5.3 Effect of temperature on reaction rate – concept of activation energy, energy barrier. Arrhenius equation. Theories of reaction rates – collision theory – derivation of rate constant of bimolecular reaction – failure of collision theory – Lindemann's theory of unimolecular reaction.

5.4 Theory of absolute reaction rate – derivation of rate constant for a bimolecular reaction – significance of entropy and free energy of activation. Comparison of collision theory and absolute reaction rate theory. (ARRT). (Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

Text Books:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000. (Unit – I & II)
2. Bahl B.S. and Bahl A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010). (Unit-III)
3. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co. (2013) (Unit-IV &V)

References Books:

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
3. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011).
4. Samuel Glasstone, Thermodynamics for Chemists (3rd printing), East- West Edn. (1974)
5. Puri B.R., Sharma L.R. and Pathania M.S., Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co. (2013)
6. Gurtu J.N. and Amit Gurtu, Chemical Kinetics, 5th Edn, Mittal K.K. (1979)

Web resources:

1. <http://www.webelements.com>
2. <https://www.topfreebooks.org>.
3. <http://www.lib.utexas.edu/thermodex>
4. <https://www.e-booksdirectory.com>

Course Outcome:

Students should be able

- To learn about the compounds of d and f-block elements.
- To acquire the knowledge of preparation, properties and uses of Organometallic compounds.
- To know the chemical processes involved in the preparation of alcohols and ethers.
- To learn the thermodynamic principles and thermochemistry aspects.
- To gain knowledge about the rate of chemical reaction and its theory.

Non Major Elective – II Food Science

Internal : 25
External : 75
Exam Hours : 3

Semester :VI
No. of .Hours/Week: 2
Credits: 2

Course Objective:

- To learn the importance of food and nutritional care
- To study the biological functions of food
- To understand the constituents of food
- To acquire knowledge about adulteration in food.
- To understand health problems due to food adulterants.

UNIT I FOOD NUTRITION

- 1.1 Food, Nutrition and Health – The meaning of food nutrition, nutritional care and health - Nutritional problems in India. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

UNIT II BIOLOGICAL IMPORTANCE

- 2.1 Biological importance of food – Nutritional classification of food – nutrients as body constituents – digestion and absorption of food, caloric content and dieting. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

UNIT III CONSTITUENT OF FOOD

- 3.1 Basic chemical constituents of food – Biological functions of carbohydrates, proteins, fats, vitamins, minerals and water. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

UNIT IV FOOD ADULTERATION

- 4.1 Food adulterants testing – common adulterants in food – testing methods of all food adulterants. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

UNIT V HEALTH EFFECTS

- 5.1 Health Problems of food adulteration – Principal adulterants and their health effects. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

Text Books:

1. Alex Ramani V– Food Chemistry, MJP Publishers, Tripilcane, Chennai, 2009.
2. Thang Jacob, Food adulteration, Mac Millan company of India Ltd., New India, 1976.

References Books:

1. Jeyaramanj, Laboratory manual in biochemistry, Wiley eastern Ltd., New Delhi, 1981.
2. B.Srilakshmi, “ Food Science”, 3rd edition, New age International (P) Ltd., New Delhi, 2005.
3. B.Srilakshmi, “ Nutrition Science”, 1st edition, New age International (P) Ltd., New Delhi.
4. Swaminathan M, “Food Science and Experimental Foods”, Ganesh & Company.
5. Corrinne H.Robinson, “ Fundamentals of normal nutrition”, Mac Millan Company of India Ltd., New Delhi.

Web resources:

1. <https://www.topfreebooks.org>.
2. <https://bookboon.com>.

Course Outcome:

Students will gain an understanding

- Knowledge of food nutrition, health and awareness of nutritional problems in India.
- To analyze the biological importance and nutritional classification of food.
- To learn depth knowledge about constituent, biological functions of carbohydrates, proteins, fats, vitamins, minerals and water.
- To identify the adulterants, present in food and their testing methods.
- To be able to recognize the principal adulterants and their health effects.

SKILL BASED ELECTIVE – I PHARAMACEUTICAL CHEMISTRY

Internal : 25
External : 75
Exam Hours : 3

Semester :IV
No. of .Hours/Week: 2
Credits: 2

Course Objective:

- To learn the terminology and routes of administration of drug.
- To learn the use of Indian Medicinal plants.
- To know about designation of drugs
- To know about common body ailments and treatment.
- To gain knowledge in vitamins, micronutrients and antioxidant.

UNIT I INTRODUCTION

1.1 Common diseases – Infective diseases – insect – borne, and water- borne – hereditary diseases – Terminology – drug , pharmacology , pharmacognosy , pharmacodynamics , pharmacokinetics, antimetabolic.

1.2 Absorption of drugs – routes of administration of drugs , factors affecting absorption – Assay of drugs – chemical , biological , immunological assays.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

UNIT II DRUGS

2.1 Various sources of drugs , pharmacologically active constituents in plants. Indian medicinal plants – tulsi , neem , keezhanelli – their importance.

2.2 Classification of drugs – biological chemical – mechanism of drug action – action at cellular and extra cellular sites. **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

UNIT III CHEMOTHERAPY

3.1 Designation of drugs based on physiological action , Definition and two examples each of Anesthetics – General , IV and local – Analgesics – Narcotic and synthetic – Antipyretic and anti inflammatory agents – Antibiotics – penicillin , streptomycin, chloramphenicol, tetracyclines – Antivirals .

3.2 AIDS – symptoms , prevention , treatment.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

UNIT IV COMMON BODY AILMENTS

4.1 Diabetes – causes , hyper and hypoglycemic drugs.

4.2 Blood pressure – Sistolie & Diastolic Hypertensive drugs – Cardiovascular drugs – antiarrhythmic , antianginals , vasodilators.

4.3 CNS depressants and stimulants – Psychedelic drugs , hypnotics , sedatives (barbiturates , LSD). **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

UNIT V HEALTH PROMOTING DRUGS

5.1 Nutrients – Vitamins A, B, C, D, E and K. Micronutrients Na, K, Ca, Cu, Zn and I – Medically important inorganic compounds of Al P AS Hg Fe- L examples each their role and application.

5.2 Organic Pharmaceutical acids , Agents for pituitary function (metyrapone) – Organic pharmaceutical bases – antioxidants . **(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)**

Text books:

1. Jayasree Ghose , Pharmaceutical chemistry , S,Chand and Company Ltd ., New Delhi, 2006.
2. Lakshmi S.,Pharmaceutical chemistry , S.Chand & and sons , New Delhi,1995.

References Books:

1. Ashutosh Kar , Medicinal chemistry , Willey Eastern Ltd ,. New Delhi,1993.
- 2.David William & Thomas Lemke , Foyes principles of medicinal chemistry , 5th edition BI publishers, 2005 .
- 3.Romas Nogrady , Medicinal chemistry , II Edition, Oxford Univ.Press, 2004.
4. Cherilyn Tilman, “Principles of Occupational Health and Hygiene-an introduction” Allen and Unwin, Sydney, 2007.
5. Fryer, Jane Eayre, “ FirstAid Book”, John C.Winston Company.

Web resources:

1. <https://www.topfreebooks.org>.
2. <https://bookboon.com>.

Course Outcome:

Students should be able

- To know the terminology in Pharmaceutical chemistry.
- To understand the assay of drugs, administration of drugs.
- To classify drugs based on biological and chemical methods.
- To recognize the chemotherapy of some common diseases.
- To learn depth concepts of nutrients and organic pharmaceutical aids.

CORE COURSE V INORGANIC CHEMISTRY-I

Internal : 25
External : 75
Exam Hours : 3

Semester : V
No. of .Hours/Week: 5
Credits: 5

Course Objective:

- To understand the concept of isomerism in coordination compounds their structural and magnetic properties.
- To study about the theories of coordination compounds.
- To learn about types of reactions of complexes and their mechanism and learn about Jahn teller effect and chelate effect.
- To learn about the preparation, properties, structure, bonding and uses of carbonyl, borides, carbides and nitrides.
- To learn about classification, preparation, properties, structure, magnetic properties and application of dipole moment of Nitrosyl Compounds.

UNIT I COORDINATION COMPOUNDS-I

1.1 Introduction- Types of ligands: unidentate, bidentate and poly dentate ligands, chelating ligands and chelates- IUPAC nomenclature of coordination compounds.

1.2 Isomerism in coordination compounds: Structural isomerism, hydrate isomerism, coordination isomerism, ionisation isomerism, linkage isomerism, coordination position isomerism.

1.3 Stereoisomerism: Geometrical isomerism of four and six coordinate complexes, optical isomerism of four and six coordinate complexes, Werner and sidgwick theories, methods of detecting complex formation.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT II COORDINATION COMPOUNDS-II

2.1 Theories of coordination compounds: Valence bond theory, limitations of valence bond theory, crystal field theory – splitting of d orbitals in octahedral, tetrahedral and square planar fields, CFSE, factors affecting CFSE, colour, geometry and magnetic properties of coordination compounds, Jahn – Teller distortion (an elementary idea).

2.2 Molecular orbital theory : Molecular orbital diagram for $[\text{Co}(\text{NH}_3)]^{3+}$. Ligand field theory. (An elementary treatment only).

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT III COORDINATION COMPOUNDS-III

3.1 Labile and inert complexes, stability of coordination compounds- thermodynamic and kinetic stability, relationship between stepwise formation constant and overall formation constant, factors affecting the stability of complexes.

3.2 Unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square planar complexes, trans effect- theories of trans effect and applications.

3.3 A few biologically important coordination compounds: Chlorophyll, haemoglobin and vitamin B₁₂.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT IV CARBONYLS AND BINARY METALLIC COMPOUNDS

4.1 Metal carbonyls: Mono and binuclear carbonyls of Ni, Fe, Cr, Co and Mn- preparation, structure, reactions, bonding and uses.

4.2 Structure and bonding in metal alkenyl and metal alkyl complexes of $[\text{PtCl}_3(\text{C}_2\text{H}_4)]^-$, $[\text{Co}(\text{CO})_6(\text{RC CR})]$ and ferrocene.

4.3 Binary metallic compounds: borides, carbides, hydrides and nitrides- classification, preparation, properties and uses. **(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)**

UNIT V NITROSYL COMPOUNDS AND MAGNETIC PROPERTIES

5.1 Nitrosyl compounds: Classification- nitrosyl chloride and sodium nitroprusside- preparation, properties and structure.

5.2 Magnetic properties-meaning of the terms-magnetic susceptibility- magnetic moment-types of magnetism-Gouy balance-applications of magnetic properties

5.3 Dipolemoment- determination, application in the study of simple inorganic molecules. (Content – 12 Hrs, Assessment – 3 Hrs)

(15Hrs)

Text Books:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L. Soni, 'Text Book of Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.

References Book:

3. W.U. Malik, G.D. Tuli and R.D. Madan, S.Chand and Company Ltd., 'Selected topics in Inorganic Chemistry', 7th edition, 2001.
4. Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
5. B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Inorganic Chemistry', 21st edition, Vallabh Publications, 2004-2005.
6. J.E. Huheey, 'Inorganic Chemistry', 4th edition, Pearson Education. Inc. 1993.
7. F.A. Cotton, 'Advanced Inorganic Chemistry', 6th edition, John Wiley & Sons, Pvt. Ltd., 2003 – 2004.

Web Resources:

1. <https://www.chemheritage.org/>
2. <http://www.chemspider.com/>

Course Outcome:

On completion of the Course, Students should be able to

- Understand the types of ligands, isomerism.
- Recognize the splitting of orbitals.
- Know the importance of coordination compounds.
- Recognize the structure and bonding of carbonyls and binary metallic compounds.
- Predict the magnetic properties of coordination compounds.

CORE COURSE VI ORGANIC CHEMISTRY I

Internal : 25
External : 75
Exam Hours : 3

Semester : V
No. of .Hours/Week: 5
Credits: 5

Course Objective:

- To understand on the carbonyl compounds and Nitrogen compounds.
- To acquire the knowledge in carboxylic acids.
- To gain knowledge in functional group interconversion.
- To acquire the knowledge about heterocyclic compounds and chemistry of dyes.
- To learn about redox reagents and their application.

UNIT I CHEMISTRY OF CARBONYL COMPOUNDS

1.1 Nomenclature – structure of carbonyl compounds- chemical properties- nucleophilic addition mechanism at carbonyl group (eg: HCN,ROH,RNH₂) – acidity of alpha hydrogen- keto- enol Tautomerism (proof for the two forms)

1.2 Reduction and oxidation reactions of carbonyl compounds-paraformaldehyde, meta formaldehyde-uses of aliphatic carbonyl compound- Claisen condensation- Aldol condensation- Robinson annulations.

1.3 General methods of preparation of aromatic carbonyl compounds-physical and chemical properties-uses-effect of aryl group on the reactivity of carbonyl group.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT II CHEMISTRY OF CARBOXYLIC ACIDS

2.1 Nomenclature- Acidity of carboxylic acids based on substituent effect- comparison of acid strength of halogen substitute acetic acids- acid strengths of substituted benzoic acids- Acid derivatives- Nucleophilic substitution mechanism at acyl carbon.

2.2 Preparation, properties and uses of acid derivatives: acid chloride, anhydrides, esters, amides- chemistry of compounds containing active methylene group- synthesis and synthetic applications of acetoacetic ester and malonic ester.

2.3 Preparation of dicarboxylic acid- physical and chemical properties-uses. Introduction to oils and fats- fatty acids-manufacture of soap-mechanism of cleaning action of soap.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT III CHEMISTRY OF NITROGEN COMPOUNDS

3.1 Nomenclature- nitro alkanes- alkyl nitrites- differences- aromatic nitro compounds- preparation and reduction of nitro benzene under different conditions, TNT.

3.2 Amines- effect of substituent's on basicity of aliphatic and aromatic amines- Reactions of amino compounds (primary, secondary, tertiary and quaternary amine compounds)- Mechanism of carbylamines reaction, diazotization and comparison of aliphatic and aromatic amines.

3.3 Diazonium compounds – preparation and synthetic applications of diazomethane , benzene diazonium chloride and diazo acetic ester.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT IV CHEMISTRY OF HETEROCYCLIC COMPOUNDS AND DYES

4.1 Introduction- nomenclature of heterocyclic compounds having not more than two hetero atoms such as oxygen, nitrogen and sulphur- structure, synthesis and properties of furan, pyrrole, thiophene. Pyridine- structure, preparation-compare the basicity of pyridine with pyrrole and amines.

4.2 Quinoline- structure and Skraup synthesis. Isoquinoline- structure and Napieralski synthesis and Indole- structure and Fischer- indole syntheses.

4.3 Dyes- color and constitution- chromophore- auxochrome- classification according to application and structure- preparation and uses of – methyl orange, fluorescein, Alizarin, Indigo and malachite green dyes.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT V OXIDATION AND REDUCTION

5.1 Oxidation: Osmium tetroxide- Chromyl chloride – Ozone-DDQ-Dioxiranes.

5.2 Lead tetraacetate- selenium dioxide-DMSO either with Ac_2O or oxalyl chloride-Dess-Martin reagent.

5.3 Reduction: Catalytic hydrogenation using Wilkinson Catalyst- Reduction with LAH, NaBH_4 , tritertiary butoxy aluminum hydride, NaCNBH_3 , hydrazines.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

Text Books:

1. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011)
2. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., 2010.

References Books:

1. Finar I.L., Organic Chemistry, Vol 1&2, (6th edition) England, Addison Wesley Longman Ltd. (1996).
2. Pine S.H., Organic Chemistry, (5th edition) New Delhi, McGraw – Hill International Book Company (1987)
3. Seyhan N. Ege, Organic Chemistry, (5th edition) New York, Houghton Mifflin Co., (2005)
4. Ahluwalia V.K., Rakesh Kumar Prashar, “ Organic Reaction Mechanisms”, (4th Edition), Alpha Science International., (2011).
5. Paula Yurkanis Bruice, “Organic Chemistry”, (8th Edition), University of California, Santa Barbara, Pearson Ltd., (2011).

Web Resources:

1. <http://organicdivision.org/links.html>
2. <http://www.chemistryguide.org/>

Course Outcome:

On completion of the Course, Students should be able to

- Learn about the reduction and oxidation reaction of carbonyl compounds
- Understand the preparation, properties and uses of carbonyl compounds
- Know about the chemistry of Nitrogen compounds
- Predict the structure of Heterocyclic compounds
- Aware the types of oxidizing and reducing agents.

CORE COURSE VII
PHYSICAL CHEMISTRY I

Internal : 25
External :75
Exam Hours : 3

Semester :V
No. of .Hours/Week: 6
Credits: 6

Course Objective:

- To gain knowledge in Photo chemistry and Group theory.
- To understand the efficient way of converting work into energy and vice versa from the thermodynamic perspective.
- To understand the method of enhancing the efficiency of the certain industrial processes.
- To learn about solutions, their types, colligative properties, effect of added salt and molecular weight determination.
- To learn chemical and Physical states of various systems and their coexistence in equilibrium.
- To understand the chemical aspects of metallic, binary and ternary mixtures - composition and properties through phase diagrams.

UNIT I PHOTOCHEMISTRY AND GROUP THEORY

1.1. Consequences of light absorption- Jablonski diagram- radiative and non- radiative transitions. Lambert's Beer law, quantum efficiency.

1.2. Photochemical reactions- Comparison between thermal and photochemical reactions. Photosensitization and quenching. Fluorescence, Phosphorescence and chemiluminescence. Laser and uses of lasers

1.3. Group theory- symmetry elements and symmetry operation- group postulates and types of groups- abelian and non abelian- symmetry operation of H₂O molecule.

1.4. Illustration of group postulates using symmetry operation of H₂O molecule- construction of multiplication table for the operation of H₂O molecules -point group- definition- elements (symmetry operations) of the following molecules-H₂O, BF₃ and NH₃.
(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT II THERMODYNAMICS II

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

2.2. 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.

2.3. Gibb's free energy(G) and Helmholtz free energy (A)- variation of A and G with P,V and T-Gibb's- Helmholtz equation and its applications.

2.4 Thermodynamics equation of state, Maxwell's relations-A and G as criteria for spontaneity and equilibrium. (Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT III THERMODYNAMICS III

3.1 Equilibrium constant and free energy change- thermodynamic derivation of law of mass action- equilibrium constants in terms of pressure and concentration-NH₃, PCl₅ and CaCO₃.

3.2 Thermodynamic interpretation of Lechatelier's principle (Concentration, temperature, pressure and addition of inert gases).

3.3 System variables 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 Clausis-Clapeyron equation-applications.

3.4 Third law of thermodynamics- Nernst heat theorem. Statement of III law and concept of residual entropy- evaluation of absolute entropy from heat capacity data.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT IV SOLUTIONS

4.1 Raoult's law, Henry's law, Ideal and non- ideal solutions, completely miscible liquid systems-benzene and toluene. Derivation from ; Raoult's law and Henry's law. Duhem Margules equation. Theory of fractional distillation. Azeotropes- HCl- water and ethanol-water system.

4.2 Partially miscible liquids- phenol-water, triethylamine-water and nicotine- water systems. Lower and upper CSTs- effect of impurities on CST. Completely immiscible liquids- principle and applications of steam distillation. Nernst distribution law, derivation.

4.3 Dilute solutions- colligative properties, relative lowering of vapour pressure, osmosis, law of osmotic pressure, derivation of elevation of boiling point and depression in freezing point.

4.4 Determination of molecular masses using colligative properties. Abnormal molecular masses, molecular dissociation- degree of dissociation- molecular association.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT V PHASE CHANGES

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

5.2 Two- component systems- solid liquid equilibria, simple eutectic (lead-silver, Bi-Cd), desilverisation of lead.

5.3 Compound formation with congruent melting point (Mg-Zn) and incongruent melting point (Na-K).

5.4 Solid solutions-(Ag-Au)- fractional crystallization, freezing mixtures- FeCl₃-H₂O system, CuSO₄-H₂O system. (Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

Text books:

1. Raman, K., Group theory and its application to Chemistry, New Delhi: Tata McGraw-Hill. (1990).
2. Puri B.R., Sharma L.R. and Pathania M.S. , Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co. (2013).

References Books:

1. Gurdeep Chatwal R, Photochemistry, Good publishing House.
2. Samuel Glasstone , Thermodynamics for Chemists (3rd printing), East- West Edn. (1974).
3. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.
4. Atkins P.W. , Physical chemistry, (5th edition), Oxford University press. (1994).
5. Sangaranarayanan, M.V., Mahadevan, V., Text Book of Physical Chemistry, 2nd Edition, Hyderabad, Universities Press, (India) 2011.

Web Resoucrses:

1. <http://www.lib.utexas.edu/thermodex>
2. <http://www.chemistryguide.org>

Course Outcome:

On completion of the Course, Students should be able to

- Learn about Photochemistry
- Predict the symmetry elements and symmetry operations
- Apply the concept of Second law of thermodynamics
- Know the partial molar quantities.
- Recognize the component system using phase rule.

CORE PRACTICAL PHYSICAL CHEMISTRY (P)

Internal : 40
External : 60
Exam Hours : 3

Semester : V
No. of .Hours/Week: 3
Credits: 3

Course Objective:

- To learn the fundamentals of various physical experiments.
- To understand the method of determination of critical solution temperature, transition temperature and rate constant.
- To acquire knowledge and skills of drawing graph and handling of some precision instruments.

List of Experiments:

1. Critical Solution Temperature
2. Effect of impurity on Critical Solution Temperature
3. Transition Temperature
4. Rast Method
5. Phase Diagram (Simple eutectic system)
6. Kinetics of Ester Hydrolysis
7. Partition Co-efficient of iodine between water and carbon tetrachloride.
8. Conductometric Acid-Base Titration
9. Potentiometric Redox Titration
10. Determination of cell constant

Mark Distribution :		
External	: 60	Internal : 40
Practical	: 45	
Procedure Writing with formula	: 10	
Record	: 05	

Text books:

1. Venkateswaran V, Veeraswamy R, Kulandaivelu A.R, "Basic Principles of Practical Chemistry", (2nd edition), Sultan Chand & Sons, New Delhi (1997).

References Books:

1. D.P. Shoemaker, C.W. Garland & J.W. Nibler, "Experiments in Physical Chemistry" 5th edition, McGraw Hill, 1989.
2. V.D. Athawala & P. Mathur, "Experimental Physical Chemistry", New age International publisher, 2001.
3. Findlay. A, "Practical Physical Chemistry", 7th edition, London, Longman, 1959.
4. Ahluwalia V.K, Dingra. S & Gulati. A, "College Practical Chemistry", Orient Longman Pvt Ltd., Hyderabad, 2005.

Web Resource:

1. <http://www.vlab.co.in/index.php>

Course Outcome:

Students will gain an understanding

- To understand the method of determination of critical solution temperature, transition temperature and rate constant.
- To learn the fundamentals of conductometric titration.

MAJOR BASED ELECTIVE – I ANALYTICAL CHEMISTRY

Internal : 25
External : 75
Exam Hours : 3

Semester : V
No. of .Hours/Week: 5
Credits: 5

Course Objective:

- To learn the storage and handling of various chemicals and first aid procedures.
- To demonstrate competence in collecting and interpreting data from their knowledge on analytical techniques.
- To know the separation and purification technique of solvents.
- To learn about thermogravimetric analysis, differential thermal analysis, analytical electrochemistry and its applications.
- To learn about colorimetric analysis, coulometry analysis and its application.

UNIT I

1.1 Laboratory Hygiene and safety: Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous chemicals.

1.2 Simple first aid procedure from accidents : Acid in eye, alkali in eye, acid burns, alkali burns, bromine burns, poisoning, inhalation of gases, cut by glasses and heat burns.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT II

2.1 Data Analysis: Errors in chemical analysis, classification of errors, determinate errors, instrumental errors, personal errors, constant errors, and proportional errors – correction of determinate errors, random errors . Precision, accuracy and rejection of data questioned. Significant figures. Mean and standard deviation. Curve fitting.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT III

3.1 Separation and purification techniques: General principles involved in the separation of precipitates. Solvent extraction.

3.2 Chromatography: Principles involved in adsorption, partition and ion exchange, paper, thin layer, column, Electrophoresis applications.

3.3 Desiccants, vacuum drying, distillation, fractional distillation, steam distillation, azotropic distillation, crystallization and sublimation – principles and techniques.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT IV

4.1 Thermo analytical Methods: Principles involved in TGA and DTA – instrumentation. Characteristics of TGA ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) and DTA curves ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$). Factors affecting TGA and DTA curves.

4.2 Thermometric titration of HCl Vs NaOH

4.3 Analytical Electrochemistry: Redox potential – measurement and applications. Interpretation of chemical behavior. Electrolytic separations. Principles of Electrodeposition. Electro gravimetric (estimation of Cu and Ag).

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT V

5.1 Colorimetric analysis: Laws of colorimetry – instrumentation. Nessler's and photoelectric colorimetric method- operation and application. Estimation of Ni, Cu and Fe.

5.2 Techniques in kinetics: Principles and techniques used to follow the kinetics of ordinary and fast- photochemical reactions.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

Text books:

1. R.Gopalan, P.S. Subramanian, and K. Rengarajan – “Elements of Analytical Chemistry”, 2nd edition, Sultan chand &Co.,
2. Vogel.A “ Text book of Quantitative Inorganic analysis”, 4th edition, English language book society.,

References Books:

1. B.K. Sharma, “ Instrumental methods of chemical analysis”, Goel Publishing House, Merrut (1997).
2. Gurdeep Chatwal and Sham Anand , “Instrumental methods of chemical analysis” Himalaya publishing house (2005).
3. D.A. Skoog and D.M.West, “ Fundamentals of analytical chemistry”, 7th edition, Hartcourt College Publishers.
4. R.A. Day and A.L. Underwood – Quantitative analysis.
5. Mendham J, Denny R.C., Barnes J.D., Thomas M, “ Vogel’s Text book of quantitative chemical analysis”, 6th edition, Pearson education.

Web Resources:

1. <http://www.chemexper.com>

Course Outcome:

On completion of the Course, Students should be able to

- Aware of Laboratory hygiene and safety.
- Predict the data analysis in analytical techniques
- Learn about separation and purification techniques.
- Recognize the thermo analytical methods such as TGA,DTA and analytical electrochemistry.
- Understand the colorimetric analysis and techniques in kinetics.

SKILL BASED ELECTIVE – II APPLIED CHEMISTRY

Internal : 25
External : 75
Exam Hours : 3

Semester :V
No. of .Hours/Week: 2
Credits: 2

Course Objective:

- To learn about types and hardness techniques of water.
- To learn how to determine TDS,COD and BOD.
- To understand about the application of Leather Chemistry.
- To shall know about the physiochemical properties of milk.
- To understand about the constituent of dairy products.

UNIT I WATER CHEMISTRY I

1.1 Water – types of water - soft and hard water – hardness, degree of hardness - Reverse osmosis and ion exchange methods – principles and techniques.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

UNIT II WATER CHEMISTRY II

2.1 Water Analysis - Determination of TDS, Total hardness by EDTA, BOD and COD.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

UNIT III LEATHER CHEMISTRY

3.1 Introduction, chief process used in leather manufacture, structure of hide and skin , leather processing – process before tannage – tanning process – vegetables tanning and chrome tanning.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

UNIT IV DIARY CHEMISTRY I

4.1 Milk – Definition, physiochemical properties of milk, constituents of milk, chemical change taking place in milk - boiling, pasteurization, sterilization and homogenization.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

UNIT V DIARY CHEMISTRY II

5.1 Definition of creams, butter, ghee and ice creams. Milk powder – definition, need for making Powder. Principles involved in drying process.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

Text books:

- 1.B.K.Sharma, Industrial Chemistry, 13th edition, Goel Publishing House, Reprint 2008.
- 2.Mp Mathur, Datta Roy D, Dinakar P, “Text book of Dairy Chemistry”, Indian council of Agricultural Research, New Delhi.

References Books:

1. Dilip Kumar Das, Introductory Soil Science, 1st Edition, Kalyani Publishers, Reprint 2002.

Web Resource:

1. [https:// www.chemistryguide.org/](https://www.chemistryguide.org/)
2. <http://chemcollective.org/home>

Course Outcome:

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

- Develop an understanding about types of water.
- Experience in water analysis such as TDS, Total hardness, BOD and COD
- Expertise in Leather manufacture and processing.
- Learn about constituent physical and chemical properties of milk.
- Skills in preparation of dairy products such as butter, ghee, icecream.

SKILL BASED ELECTIVE – III POLYMER CHEMISTRY

Internal : 25

External : 75

Exam Hours : 3

Semester :V

No. of .Hours/Week: 2

Credits: 2

Course Objective:

- To learn the chemistry of polymers.
- To learn Polymer structure, properties and methods of molecular weight determination of polymers.
- To shall know the kinetics of polymers.
- To gain knowledge about the natural and synthetic polymers.
- To learn the constituents and importance of Plastics and Resins.

UNIT I INTRODUCTION

1.1 Introduction to polymers and Macro molecules. Molecular forces and Chemical bonding in polymers.

1.2 General methods of preparation of polymers.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

UNIT II MOLECULAR WEIGHT OF POLYMERS

2.1 Polymer structure - Linear, branched and cross linked polymers Stereo chemistry of polymers – Isotactic, syndiotactic and Atactic. Properties of Polymers.

2.2 Molecular weight of Polymers - Number average molecular weight and weight average molecular weight. Viscosity and molecular weight. Osmometry.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

UNIT III KINETICS

3.1 Co polymerization - Definitions –homo and copolymers, Block copolymers and graft copolymers.

3.2 Kinetics of polymerization - Kinetics of free radical polymerization kinetics of cationic polymerization. Mean kinetic chain length. Degree of polymerization. Inhibition and retardation. Chain transfer.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

UNIT IV NATURAL & SYNTHETIC POLYMER

4.1 Natural and synthetic rubbers, constitution of natural rubber. Thiocol, Polyurethane and silicone rubbers. Thermocole polymers related to natural rubber – Chlorinated rubber, oxidized rubber, cyclised rubber and ebonite.

4.2 Acrylic polymers - Polymers of acrylic acid, methacrylic acid, and poly acrylates.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

UNIT V PLASTICS & RESINS

5.1 Plastics and Resins - Definitions, Thermoplastic and thermo setting resins. Constituents of plastics fillers, dyes, pigments, plasticizers, lubricants and catalysts.

5.2 Important thermoplastic resins acrylics, polyvinyl and cellulose derivatives. Important thermo setting resins – Phenolic resins, amino resins, epoxy resins, alkyd resins and silicone resins.

(Content – 4 Hrs, Assessment – 2 Hrs) (6Hrs)

Text Books:

1. V.R.Gowarikar, N.V.Viswanathan “Polymer science”, Wiley Eastern Ltd., New Delhi, 1978.
2. M.G.Arora, M.Singh and M.S.Yadav “ Polymer Chemistry” 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.

References Books:

1. F.W.Bilmeyer, “Text book of Polymer Science”, Jr.John Wiley and Sons, 1984.
2. B.K.Sharma “ Polymer Chemistry”, Goel Publishing House, Meerut, 1989.

Web Resource:

1. [https:// www.chemistryguide.org/](https://www.chemistryguide.org/)
2. <http://chemcollective.org/home>

Course Outcome:

Students should be able

- To help students explore about polymers and macromolecules.
- To assess the molecular weight of polymers, structure and its stereochemistry.
- To recognize the kinetics of polymerization.
- To distinguish the natural and synthetic polymer.
- How to make plastics and resins.

**CORE COURSE VIII
ORGANIC CHEMISTRY II**

Internal : 25
External : 75
Exam Hours : 3

Semester : VI
No. of .Hours/Week: 6
Credits: 6

Course Objective:

- To learn the Chemistry of Sugars.
- To learn the Chemistry of Amino acids, Nucleic acids and Vitamins.
- To study the Chemistry of Alkaloid and Terpenoid.
- To learn the molecular rearrangement and its mechanism.
- To learn the basic concept of UV-Visible , IR and NMR spectroscopy.

UNIT I CHEMISTRY OF CARBOHYDRATES

1.1 Carbohydrate- classification, properties of mono saccharides (glucose and fructose), structure and configuration of mono saccharides, interconversion.

1.2 Ascending and descending series, mutarotation, epimerization- cyclic structure-determination of size of sugar rings.

1.3 Disaccharides- sucrose, maltose- structure elucidation- polysaccharide- starch and cellulose (elementary treatment). **(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)**

UNIT II CHEMISTRY OF PROTEINS AND VITAMINS

2.1 Amino acids- Zwitter ion- isoelectric point – general methods of preparation and reactions of amino acids. Peptides- Peptide linkages- proteins- classification of proteins.

2.2 Structure of proteins- primary structure- end group analysis- Edman method- secondary structure- tertiary structure- denaturation- colour reactions of proteins.

2.3 Nucleic acids- elementary treatment of DNA and RNA.

2.4 Vitamins-classification, structure and biological importance of vitamins A,B₁,B₂,B₆,B₁₂ and C. **(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)**

UNIT III CHEMISTRY OF ALKALOIDS AND TERPENOIDS

3.1 Chemistry of natural products- alkaloids- classification, isolation- methods for synthesis of coniine, piperine, nicotine and quinine.

3.2 Terpenoids- classification- isoprene, special isoprene rule, methods for synthesis of citral, limonene, menthol, camphor.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT IV MOLECULAR REARRANGEMENTS

4.1 Molecular rearrangements- types of rearrangement (nucleophilic and electrophilic)-mechanism with evidence for the following re-arrangements: pinacol-pinacolone.

4.2 Benzil-benzilic acid, Benzidine, Claisen, Fries, Hofmann. Curtius, Lossen, Beckmann and dienone- phenol rearrangements. **(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)**

UNIT V ORGANIC SPECTROSCOPY

5.1 UV-VIS spectroscopy- types of electronic transitions- Instrumentation-solvent effects on max- Woodward- Fieser rules for calculation of λ_{max} : dienes only- bathochromic shift and hypsochromic shift.

5.2 IR spectroscopy- number and types of fundamental vibrations- selection rules- modes of vibrations and their energies, Instrumentation- position of IR absorption frequencies for functional groups like aldehyde, ketone, alcohol, acid, amine and amide.

5.3 NMR spectroscopy- principle- chemical shift- factors affecting the chemical shift- Inductive effect and hydrogen bonding- TMS, delta scales, splitting of signals- spin-spin coupling, NMR spectrum of EtOH, n-propyl bromide and isopropyl bromide.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

Text Books:

1. Bahl B.S. and Bahl A., "Advanced Organic Chemistry", 12th edition, Sultan Chand & Co., (2010)
2. Y.R.Sharma, "Elementary Organic Spectroscopy", 5th edition, S.Chand & Company., (2013).

References Books:

1. Finar I.L., "Organic Chemistry", Vol 1&2,6th edition,Addison Wesley Longman Ltd. (1996).
2. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. "Organic Chemistry", 7th edition, Pearson (India)., (2011)
3. Pine S.H., "Organic Chemistry",5th edition,McGraw – Hill International Book Company (1987)
4. William Kemp, "Organic Spectroscopy", 3rd edition, ELBS.
5. Silverstein, R. M, Webster, F. M, " Spectroscopy identification of Organic compounds", 7th edition, CRC Press, (2015)

Web Resoucrs:

1. <http://organicdivision.org/links.html>
2. <http://www.chemistryguide.org/>
3. <http://chemcollective.org/home>

Course Outcome:

Students will gain an understanding of

- The classification, properties, structure and configuration of mono, di and poly saccharides.
- The chemistry of proteins and vitamins.
- The importance of alkaloids and terpenoids.
- Predicting the molecular rearrangements with its types and mechanism.
- The fundamental principles of UV-Vis, IR and NMR spectroscopy.

CORE COURSE IX PHYSICAL CHEMISTRY II

Internal : 25
External : 75
Exam Hours : 3

Semester : VI
No. of .Hours/Week: 6
Credits: 6

Course Objective:

- To learn the basics of electrochemistry and they understand the practical use of electricity and their laws.
- To understand the nature of electrolytes and their theories and the concept of emf and its application.
- To learn the concept of electrochemical cell and its applications and the concept of ionic mobility and its practical applications.
- To learn about types and mechanism of catalysis and absorption reactions.
- To understand the effect of radiation on humans and they learn the basics of spectroscopy.
- To learn the use of UV spectroscopy and apply the IR spectroscopy of chemical compounds.
- To learn about concepts of NMR Spectroscopy.

UNIT I ELECTRICAL CONDUCTANCE

1.1 Conductance in metal and in electrolytic solution- specific conductance and equivalent conductance. Arrhenius theory of electrolytic dissociation and its limitation. Weak and strong electrolyte according to Arrhenius theory. Ostwald's dilution law- Derivation, applications and limitation.

1.2 Effect of dilution on equivalent conductance and specific conductance. Kohlrausch's law and its applications. The elementary treatment of the Debye-Huckel- Onsagar equations for strong electrolytes- evidence for ionic atmosphere.

1.3 Transport number and Hittorf's rule. Determination of transport number by Hittorf's method and moving boundary method.

1.4 Application of conductance measurements-determination of degree of dissociation of weak electrolytes-determination of solubility product of a sparingly soluble salt. common ion effect, conductometric titrations.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT II ELECTROCHEMICAL CELLS

2.1 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 (G,H,S and K)

2.2 Types of reversible electrons-gas/metal ion-metal/metal ion, metal/soluble salt/anion and redox electrodes, electrode reactions.

2.3 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.

2.4 Potentiometric titrations-Acid –Base titrations-Oxidation-reduction (Redox)titrations- Precipitation titrations. Corrosion-general and electrochemical theory- passivity- prevention of corrosion.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT III CATALYSIS AND SURFACE PHENOMENA

3.1 Catalyst-Definition and Characteristics-Types of catalysis- Homogeneous and heterogeneous, induced, auto, positive and negative catalysis, catalytic poisons and catalytic promoters.

3.2 Enzyme catalysis- Michaelis- menten equation and Michaelis – menten law.

3.3 Adsorption-types-chemical and physical, characteristics of adsorption theory.

3.4 Different types of isotherms- Freundlich and Langmuir adsorption isotherms.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT IV SPECTROSCOPY I

4.1 Electromagnetic spectrum- the region of various types of spectra. Microwave spectroscopy- rotational spectra of diatomic molecules treated as rigid rotator, condition for a molecule to be active in microwave region.

4.2 Rotational constants (B) and selection rules for rotational transition. Frequency of spectral lines, calculation of inter nuclear distance in diatomic molecules.

4.3 Infrared spectroscopy- vibrations of diatomic molecules- harmonic oscillators, zero point energy, dissociation energy and force constant, condition for molecule to be active in the IR region, selection rules for vibrational transition, fundamental bands, overtones and hot bands.

4.4 UV-Visible spectroscopy-conditions- Franck-Condon principle- pre dissociation-applications. (Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT V SPECTROSCOPY II

5.1 Raman spectroscopy- Rayleigh scattering and Raman scattering. Stokes and anti stokes lines in Raman spectra, Raman frequency, quantum theory of Raman effect, conditions for a molecule to be Raman active.

5.2 Comparison of Raman and IR spectra- structural determination from Raman and IR spectroscopy, rule of mutual exclusion.

5.3 NMR spectroscopy- nuclear spin and conditions for a molecule to give rise to NMR spectrum- theory of NMR spectra, number of NMR signals, equivalent and non-equivalent protons. (Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

Text Books:

1. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin chand and Co. (2013)
2. Colin Bannwell N and Elaine Mc Cash M, Fundamentals of molecular spectroscopy, 4th edition, Mc Graw hill publishing company limited.

References Books:

1. Bahl B.S., Arun Bahl and Tuli G.D. . “Essentials of Physical Chemistry”, New Delhi: Sultan Chand and Sons., (2012)
2. Moore W. J. “Physical chemistry”, 5th Edition, Orient Longman Ltd., (1972).
3. Glasstone S. and Lewis D., “Elements of Physical Chemistry”, London, Mac Millan & Co Ltd.
4. .Y.R.Sharma, “ Elementary Organic Spectroscopy”, 5th edition, S.Chand & Company., (2013).
5. Russell S. Drago,, “Physical methods in Inorganic chemistry”, East-west student edition., (1978).

Web Resource:

1. <http://www.chemistryguide.org/>
2. <http://chemcollective.org/home>

Course Outcome:

Students will gain an understanding of

- Knowledge of electrical conductance with its applications.
- Learn depth about electrochemical cells and electrodes.
- The applications of catalysis and isotherms
- The use of UV spectroscopy and applications of IR and UV in chemical compounds.
- The fundamental application of Raman and NMR spectroscopy.

**CORE PRACTICAL IV
GRAVIMETRIC AND ORGANIC ANALYSIS (P)**

Internal : 40
External : 60
Exam Hours : 6

Semester :VI
No. of .Hours/Week: 6
Credits: 5

Course Objective:

- To learn the techniques of gravimetric analysis.
- To learn the methods of preparing organic compounds.
- To learn the determination of physical constants of compounds.
- To learn the techniques of organic qualitative analysis
- To learn the derivatives of organic qualitative analysis.

GRAVIMETRIC ANALYSIS:

1. Estimation of Lead as lead chromate.
2. Estimation of Barium as barium chromate.
3. Estimation of Nickel as Nickel - DMG complex.
4. Estimation Calcium as calcium oxalate monohydrate
5. Estimation of Barium as barium sulphate.

ONLY FOR DEMONSTRATION:

1. Estimation of Copper as copper (I) thiocyanate
2. Estimation of Magnesium as magnesium oxinate
3. Estimation of Iron as Iron (III) oxide.

ORGANIC QUALITATIVE ANALYSIS AND ORGANIC PREPARATION:

Analysis of Simple Organic compounds

(a) characterization of functional groups

(b) confirmation by preparation of solid derivatives / characteristic colour reactions.

Note: Mono –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: (ANY FOUR)

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.

MARK DISTRIBUTION:

Internal : 40		
External : 60	Gravimetric	25
	Organic Preparation	10
	Physical Constant	05
	Organic Analysis	15
	Record	05

Text Books:

1. Venkateswaran V, Veeraswamy R., Kulandaivel A.R., "Basic Principles of Practical Chemistry", 2nd edition, Sultan chand & sons, (1997)
2. Furniss, B.S., et al., "Vogel's textbook of Practical Organic Chemistry", 7th edition, ELBS, London (1984).

Web Resource:

1. <http://www.vlab.co.in/index.php>

Course Outcome:

Students will gain an understanding of

- To know the technique of organic qualitative analysis.
- To learn the determination of Physical constants of organic compounds.

MAJOR BASED ELECTIVE II
NUCLEAR, INDUSTRIAL CHEMISTRY AND METALLIC STATE

Internal : 25

Semester : VI

External : 75

No. of .Hours/Week: 6

Exam Hours : 3

Credits: 6

Course Objective:

- To learn about fundamental of Nuclear Chemistry.
- To learn measurement and applications of radioactive isotopes.
- To study composition and uses of fossil fuels, safety matches, paint and varnish.
- To understand the various theories of metallic bonding, different types of semi conductors.
- To know the composition and uses of Inorganic polymers and silicates.

UNIT I NUCLEAR CHEMISTRY I

1.1 Introduction – composition of nucleus and nuclear forces.

1.2 Nuclear stability – o/p ratio, mass defect, binding energy, packing fraction and magic numbers, shell and drop models.

1.3 Isotopes – detection and separation. Isotopic constitution of elements and whole number rule. Deviation of atomic weights from whole numbers. Isobars, isotones and isomers.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT II NUCLEAR CHEMISTRY II

2.1 Radioactivity- Radioactive emanations. Disintegration theory – modes of decay – Group displacement law – Rate of disintegration – Half life and average life – Radioactive series, Geiger Nuttal rule. Detection and measurements -Wilson cloud chamber & Geiger Muller Counter.

2.2 Nuclear transformations use of projectiles nuclear reactions fission and fusion. Nuclear reactors. Applications of radio isotopes – Medicine, Agriculture, Industry & Carbon dating – Radio active waste disposal.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT III INDUSTRIAL CHEMISTRY

3.1 Fossil fuels – varieties of coal and petroleum – petroleum refineries in India. Gaseous fuels – natural, gobar, coal, water, semi water and producer gases. Liquefied Petroleum Gases (LPG)

3.2 Safety matches – Introduction, Raw materials and manufacturing methods.

3.3 Paints and varnishes- Definition, types and composition.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT IV METALLIC STATE

4.1 Metallic state – packing of atoms in metal (BCC, CCP, HCP). Theories of metallic bonding- Electron gas Pauling and Band theories. Structure of alloys substitutional and interstitial solid solutions – hume rothery ratios crystal defects.

4.2 Semi conductors – Extrinsic and Intrinsic – n-type and p-type conductors. Structure and uses in electronic industry.

(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)

UNIT V INORGANIC POLYMERS & SILICATES

5.1 Inorganic polymers – coordination polymers, metal alkyls, phosphonitrilic polymers.

5.2 Silicates – Classification into discrete an ions, one, Two and three dimensional structure with typical examples. composition, properties and uses of beryl, asbestos, talc, mica, zeolites and ultramarines. **(Content – 15 Hrs, Assessment – 3 Hrs) (18Hrs)**

Text Books:

1. R.D. Madan, “Modern Inorganic Chemistry”, 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L.Soni, ‘Text Book of Inorganic Chemistry’, 20th revised edition, Sultan Chand & Sons, 2000.

Reference Books:

1. Gilreath, ‘Fundamental concepts of Inorganic Chemistry’, 18th Printing, McGraw Hill International Book Company, 1985
2. S. Glasstone, ‘Source book on Atomic Energy’, East-West Press, 1967.
3. R.Gopalan, P.S. Subramanian and K. Rengarajan, ‘Elements of Analytical Chemistry’, Sultan Chand & Sons, 2nd edition, 1991.
4. B. K. Sharma, “ Industrial Chemistry”, 13th edition, Goel Publishing House, Reprint 2008.
5. F.W.Bilmeyer, “Text book of Polymer Science”, Jr. John Wiley and Sons, 1984.

Web Resource:

1. <http://www.chemistryguide.org/>
2. <http://chemcollective.org/home>

Course Outcome:

Students should be able to

- Acquire knowledge of nuclear structure, stable and unstable atomic nuclei.
- Know the fundamentals of radioactivity, isotopic chemistry, radiation chemistry and the applications of these in medicine, agriculture and industry.
- Learn about the fossil fuels, safety matches, paints and varnishes.
- Handle the semiconductors.
- Gain a preliminary understanding of inorganic polymers.

SKILL BASED ELECTIVE III AGRICULTURAL CHEMISTRY

Internal : 25
External : 75
Exam Hours : 3

Semester : VI
No. of .Hours/Week: 5
Credits: 5

Course Objective:

- To learn about the composition and properties of soil.
- To understand the source and properties of Micronutrient fertilizer.
- To know the importance of Green manure.
- To study about the pest management and its control.
- To know the chemistry of Fungicide, Herbicide and Acaricide.

UNIT I COMPOSITION AND PROPERTIES OF SOIL

1.1 Definition of soil – soil composition. Soil Physical properties – soil separates and particle size distribution – soil texture and structure. Bulk density, particle density, pore space, soil air, soil temperature, soil water.

1.2 Soil chemical properties – soil colloids – Inorganic colloids – clay minerals – amorphous – Ion exchange reactions – organic colloids – soil organic matter – Decomposition – Humus formation – significance on soil fertility, soil reaction .

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT II MICRONUTRIENT FERTILIZER

2.1 Secondary and micronutrient fertilizers – complex and mixed fertilizers – sources, manufacture, properties and reactions in soils.

2.2 Preparation of slow release fertilizer – compatibility of fertilizers – fertilizer blending – preparation of different fertilizer mixtures .

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT III GREEN MANURE

3.1 Nutrient potential of different organic manures Agricultural, industrial and urban wastes – preparation of enriched farm yard manures - Zinc enriched organics.

3.2 Green manures – green leaf manure – bulky organic and concentrated organic manures – compost –composting of coir pith; sugarcane trash, leaf litters and farm wastes – oil cakes, bone meal, fish meal, guano poultry manures - fertilizer use efficiency – integrated nutrient management.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT IV PEST MANAGEMENT & CONTROL

4.1 Pesticides – formulations – emulsifiable concentrate, water miscible liquids, wettable powders dusts, granules, classification of pesticides – mode of action – characteristics – uses and safety measures in the analysis and handling of pesticides.

4.2 Insecticides – plant products – Nicotine, pyrethrum, rotenone, petroleum oils. Inorganic Pesticides – Arsenical fluorides, borates. Organic pesticides – organochlorine compounds – D.D.T, B.H.C., methoxychlor, chlordane, endosulfon. Organophosphorous compounds dichloroethyls, methyl carbamic acid derivatives – carbaryl – structure and mode of action.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

UNIT V FUNGICIDES, HERBICIDES & ACARICIDES

5.1 Fungicides – inorganic – sulphur compounds – copper compounds – Mercuric compounds, organic – dithiocarbamates – Dithane . Bordeaux mixture.

5.2 Herbicides : Inorganic herbicides – Arsenical compounds Boron compounds cyanamide – cyanides and thiocyanates, chlorates and sulphamates. Organic herbicides - Nitro-compounds – chlorinated compounds – 2,4D-Pyridine compounds – Triazine compounds – Propionic acid derivatives – urea herbicides, alachlor.

5.3 Acaricides – Rodenticides – Attractance – Repellants – Fumigants Defoliant.

(Content – 12 Hrs, Assessment – 3 Hrs) (15Hrs)

Text Books:

1. N.C. Brady, The nature and properties of soils Eurasia publishing house, (P) Ltd. 9th Ed. 1984.
2. Colling G.H., Commercial Fertilizers McGraw publishing house., 1955

References Books:

1. Biswas, T.D. and Mukeherjee S.K. Text book of soil science 1987.
2. A.J. Daji A. Text book of soil science Asia publishing house, Madras (1970).
3. Donahue, R.L. Miller, R.W. and Shickluna, J.C. soils – An introduction to soils and plant Growth – Prentice Hall of India (P) Ltd., New Delhi 1987..
4. Colling G.H. , Commercial Fertilizers McGraw publishing house 1955.
5. Lakshmanan, “ Agricultural Chemistry”, VVPublishers.,

Web Resource:

1. <http://www.chemistryguide.org/>
2. <http://chemcollective.org/home>

Course Outcome:

- Students acquire the basic knowledge of Composition, Physical and Chemical properties of soil.
- Students is able to understand the secondary and micronutrient fertilizer.
- Students can accumulate skills about green manure.
- Students should be able to apply the knowledge of Pest Management and control.
- Students should know the preparation and applications of fungicides and herbicides.