Courses of Study

M.Sc.Chemistry

Session 2019-20

Khariar Autonomous College,Khariar
District:Nuapada
Odisha
766107

COURSE STRUCTURE
Semester – I

M.Sc. CHEMISTRY COURSES OF STUDY (CBCS)

Course Code	Course Name	Study Hours per week	Total Study Hours	Marks				Duration of Exam	Credit
CHEMISTRY				Mid Sem	Internal Assignment	End Sem	Total Marks		
CH -CC-101	Basic Organic Chemistry I	4 Hrs	60 Hrs	20	20	60	100	3.0 Hours	04
CH -CC-102	Basic Inorganic Chemistry – I	4 Hrs	60 Hrs	20	20	60	100	3.0 Hours	04
CH -CC-103	Basic Physical Chemistry – I	4 Hrs	60 Hrs	20	20	60	100	3.0 Hours	04
CH -CC-104	Basic Spectroscopy	4 Hrs	60 Hrs	20	20	60	100	3.0 Hours	04
CH -CC-105	Organic Chemistry Practical I	6 Hrs	60 Hrs			50	50	6.0 Hours	2
CH-CC-106	Inorganic Chemistry Practical I	6 Hrs				50	50	6.0 Hours	2
TOTAL =		28 Hrs	300 Hrs				500		20

Semester – II

Course Code	Course Name	Study Hours per week	Total Study Hours		Marks			Duration of Exam	Credit
CHEMISTRY				Mid Sem	Internal Assignment	End Sem	Total Marks		
CH -CC-201	Basic Organic Chemistry II	4 Hrs	60 Hrs	20	20	80	100	3 Hrs	04
CH -CC-202	Basic Inorganic Chemistry II	4 Hrs	60 Hrs	20	20	80	100	3 Hrs	04
CH -CC-203	Basic Physical Chemistry II	4 Hrs	60 Hrs	20	20	80	100	3 Hrs	04
CH -CC-204	Applications of Spectroscopy	4 Hrs	60 Hrs	20	20	80	100	3 Hrs	04
CH -CC-205	Organic Chemistry Practical II	6 Hrs	60 Hrs			50	50	3 Hrs	2
CH-CC-206	Inorganic Chemistry Practical	6 Hrs				50	50	6 Hrs	2
TOTAL =		28 Hrs	300 Hrs				500		20

Semester –III

Course Code	Course Name	Study Hours per week	Total Study Hours		Marks			Duration of Exam	Credit
CHEMISTRY				Mid Sem	Internal Assignment	End Sem	Total Marks		
CH -CC-301	Advanced Inorganic Chemistry	4 Hrs	60 Hrs	20	20	80	100	3.0 Hours	04
CH -CC-302	Research Methodology	4 Hrs	60 Hrs	20	20	80	100	3.0 Hours	04
CH -CC-303	Environmental Chemistry / Organic Synthesis	4 Hrs	60 Hrs	20	20	80	100	3.0 Hours	04
CH -CC-304	Bio-organic Chemistry / Polymer Chemistry	4 Hrs	60 Hrs	20	20	80	100	3.0 Hours	04
CH -CC-305	Physical Chemistry Practical	6 Hrs	60 Hrs			50	50	6.0 Hours	2
CH-CC-306	Analytical Chemistry Practical	6 Hrs				50	50	6.0 Hours	2
TOTAL =		28Hrs	300 Hrs				500		20

Semester – IV

Course Code	Course Name	Study Hours per week	Total Study Hours		Marks			Duration of Exam	Credit
CHEMISTRY				Mid Sem.	Internal Assignment	End Sem.	Total Marks		
CH -CC-401	Advanced Physical Chemistry	4 Hrs	60 Hrs	20	20	80	100	3.0 Hours	04
CH -CC-402	Analytical Chemistry	4 Hrs	60 Hrs	20	20	80	100	3.0 Hours	04
CH -CC-403	Bio-inorganic Chemistry / Organic Photochemistry	4 Hrs	60 Hrs	20	20	80	100	3.0 Hours	04
CH -CC-404	Computer for Chemist / Chemistry and Society	4 Hrs	60 Hrs	20	20	80	100	3.0 Hours	04
CH-CC-405	Project					100	100		04
TOTAL =		28 Hrs	300 Hrs				500		20

FIRST SEMESTER
Core Course - 101
Paper -I
BASIC ORGANIC CHEMISTRY-I

UNIT-I:
NATURE AND BONDING IN ORGANIC MOLECULES

Delocalized Chemical Bonding; Conjugation, Cross conjugation, Resonance, Hyperconjugation, Bonding in fullerenes, Tautomerism, Aromaticity in Benzenoid and non-benzenoid compounds, Alternant and non-alternant hydrocarbons, Huckei's rule, Energy level of Pi- molecular orbitals, Annulenes ,Aromaticity, anti aromaticity and homoaromaticity, PMO approach. Bonds weaker than covalent, Addition compounds, Crown ether complexes, Cryptands, Inclusion compounds, Cyclodextrins, Catenanes and Rotaxanes.

UNIT-II:
STRUCTURE AND REACTIVITY

Types of reaction mechanism, Thermodynamic and kinetic requirments, Kinetic and thermodynamic control, Hammonds postulate ,Curtin Hammett's Principle, Potential energy diagram. Hammett equation, Substitution and reaction constants .Taft equation. Hard Soft concept of acid and base. Reaction intermediates :Generation, structure, stability and fate of Carbenes, Nitrenes and Benzynes.

METHODSOF DETERMINING REACTION MECHANISM

Kinetic and non-kinetic methods: Kinetic data and its interpretation; Kinetic isotope effect (primery and secondary).Non-kinetic use of isotopes for determining reaction mechanism (isotopic labelling).Product analysis. stereochemical studies and cross-over experiments. Study of intermediates: Isolation, detection and trapping of reaction intermediate

UNIT-III:
STEREOCHEMISTRY

Conformation of cycloalkanes and decalins, Effect of conformation on reactivity. Elements of symmetry, chirality, molecules with more than one chiral centres, Threo and erythro isomers, enantiotropic and diastereotropic atoms .groups, and faces, Stereospecific and stereoselective synthesis, Optical activity in absence of chiral carbons, Chirality due to helical shape.Asymmetric synthesis and optical purity.

UNIT-IV:
ORGANIC PHOTOCHEMISTRY

Light absorption.Jablonski diagram, Photodissociation reaction, Norrish type-I and Norrish type-II Cleavage, Photochemical Reduction,Photoisomerisation, di-pimethane rearrangement, Barton Reaction, Photo Fries rearrangement, Photochemistry of Aromatic Compounds.Singlet molecular Oxygen reactions.

Books Recommended

1. Advanced Organic Chemistry- Reactions Mechanism & Structure -Jerry March(John Wiley)
2.March's Advanced Organic Chemistry Jerry March(John Wiley)
3.0 rganic Chemistry--Clayden ,Greeves ,Warren and Wothers (OxfordO
4.Stereochemistry ofOrganic Compounds-D.Nasipuri (New Age International)
5.Molecular Reactions and Photochemistry -C.H.De Puy and O.L.Chapman (Printice Hall)

FIRST SEMESTER
Core Course - 102
Paper -II
BASIC INORGANIC CHEMISTRY-I

Unit-I:

COVALENT BOND

Qualitative approach to valence bond theory, The hydrogen molecule-perturbation and variation methods, The secular equation, Resonance and ionic contribution, Qualitative discussion on molecular orbital theory, bonding and antibonding orbital, energy distribution and stability, MO energy level diagrams of simple diatomic molecules like N_2, O_2, F_2. CO and NO.

Unit-II:

INORGANIC STEREOCHEMISTRY

Hybridisation and wave mechanical description for sp, sp^2, sp^3orbital, qualitative idea about dsp^2,$dsp^3$and d^2sp^3, VSEPR theory, shapes of simple molecules like N_2O, F_2O, ICl_2, PCl_5, ClF_3, SF_6, IF_7, $TeCl_4$, $XeOF_4$, XeF_6, Linnet's double quartet theory and spectra of simple molecules.

Unit-III:

MANY ELECTRONS SYSTEM

Qualitative treatment for many electron systems, Self consistent field theory, The variation principle, Angular momentum and addition of angular momentum, LS and JJ coupling, Spectral terms for p^1_p^6 and d^1-d^{10} metal ions

Unit-IV:

BONDING IN CO-ORDINATION COMPOUNDS

Valence bond theory-strength and short coming ,Crystal field theory-effect spin types, CFSE, Measurement of 10 Dq, Evidence for crystal stabilization energy in octahedral, tetrahedral, tetragonal, square pyramidal and square planner fields, Molecular orbital theory (qualitative), MO energy level diagrams, Sigma –pi bonding and their importance in co-ordination compounds

Books Recommended:

1. Advanced Inorganic Chemistry FA Cotton & Wilkinson (John wiley)
2. Inorganic chemistry, J.E. Huhey (Harpes & Row)
3. Comprehensive Co-ordination Chemistry G.Wilkinson, R.D. Gillards & JA Mc Cleverty (Pergaman)
4. Co-ordination Chemistry D.Banerjea (Asian Books Pvt. Ltd)
5. Modern Coordination Chemistry – Lewis & Wilkers
6. Atomic Structure & Chemical bond Manas Chand (TMH)
7. Theoretical Inorganic Chemistry M.C. Day & J.Selbin (Affiliated East West Press Pvt. Ltd.)

FIRST SEMESTER
Core Course – 103
Paper -III
BASIC PHYSICAL CHEMISTRY-I

Unit-I:

CLASSICAL THERMODYNAMICS

A. Brief resume of the concept of enthalpy, entropy, free energy and laws of thermodynamics, Partial molar properties, Chemical potential, Effect of temperature and pressure, Determination of partial molar properties by: (1) Direct Method, (ii) Apparent method, (iii) Method of intercept.

B. Concept of fugacity and its determination by (i) Graphical method, (ii) From equation of state

(iii) Approximation method, Nernst heat theorem and its application to solid, Third law of thermodynamics, Experimental determination of entropy by third law.

Unit-II:

STATISTICAL THERMODYNAMICS

Thermodynamic probability and entropy, Maxwell-Boltzmann statistics, Partition function (translational, vibrational, rotational and electronic) for diatomic molecules: relationship between partition and thermodynamic function (internal energy, enthalpy, entropy and free energy), Calculation of equilibrium constant, Fermi-Dirac statistics, Bose-Einstein statistics, Distribution law and its application to metal and helium.

Unit-III:

NON-EQUILIBRIUM THERMODYNAMICS

Thermodynamic criteria for non-equilibrium states, Entropy production and entropy flow, Entropy balance equation for the different reversible processes (heat flow and chemical reaction), Transformation of the generalized fluxes and forces, Non-equilibrium stationary state, Microscopic reversibility, Onsager's reciprocity relation, Electrokinetic phenomena, Diffusion, Electric conduction.

Unit-IV:

CHEMICAL DYNAMICS

Collision theory of reaction rate, Activated complex theory, Arrhenius equation, Ionic reaction, Kinetic salt effect, Steady state kinetics, Photochemical reaction (Hydrogen- Bromine and Hydrogen-Chlorine react ions), Oscillatory reactions (Belousov-Zhabotinsky reaction), Homogeneous catalysis, General features of fast reaction, Study of fast reaction by flow method and relaxation method. Dynamics of Unirnolecular reactions (Lindemann- I-Iinshelwood and Rice- Ramsperger- Kassel- Marcus theories)

Books Recommended :

1. Physical Chemistry, P.W. Atkins, ELBS
2. Thermodyanamics, GN Lewis & M Randal
3. Molecular Thermodynamics, DA McQuarie & Simon Viva
4. Non Equilibrium Thermodynamics, SR de Groot & Mazur, Dove
5. Statistical Mechanics & Thermodynamics, C. Garrod
6. Chemical Kinetics, KJ Laidler, MC graw – Hill
7. Kinetics and Mechanism of Chemical Trans formations J Ramanujan & J. Kuriaeose, Mc Millan.

FIRST SEMESTER
Core Course - 104
Paper -IV
BASIC SPECTROSCOPY

Unit-I:
ELECTRONIC SPECTROSCOPY

A. Atomic spectroscopy- Energies of atomic orbital, Spectra of hydrogen atom alkali metal atom.
B. Molecular spectroscopy Energy levels, Vibrational progression and geometry of excited state, Frank-Condon principle. Electronic spectra of poly atomic molecule

UNIT-II:
VIBRATIONAL SPECTROSCOPY

A. Infra -red spectroscopy: Vibrational energy of diatomic molecules, zero point energy, force constant and bond strength, Morse potential energy diagram, vibrational-rotational spect oscopy, P,Q,R branches, break - down of Oppenheimer approximation, vibration of polyatomic molecules, Selection rules, Normal mode of vibration, Group frequencies, Overtones, Hot bands, Factors affecting the band positions nd intensities for IR- region.
B. Raman Spectroscopy: Classical and quantumtheories of Raman effect, Pure rotational, vibrational and rotational Raman spectra Selection rule, Mutual exclusion principle, Resonance Raman spectroscopy, Coherent anti Stoke's- Raman spectroscopy.

Unit-III
A. MICROWAVE SPECTROSCOPY:

Classification of molecules, Rigid rotator model, Ef1ect of isotopic substitution on transition frequencies, Non- rigid rotator , Stark effect, applications.
B. Photo electron spectroscopy: Basic principles, Photoelectric effect, Ionisation process, Koopmanss thermo photoelectron spectra of simple molecules, ESCA, Chemical information from ESCA, Auger electron spectroscopy,

Unit-IV
A. ELECTRON SPIN RESONANCE SPECTROSCOPY:

Basic principles , Zero- field splitting and Kramer's degeneracy, Factors affecting g value , Isotopic and anisotropic hyperfine coupling constant, Measurement techniques, Application.
B. Mossbauer spectroscopy: Basic principles, Spectral parameters and, spectral display, Application of the techniques to study the bonding and structure of Fe^{2+} and Fe $^{3+}$ compounds including those of intermediate spins.

Books Recommended

1. Modern Spectroscopy, J M Hollas, John Wiley
2. Physical Methods in Chemistry R S Drago
3. Basic Principles of Spectroscopy R. Chang Mc Graw Hill
4. Introduction to photo electron spectroscopy P K Ghose, John Wiley
5. Introduction to Molecular Spectroscopy G M Barrow, Mc Grow Hill
6. Organic Spectroscopy William Kemp (Mac Million)

FIRST SEMESTER

Core Course - 105

Paper –V (A)

ORGANIC CHEMISTRY PRACTICAL - I

Identification of Organic Compound having at least two functional groups. Submission of derivatives. (Students are expected to submit pure and dry samples of their derivatives of their Lab. work at the time of examination along with practical records.)

FIRST SEMESTER

Core Course - 106

Paper –V (B)

INORGANIC CHEMISTRY PRACTICAL - I

1. Preparation and Characterization of the following inorganic complexes.

(a) Hexaminecobalt (III)chloride

(b) Potassiumtrisoxalatochrornate (III)

(e) Trans- Potassiumbis (Oxalato) diaquochromate (III)

(d) Cis –Potassiumbis (Oxalato) diaquochromate (III)

2. Complete analysis of (a) Brass (b) Cement

SECOND SEMESTER
Core Course - 201
Paper -VI
BASIC ORGANIC CHEMISTRY-II

Unit-I:

(A) ALIPHATIC NUCLEOPHILIC SUBSTITUTIONS

S_N2 and S_N1 mechanisms, Ion pairs in S_N1- mechanisms, Mixed S_N2 and S_N1- mechanisms, SET mechanism, S_Ni- mechanism, Nucleophilic substitution in allylic, vinylic and aliphatic trigonal carbon, Neighbouring group participation mechanism, Non-classical carbocation, Effect of structure of the substrate, Attacking nucleophile, Solvent, Leaving group on reactivity of nucleophilic substitution.

(B) ALIPHATIC ELECTROPHILIC SUBSTITUTIONS:

S_E1, S_E2 and S_Ei- mechanisms, Distinction in between S_E2 and S_Ei, Electrophilic substitutions at allylic substrate. Effect of substrate structure, leaving group and solvent on reactivity.

Unit-II:

(A) AROMATIC ELECTROPHILIC SUBSTITUTIONS:

Areniurn ion mechanism, Pi- complex mechanism, Orientation and reactivity, Ortho -para ratio, Ipso attack , Orientation of benzene with more than one substituent, Vilsmeir- Hack reaction. Gattermann - Koch reaction, Reimer- Tiemann reaction, Hoesch reaction.

(B) AROMATIC NUCLEOPHILIC S BSTITUTIONS

ArS_N2-- mechanism, ArS_N1- mechanism, Benzyne mechanism, Reactivity effect of substrate structure, leaving group ,attacking nucleophile; Von-Richter rearrangement, Sommelet -Hauser rearrangement, Smiles rearrangement.

(C) FREE RADICAL SUBSTITUTIONS

Free radical reactions ,Mechanism of free radical substitutions, Neighbouring group assistance in free radical reactions, Free radical substitutions at bridge head. Allylic halogenations, Coupling of alkynes, Arylation of aromatic compounds by diazonium salt, Hunsdiecker reaction, Kochi reaction.

Unit-III

A. ADDITION REACTION

Electrophilic addition mechanism (syn and anti), Nucleophilicaddition mechanism, Free radical addition mechanism, Addition to conjugated system, Orientation and reactivity, Hydroboration, Epoxidation, Sharpless asymmetricepoxidat ion, Michael addition.

B. ELIMINATION REACTION

E2, E1 and E1cB mechanism, Comparison in between E_2, E_1 and E1cB, Reactivity effect of substrate structure, Attacking reagent ; Leaving group and Reaction medium. Pyrolytic elimination , Peterson elimination reaction, hydroalkoxy elimination.

Unit-IV

PERICYCLIC REACTIONS:

Defination and properties of pericyclic eactions. Classification of pericyclic reactions. Symrnetry properties of molecular orbitals of ethylene; 1,3- Butadiene; Allyl system and l,3,5- hexatriene. Analysis of pericyclic reactions. Correlation diagram, FMO and PMO approach. (4+2) and (2+2) cycloaddition reactions.Electrocyclic reaction mode of ring closure and ring opening and stereochemistry. Orbital correlation diagram and FMO method analysis. Sigmatropic reaction, PMO approach.

Books Recommended :

1. Organic Chemistry – Clayden, Greeves, Warren & Wothers
2. Adv. Organic Chemistry – Carry & Sundberg
3. Organic Reaction Mechanism – Singh & Mukharjee, Macmillan
4. Organic Reaction Mechanism – RK Bansal, New Age
5. Organic Reaction Mechanism - P.S. Kalsi, New Age

SECOND SEMESTER
Core Course - 202
Paper -VII
BASIC INORGANIC CHEMISTRY-II

Unit-I:

SPECTRAL PROPERTIES OF TRANSITION METAL COMPLEXES

Spectroscopic ground states, Correlation and Orgel diagrams for-transition metal complexes (d^1 to d^9 states), Charge transfer spectra

Unit-II:

MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEXES

Elementary idea about magnetochemistry of metal complexes, Diamagnetism, Paramagnetism, Temperature independent paramagnetism, Magnetic susceptibility and its measurement , Paramagnetism applied to metal complexes, Ferromagnetism Ferrimagnet ism and Anti-ferromagnetism.

Unit-III:

METAL-LIGAND EQULLIBRIA IN SOLUTION

Stepwise and overall formation constants and their interaction, Trends in stepwise constants, Inert and labile complexes, Kinetic application of valence bond and crystal field theories, Kinetics of octahedral substitution, Factors affecting stability of metal complexes with reference to the nature of metal ion and ligand, Chelate effect and its thermodynamic origin, Determination of binary formation constants by pH-metry and spectro photometry.

Unit-IV:

REACTION MECHANISM OF TRANSITION METAL COMPLEXES

Acid hydrolysis, Factors affecting acid hydrolysis, Base hydrolysis, Conjugate base mechanism, Direct and indirect evidences in favour of conjugate mechanism, Anation reactions, Reactions without metal ligand bond cleavage, Substitution reactions in square planar complexes, Trans effect, Mechanism of one electron reactions, Outersphere type reactions, Cross reactions and Marcus-Hush theory, Inner sphere type reactions.

Books Recommended :

1. Advanced Inorganic chemistry F A Cotton & G. Wilkinson (John Wiley)
2. Inorganic chemistry J.F. Huhey (Harpes & Row)
3. Modern Co-ordination chemistry J. Lewis & R.G. Wilking (Inter Science, New York)
4. Mechanism in Inorganic Reactions : A Study of Metal complexes in solution F. Bosolo & RG Pearson (John wiley, New York)
5. Inorganic Reaction Mechanism J.O. Edwords (Benjamin, New York)

SECOND SEMESTER
Core Course - 203
Paper -VIII
BASIC PHYSICAL CHEMISTRY –II

Unit-I
ELECTROCHEMISTRY-I
A. Electrochemistry of solution, Debye Huckel-Onsager treatment, Ion-solvent interactions, Born Model, Ion-ion interactions, Debye-Huckel, Bjerrum Model, Thermodynamics of electrified interface equations, Derivation of electrocapillarity, Lippmann equations, tructure of electrified interfaces, Over potential, Derivation of Butler-Volmer equation, Tafel plot.
B. Activity and activity coefficient, Ionic strength, Debye-Huckel limiting law and its verification, Degree of dissociation and its determination, Determination of activity coefficient by freezing point, Vapour pressure and solubility measurement, Ion association, Association constant, Determination of dissociation constant of electrolyte.
Unit-Il
ELECTROCHEMISTRY-II
A. Semiconductor interfaces, Theory of double layer at semiconductor, Electrolytic solution interfaces, Structure of double layer interfaces, Effect of light at semiconductor solution interface, Fuel cell, Corrosion: Homogeneous theory, forms of corrosion, corrosion monitoring and prevention, Passivity of metals.
B. Electromotive force, Measurement of EMF, Relationship between EMF and thermodynamics parameters. (free energy change, enthalpy change and entropy change), Thermodynamics of reversible cells, Electrode potential in terms of osmotic pressure and solution pressure. Nernst equation relating electrode potential and concentration.
Unit-III
SURFACE CHEMISTRY
A. Adsorption, Surface tension, Capillary action, Pressure difference across curved surface (Laplace equation), Vapour pressure of droplets (Kelvin equation), Gibb's adsorption isotherm, Estimation of surface area (BET equation), Surface films on liquids (electrokinetic phenomenon), Catalytic activity at surfaces.
B. MICELLES
Surface active agents, Classification, Micellization, Hydrophobic interaction, Critical micellar concentration (CMC), Factors affecting CMC of surfactants, Counter ion Binding to micelles. Thermodynamics of micellization, Phase separation and mass action models, Solubulisation, Microemulsion, Reverse micelles.
Unit-IV
SOLID STATE
Crystal systems and lattices, Miller planes, Crystal packing, Crystal defects; Bragg's Law, Ionic crystals, Band theory, Metals and semiconductors, Types of solid state reactions.
Books Recommended :

1. An introduction to electrochemistry S. Glasstone
2. Modern Electro chemistry Vol-I & II Jom Bockris & AKN Reddy (Plenum)
3. Physical Chemistry P.C. Rakhit (Science Book Agency)
4. Physical Chemistry PW Atkins (Oxford University Press)
5. Physical Chemistry Puni, Sharma & Pathania

SECOND SEMESTER
Core Course - 204
Paper -IX
APPLICATIONS OF SPECTROSCOPY

Unit-I:

ULTRAVIOLET AND VISIBLE SPECTROSCOPY

Various electronic transitions (185-800 nm), Beer-Lambert Law, Effect of solvent on electronic transitions, Ultraviolet bands for carbonyl compounds, unsaturated carbo. yl compounds, dienes and conjugated dienes, Ultraviolet spectra of aromatic and heterocyclic compounds, Steric effect in biphenyls.

Unit -II:

INFRA-RED SPECTROSCOPY

Infra-red spectroscopy :Instrumentation, Characteristics vibrational frequencies of simple organic molecules like alkene, alkyne , aromatic compounds , alcohols, phenol, amines, aldehydes,· ketones, acids and acid derivatives, Effect of hydrogen bondii g and Solvent effect on IR -spectra, Overtones and combination bands, Fermi resonance, FT-IR.

Unit-III

A. NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

Basic principle, Chemical shift, Spin-spin interaction, Shielding mechanism. Chemical shift values and correlation to protons bonded to carbon and other nuclei, Chemical exchange, Effect of deuteration, Complex spin-spin interaction between two, three, four and five nuclei, Hindered rotation, Shift reagent, Nuclearoverhauser effect.

B. Carbon-13 NMR spectroscopy: General consideration, Chemical shift (aliphatic, olefinic, alk yne, aromatic, heteroaromatic, and carbonyl carbon), Coupling constant, Two drmen 'ion NMR spectroscopy: COSY, DEPT, lNDEQUATE techniques.

Unit-IV:

MASS SPECTROSCOPY

Introduction, El, CI , PO and FAB, Factors affecting fragmentation, Ion analysis, Ion abundance fragmentation of organic compounds with common functional groups, Molecular ion peak, Metastable ions, Me-Lafferty rearrangement, Nitrogen rule, High resolution mass spectrometry, Examples of mass spectra fragmentation for the determination of structure of simple organic molecules.

Books Recommended :

1. Fundamentals of molecular spectroscopy C.N. Banwell & MMW (TMH)
2. Modern Spectroscopy J.M. Hollas (John Willey)
3. Basic Principles of Spectroscopy R. Chang (Mc Graw Hill)
4. Theory and applications of UV Spectroscopy H.H. Jaffe & M. Orchin (IBH Oxford)
5. Spectro metric identification of organic compound selverstein (John wiley & Sons)
6. Organic Spectroscopy – William Kemp (Mac Million)

SECOND SEMESTER
Core Course - 205
Paper –X (A)
ORGANIC CHEMISTRY PRACTICAL-II

Organic Synthesis
(a) Parabromoacetanilide from Aniline
(b) Parabromoaniline from Acetanilide
(c) Metanitroaniline from Nitrobenzene
(d) Preperation of Anthranilic acid
(e) Preperation of Methyl orange.
Organic quantitative analysis
(a) Estimation of Aniline/Phenol using Bromide-Bromate mixture
(b)Determination of Iodine and saponification value of an oil sample.

SECOND SEMESTER
Core Course - 206
Paper –X (B)
INORGANIC CHEMISTRY PRACTICAL-II

1. Semi-micro qualitative analysis of a mixture containing two common and two rare cations and anions. (Rare metal ions: Mo, W .n. V)
2. Estimation of Cu, Fe, Ni, Cr and Manganese using Photoelectric Colorimeter.
3. Volumetric analysis involving EDTAas reagent. (Calcium and magnesium in Dolomite/ Nickel in stainless steel)

THIRD SEMESTER
Core Course - 301
Paper -XI
ADVANCED INORGANIC CHEMISTRY

Unit-I:

ORGANOMETALICS

Classification, Nomenclature and Characteristic of Organometallic compounds, Classification on hepaticity, Polarity of M-C bond, General characteristics of different types of Organometallic compounds, Transition metal organometallics as catalytic and synthetic reagent.

Unit-II:

METAL II-COMPLEXES

Chemistry of metal carbonyls, Constitution of metal carbonyls: mononuclear, poly nuclear and clusters with terminal and bridge carbon monoxide ligand units, Carbonylate anions, Carbonyl hydrides and Carbonyl halides. Metal nitrosyl and other types of metal nitric oxide complexes, Cyanonitrosyl. complexes of metals, Brown ring compounds

Unit-III:

RINGS, CAGES AND METAL CLUSTERS

Inorganic catenation and heterocatenation, lnorganic ring : borazine, phosphorazine and their derivatives, Inorganic cages: borides and carbides, higher boranes, carboranes, metallaboranes and metallacarboranes, compounds with metal-metal multiple bonds

Unit-IV:

NUCLEAR CHEMISTRY

Radioactive decay and equilibrium, Artificial radioactivity, Disintegration by *a* particle and neutron, Types of nuclear reaction: fission and fusion, Applications of radio isotopes to physic chemical problems, Uses of radio isotopes for dating, medicine agriculture and industry.

Books Recommended

1. Advanced Inorganic Chemistry FA Cotton & Wilkinsons (John Wiley)
2. Inorganic Chemistry J E Huhey (Harper & Row)
3. Fundamentals of radio chemistry; D.D. Sood, AVR Reddy N. Ramamoorthy (IANCAS)
4. Essentials of Nuclear Chemistry HJ Arniker
5. Chemistry of the elements NNB Greewood and A. Earnshow (Pergamon)

THIRD SEMESTER
Core Course - 302
Paper -XII
RESEARCH METHODOLOGY

Unit-I

Definition and characteristics of social research; Objectives of research; Motivation in research; Types of research: Descriptive vs. Analytical; Applied vs. Fundamental; Quantitative vs. qualitative; Conceptual vs. Empirical. Research approaches. General and specific qualities of good research worker. Criteria of good research. Problems encountered by researchers in India.

Unit-II

Hypothesis in research: Variables, Null and alternative hypothesis; Sampling technique: Probabilistic and non probabilistic sampling: Simple random sampling, Stratified random sampling ,Systematic random sampling ,Cluster random sampling, quota sampling, Convenience sampling ,Purposive sampling and Snowball sampling: sampling distributation ,Standard deviation and standard error.

Unit-III

Data Analysis: Measurement of central tendency, Measurement of dispersion; Correlation ; Z-Test: F-Test and T- Test ,ANOVA; Regression; Chi- Square; Mann- Whitney and Kruskal- wallis test Important statistical terms: Pvalue; Mean; Standard deviation ;Standard error; Residual plot.

Unit-IV

Research ethics; Political regulation of research; Examples of bad research: The Cyrl Burt Affair; Obedience to Authority; Tuskegee Syphilis Study; Zirnbardos Prison Simulation.

Report writing and presentation: Different steps in report writing; Layout of the research report; Types of report; Mechanics of writing a research report.

Recommended Books

1. Handbook of Research Design and Social Movement byDelbert Charles Miller & Nell J. Salkind. SAGE Publication.
2. Statistics for Social Science. Thousand Oaks, CA. SAGE.
3. Qualitative Research Methods for the Social Sciences; B. Berg. Allyn & Bacon.
4. Exploring Research. N.Salkind , Prentice Hall.

THIRD SEMESTER

Elective - 303

Paper -XIII

ENVIRONMENTAL CHEMISTRY

Unit-I:

CONCEPT OF ENVIRONMENT

Components of environment: Atmosphere(troposphere, mesosphere, thermosphere and exosphere) Hydrosphere, Lithosphere and Biosphere, Heat budgets of earth, Role of atmosphere in maintaining earth's heat balance, Bio-geo chemical cycles of C,N,P,S and O. Bio distribution of elements.

Unit-II:

HYDROSPHERE

Aquatic environment, Water pollutants, Trace elements in water, inorganic, organic pesticides, agricultural pollutants, detergent, oilspils and oil pollutants water analysis, Water quality parameters, Water sampling and preservation, Monitoring technology and methodology, pH, Specific conductance, Dissolved oxygen,COD, BOD, Fluorides, Cyanide, Total hardness, Toxic elements(Hg, Pb, As, Cd, Cr).

Unit-III:

ATMOSPHERE

Chemical composition of atmosphere, Particles, Ions and radical, Chemical and photochemical reaction in atmosphere, Smog formation, Oxides of nitrogen, carbon, sulphur, and their detrimental effects, Chlorofluoro hydrocarbon,Green house effect, Acid rain. Particulates, Air pollution control, Ambient air quality standard in India, Analytical methods for measuring air pollutants.

Unit-IV:

GREEN CHEMISTRY

Introduction, Principles of green chemistry. Concepts of atom economy in chemical synthesis, Some important techniques on green chemistry, Greener synthesis of furfural, citral, paracetamol, caprolactal, Green technology to control industrial pollution, Green technology in waste management.

Books Recommended

1. Green Chemistry – Designing Chemistry for the Environment by paul T Anastas & T.C. Willam son
2. Green Chemistry – Environmentally bening reactions by V.K. Anluwalia – Ane Books India – 2006
3. Green Chemistry – Environment friendly alternatives Rashmi Sanghi & MM Srivastava, Narosa Publishing, House
4. Environmental Chemistry by A.K. De
5. Environmental Chemistry by C. Barid
6. Environmental Toxicology J. Rose.

THIRD SEMESTER
Elective - 303
Paper -XIII
ORGANIC SYNTHESIS

UNIT-I

ORGANIC REAGENTS:

Reagents in organic synthesis: Willkinson catalyst, Lithium dialkyl cuprates (Gilman's reagents), Lithium diisopropylarnide (LDA); 1,3-Dithiane (Umpolung) Dicyclohexylcarbobiirnide (DCC), and Trimethylsilyliodide, DDQ, SeO:i. Baker yeast, Tri-nbutyltinhydride, Nickel tetracarbonyl, Trimethylchlorosilane.

UNIT-II

OXIDATIONS:

Introduction, Different oxidative process. Aromatiztion of six membered ring, dehydrogenation yielding C-C double bond, Oxidation of alcohols, Oxidation involving C-C double bond, Oxidative cleavage of ketones, aldehydes and alcohols, double bonds and aromatic rings, Ozonolysis, Oxidative decarboxylation.

Reductions: Introduction, Different reductive processes. Reduction of carbonyl to methylene in aldehydes and ketones, Reduction of nitro compounds and' oximes, Reductive coupling, birnolec lar reduction of aldehydes or ketones to alkenes, metal hydride reduction, acyloin ester condensation, Cannizzaro reaction, Tishchenko reaction, Willgerodt reaction.

UNIT:III

REARRANGEMENTS:

General mechanistic considerations-nature of migration, migratory aptitude, memory effects. A detailed study of the following rearrangements: Benzil-Benzilic acid, Favorskii, Arndt-Eistert synthesis, Neber, Backrnann, Hofmann, Curtius, Schmidt, Benzidine, Baeyer- Villiger, Shapiro reaction, Witting rearrangement and Stevens rearrangement.

UNIT-IV

DISCONNECTION APPROACH:

An introduction to synthons and synthetic equivalents, disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesi s, one group C-X and two group C-X disconnections, chernoselectivity, reversal of polarity cyclisation reactions, amine synthesis. Protecting Groups: Principle of protection of alcohol, amine, carbonyl and carboxyl groups.One Group C-C Disconnection: Alcohols and carbonyl compounds, regioselectivity. Alkene synthesis, use of acetylenes in organic synthesis.

Books Recommended:

1. Designing Organic Synthesis, S, Warren, Wiley. . .
2. Organic Synthesis- Concept, Met ods and Starting Materials, J. Fuhrhop and G. Penzillin, Verlage VCH.
3. Some Modern Methods of Organic Synthesis, W. Carruthers, Cambridae Univ. Press.
4. Modern Synthetic Reactions, H.O. House, W. A. Benjamin.
5. Advanced Organic Chemistry-Reactions Mechanisms and Structure, 1. March, Wiley.
6. Principles of Organic Synthesis, R. Norman and .I.M. Coxon, Blakie Academic and Professional.
7. Advanced Organic Chemistry Part-B, F.A.Careyand R. 1, Sundburg, Plenum Press.
8. Organomettalic Chemistry-A Unified Approach, R.C. Mehrotra, A. Singh.

THIRD SEMESTER
ELECTIVE - 304
Paper -XIV
BIO-ORGANIC CHEMISTRY

UNIT-I

CARBOHYDRATES:

Types of naturally occurring sugars: Deoxy-sugars, amino sugars, branched chain sugars. General methods of structure and ring size determination with particular reference to maltose, lactose, sucrose, pectin, starch and cellulose, photosynthesis of carbohydrates, metabolism of glucose, Glycoside- (amygdalin) Kerb's Cycle, Pentose Phosphate pathway.

UNIT-II

AMINO ACID, PEPTIDES AND PROTEINS:

General methods of peptide synthesis, sequence determination. Chemistry of insulin and oxytocin. Purines and nucleic acid. Chemistry of uric acid, adenine, protein synthesis.

UNIT-III

ENZYMES:

Nomenclature and classification, extraction and purification, Remarkable properties of enzymes like catalytic power, specificity and regulation, Proximity effects and molecular adaptation, Chemical and biological catalysis. Mechanism of enzyme action: Transition state theory, orientation' and steric effect, acid base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms (chymotrypsin, ribo nuclease, lysozyme and carboxypetidase A). Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors affinity labeling and enzyme modification by site directed mutagenesis. Enzyme kinetics, Michaelis-Menten and Lineweaver-Burk plots, reversible and irreversible inhibition. .

UNIT-IV

(A) KINDS OF REACTIONS CATALYZED BY ENZYMES:

Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the coupling' of ATP cleavage to endergonic processes. Transfer of sulphate addition and elimination reactions, enolic intermediates in isomerization reactions, p- cleavage and condensation, some isomerization and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylaticn reactions. .

(B) COENZYME CHEMISTRY:

Cofactors as derived from vitamins, coenzymes, prosthetic groups, and apoenzyrnes. Structure and biological functions of coenzyme A, thiamine pyrophosphate pyridoxal phosphate, NAD+, NADP+, FMN, FAD, Lipoic acid, vitamin B12. Mechanisms of reactions catalyzed by the above cofactors.

Books recommended:

1. Bioinorganic Chemistry: A Chemical Approach to Enzyme Action, Herman Duags and C. Penny, and Springer- Verlag. .
2. Understanding Enzymes, Trevor Palmer, Prentice Hall.
3. Enzyme Chemistry; Impact and Applications, d. Collin J Suckling, Chapman and Hall.
4. Enzyme Mechanisms Ed, M.1. Page and A. Williams; Royal Society Of Chemistry.
5. fundamental- of Enzymology, N.C. Price and L. Stevens. Oxford Univ. Press.

THIRD SEMESTER
ELECTIVE - 304
Paper -XIV
POLYMER CHEMISTRY

UNIT-I

INTRODUCTION TO POLYMER SCIENCE:

History of macromolecular science; Macromolecular hypothesis; Defination of polymer; Difference between polymer and macromolecule, Degree of polymerization, Classification of polymers; Natural and synthetic polymers ;Homopolymer and copolymer; Addition and condensation polymers. Organic and inorganic polymers. Processes of polymerization. Bulk Polymerization; Solution polymerization, Suspension Polymerisation, Emulsion Polymerisation.

UNIT-II

CONCEPT OF MOLECULAR WEIGHT OF POLYMER:

Number average, Weight average, Z- average and viscosity average molecular weight. Determination of molecular weight of polymers by End group analysis method. Molecular weight determination by viscosity method, Osmometry method; light scattering method and ultracentrifugation method.

UNIT-III

CONDENSATION POLYMERIZATION:

Functionalitv and conditions,Kinetics of condensation polymerization, Carothers equation; PET, Nylon 6-6;Phenol formaldehyde Resin :Poly siloxane ; Amino resins. Addition Polymerisation, monomers, free radical initiators ,propagation and termination. Steady State kinetics, HDPE,LDPE,Coordination polymerization,Polystyrene, PVC,Polytetrafluro ethylene.

UNIT-IV

IONIC POLYMERIZATION:

Cationic polymerization and mechanism, Anionic polymerization, living polymer. Sterio regular polymerization, Ziegler Natta catalyst; Conducting polymers. Delocalised electronic states, Poly anilines Poly acetylenes. Biodegradable polymers Natural an d Synthetic, Poly Lactic Acid, Poly Vinyl Alcohol.

Books Recommended

1. Text book of Polymer science. By Billmeyer
2. Organic polymer chemistry By K.J.Saunders
3. Polymer Science By P.L.Nayak
4. Polymer Science By V.R.Gowariker; N.v.Viswanath?n; J. Sreedhar

THIRD SEMESTER

Core Course - 305

Paper –XV (A)

PHYSICAL CHEMIST RY PRACTICAL

1. Determination of CSTof Phenol-Water system.
2. Determination of E, from kinetics measurement of hydrolysis of Ester.
3. Determination of rate constant for inversion of cane sugar by polarimeter.
4. Determination of isentropic cornpressibilitv and isothermal compressibility of a given solution at 303.5K bv Ultrasonic Interferometer.
5. Determination of the acoustic impedance (z) and molar sound velocity (R) of a given solution by Ultrasonic interferometer.
6. Determination of the composition of unknown acetic acid solution by surface tension measurement method.
7. Determination of the composition of unknown Glycerin solution by viscosity measurement method.

THIRD SEMESTER

Core Course - 305

Paper –XV (B)

ANALYTICAL CHEMISTRY PRACTICAL

1. Determination of dissociation constant of an acid by p" meter.
2. Determination of Fe content in a give Ferrous Ammonium Sulphate solution by Colorimetry.
3. Determination of Equivalent conductance and dissociation constant of weak acid by conductance measurement method.
4. Determination of activity solubility product of silver chloride solution by emf method.
5. Separation of ions by ion- exchange chrornatographv.
6. Determination of stability constant of complex by Job's method by using spectrophotometer.

FOURTH SEMESTER
Core Course - 401
Paper –XVI
ADVANCED PHYSICAL CHEMISTRY

UNIT-I:

SYMMETRY AND GROUP THEORY

Group, Subgroup and Classes, Symmetry elements and Symmetry operations, Relationship between orders of a finite group and its subgroup, Conjugancy relation and classes, Point symmetry group, Matrix representation of groups (Representation for the C_n, C_{nv}, C_{nn}, D_{nh} etc.), Nomenclature and symmetry classification of molecu les, Irreducible representation and Orthogonality theorem, Standard reduction, Character table, Direct product.

UNIR-II:

APPLICATION OF GROUP THEORY

Transforrnat ion properties of atomic orbitals, Hybridization scheme for a-bonding (C3v, CAY, D3h, Td) projection operator, Symmetry adopted LCO, Hybrid orbital as linear combination of atomic orbitals, MO treatment of coordination compounds, *a*bonding in octahedral complexes, Formation ofLCO, Formation of MO, Construction of MO diagram.

UNIT-III:

QUANTUM CHEMISTRY: I

Principle of superimposit ion, Angular momentum, Particle in one and three dimensional boxes, Hydrogen atom, Transformation of co-ordinate, Separation of variables, qi-equation, O-equation, The radial equation, Shapes ofs,p and d orbitals.

UNIT-IV:

QUANTUM CHEMISTRY II

P-ostu!ates at quantum mechanics, 's'imple harmonic oscillator, Rigid rotator, The variation theorem, Linear variation theorem, Linear -ariation principle, Perturbation theory (first order and non egenerate), Application of various methods and perturbation theory to Helium atom, Huckel theory of conjugated systems, Bond order and charge density calculation, Application to ethylene, butadine, cyclopyl radical, cyclobutadiene.

Books Recommended:

1. Chemical applications of group theory FA Cotton.
2. Symmetry and group theory in chemistry R. Ameta
3. Introduction to quantum chemistry A.K. Chandra ™
4. Quantum Chemistry D.A. MC Quarria & Simn (Viva)
5. Physical chemistry P.W. Atkins (ELBS)

FOURTH SEMESTER
Core Course - 402
Paper –XVII
ANALYTICAL CHEMISTRY

UNIT-I:

ION EXCHANGE CHRORNATOGRAPHY:

Svnthesis of ion exchange resins. Mechanism and applications of ion exchange chromatography. Gel permeation chromatography; Principles;lnstrumentation of GSC and GLC.Adsorbant for GSc. Temperature programming, detection and resolution. Applications of Gas Chromatography.

Solvent extraction.Principle and mechanism of solvent extraction. Supramolecules like crown ethers, Cryptands and Rotaxanes. Their preperation and application in solvent extraction

UNIT-II:

POTENTIOMETRY:

Electrochemical Cell, Nernst equation. Cell potentioal, Potentiometry for quantitative analysis and Potentiometric titration.

Polarography.Diffusion limiting current, Dropping mercury electrode(DME).Principle of polarography. Half wave potential.likovic equation.Polarography as an analytical tool.

UNIT-III:

THERMO ANALYTICAL METHODS:

Introduction to thermogravimetry ;Principles of TGA; OTA and OTGA.Factors affecting TG and OTA Curves.Apparatus ,working and applications. Separation of Calcium, Strontium and Barium.

Radioanalytical Technique: Source of neutron. Neutron capture and gamma emission. Principle of neutron activation analysis. Principle of isotope dilution method and their applications.

UNIT-IV:

POLARIMETRY:

Polarised light. Applications of polarimetry. Optical rotatory dispersion and circular dichromism.

Electron Spectroscopy:Principles of electron spectroscopy.Auger emission spectroscopy. Instrumentation of electron spectroscopy.Application of auger electron spectroscopy. Electron spectroscopy for chemical analysis and Chemical shift.

Recommended Books

1. Analytical Chemistry GO Christian (John Wiley)
2. Analytical Chemistry Principles and techniques I G Hargis (Printice Hall)
3.Basic concepts in analytical chemistry S M Khoopkar (New age International)
4.instrumental methods of analysis Willard, Ivierrit and Dean
5.Analvtical Chemistry Gurdeep R Chatwal (HPH)

FOURTH SEMESTER
ELECTIVE - 403
Paper –XVIII
BIO-INORGANIC CHEMISTRY

UNIT-I

(A) METALLOPORPHYRINS:

Porphyrins and their salient features, characteristic absorption spectrum of porphyrins, chlorophyll (structure and its role in photosynthesis). Transport of Iron in microorganisms (sidrophores), types of siderophores (catechol ate and Hydroxamato siderophores).

(B) MERALLOENZYMES:

Definitions: Apoenzyme, Coenzyme, Metalloenzyme, structure and functions of carbonic anhydrase A & B, carboxy peptidases.

UNIT-II

OXYGEN CARRIERS:

a) ***Natural oxygen carriers:*** Structure of hemoglobin and myoglobin, Bohr effect, Models for cooperative interaction ill hemoglobin, oxygen Transport in human body (-perlltz rnachanism), Cyanide poisoning and its remedy. Non-heme protiens (Hemerythrin & Hemocyanin).

b) ***Synthetic oxygen carriers:*** Oxygen molecule and its reduction products, model compounds for oxygen carrier (Vaska's Iridium complex, cobalt complexes with dimethyl glyoxirne and Schiff base ligands).

UNIT-III

Transport and storage of metals: The transport mechanism, transport of alkali and alkaline earth metals, ionophores, transport by neutral rnacrocycles and anionic carriers, sodium/potassium pump, transport and storage ofIron (Transferrin & Ferritin).

UNIT-IV

SUPRNMOLECULAR CHEMISTRY:

Introduction, Some important concepts, Introduction 10 Recognition, information and' complementarity, Principles of molecular receptor designs; Spherical recognition (cryptates of metal cations) Tetrahedral recognition by macrotricyclic cryptands, Recognition of ammoniurnvions.: Recognition of neutral molecules and anionic substrates (anionic coordination).

Books Recommended:

The Inorganic Chemistry of Biological' processes - M.N.Hughes.
Bio Inorganic Chemistry. Robert Wirtay . .'
Advanced Inorganic Chemistry (4"' Edn)· Cotton and Wilkinson.
Topics in current chemistry (Inorganic Biochemistry) vol, 64 (1976) - Davison and Coworkers .
An Introductiorito Biocherncial Reaction Mechanism - James N.Lowe and Lloyalt Ingraham.
General Biochemistry- Pruron *1.S.* and Simmonds S.
Plant Physiology - Robeert N.Devtin.
Inorganic chemistry - JamesE. Huheey.

FOURTH SEMESTER
ELECTIVE - 403
Paper –XVIII
ORGANIC PHOTOCHEMISTRY

UNIT-I

INTRODUCTION TO PHOTOCHEMICAL REACTION:

Hecronic transition. Excited state. Spin multiplicity. Spin forbidden and symmetry forbidden transition. The fate of excited molecules. Furescence and Phosphorescence. Inter System Crossing and Internal Conversion Jablonski Diagram. Quantum yield.

UNIT-II

MECHANISM OF ORGANIC PHOTOCHEMICAL REACTIONS:

Primary and secondary photochemical processes. Photochemistry of Carbonyl compounds. Alpha cleavage, H atom abstraction, Charge transfer complexation, Beta cleavage. Norrish tvpe-l reaction.Norrish type-II reaction. Paterno Buchii Reaction. Photo Reduction. Poto Fries rearrangement.

UNIT-III

PHOTOCHEMISTRY OF ALKENES:

Photoisomerisation, Cycloacldition, Abstraction of H atom, Bond Clevage, Photochemistry of Polyenes. Cis-Trans isornerisation and its mechanism .Cis -Trans isomerisation in Stilbene. Photo dimerisation. Photodimerisation of Acyclic conjugated dienes. Photodimerisation of polyenes.

UNIT-IV

PHOTOCHEMISTRY OF BENZENE AND LTS DERIVATIVES:

Primery process in aromatic hydrocarbons, Valence isomerisation. Addition Reactions. Photochemistry of Conjugated aromatics. Photochemical reactions of Stilbene.

Recommended Books

l. Molecular reactions and photochemistry by C.H.De Puy and O.L.Chapman.
2. Molecular Photochemistry .N.J. Turro
3. The importance of anti bonding orbitals M.Orchin and H.jaffe
4. Organic Photochemistry and pericyclic reactions by Kusum Sharma
5. Organic Photochemistry and Pericyclic reactions by Jagadamba Singh

FOURTH SEMESTER
ELECTIVE - 404
Paper –XVIII
COMPUTERS FOR CHEMIST

UNIT-I:

FUNAMENTALS OF COMPUTERS :

Computer Basics : Components of computer, Basic idea of hardware and software, Operating Systems, Types of operating systems (OS) (MS DOS and windows). OS structures File organization in MS DOS and Windows.

UNIT-II:

MS OFFICE :

MS Word : Documentation with MS Word (including manipolutions with graphics, symbols, special characters, tables and column guides, ideating – left and right indenting) MS Excel: Use of MS Excel to prepare spread sheets including charts. MS Powerpoint : Use of MS Poserpoint to prepare different types of slides including graphics, colour management, animations sound effets etc.

UNIT-III:

PROGRAMMING IN C:

Introduction C, Data type and operators, variables & built-in functions, Input/Output statements, Basic C programmes with simple mathematical and chemical formulae, Control flow statements like if. Else, nested-if, switch/case, looping statements (while, for & do, while), pointers, arrays & strings, User defined functions, structure, Unions file handling.

UNIT-IV

APPLICATIONS TO SIMPLE CHEMICAL PROBLEMS:

Development for small computer codes for simpler chemical calculations such as evaluation of

i) State variables using ideal gas equation and van der Waals equation etc.
ii) Rate constants for first order and second order reactions.
iii) Energy of activation using Arrhenius equation.
iv) Half-life and fractiona-life of zero, first and second ordre reactions.

BOOKS RECOMMENDED

01. Introduction to computer-V.K. Jain.
02. An introduction to Digital Computer Design-V. Rajaraman, T. Radhakrishnan (Prentice Hall)
03. Computational Chemisttry-A.C. Norris
04. Programming in C.V. Rajaraman.
05. Programming in C-Balguruswamy.

FOURTH SEMESTER
ELECTIVE - 404
Paper –XVIII
CHEMISTRY AND SOCIETY

UNIT-I:

CHEMICALS IN FOOD

Carbohydrates: Classification, Sugar and Non-sugar, Glucose, fructose, starch and cellulose. Importance of carbohydrates.

(b) Amino acids: ClassifiCation, essential and nonessential amino acids. Zwitter ionic structure, polypeptide.

(c) Lipids, Classification, Oil and fats, metabolism of lipid.

(d) Vitamins: Classification. Nomenclature and disease caused by the deficiency of vitamins

UNIT-II:

CHEMICALS IN MEDICINES.

Development of new drugs, Procedure followed in drug design, different type of drugs, analgesics, antipyretics, antiseptics and antibiotics, metals in medicine, metal deficiency and disease, toxic effect of metals.

UNIT-III:

CHEMICALS IN AGRICULTURE

Fixation of nitrogen, fertilizers, Classification of fertilizers ,Nitrogenous, Phosphorous and Potash fertilizer, Pesticides, Classification, Insecticides, fungicides and rodenticides. Detrimental effect of pesticides (DDT, BHC, Parathion)

UNIT-IV:

CHEMICALS IN DAILY LIFE

General idea about soap, synthetic detergent ,sampoo, synthesis of soap and detergent ,advantage and disadvantage of synthetic detergent. Cosmetics and perfumes, plastics and its detrimental effect on environment.

FOURTH SEMISTER
CORE COURSE - 405
PROJECT

Guidelines:

The objective of the project work is to help the student to develop the ability to apply theoretical and practical tools and techniques to solve real life problems related to industry, research laboratory and institutions. After completion of project work, the student should be able to:

1. Identifying the problem in a system.
2. Review of literature relating to the problem.
3. Evaluation of research problem.
4. Collecting materials and methods.
5. Data collection and analysis.
6. Develop the ability to communicate effectively.

Guide lines:

1. Student shall undertake the project work related to Chemical Science only.
2. Head of the Department must provide the services of a teacher for supervising the project work.
3. Each student has to take up project work individually and one teacher can supervise a maximum of four students at a time.
4. After identification of the topic and Supervisor the students have to prepare a project proposal and submit it before HOD for approval. After careful examination of the support system of the Dept. the HOD will approve the proposal for project work.
5. The Dept. will provide the general chemicals and other equipments that are available. But if a student is interested in a topic in which some other chemicals are required which are not available in the Dept. then he/ she has to bear the cost of these chemicals.
6. After completion of the project the student have to submit three copies of the project report to the HOD before the commencement of the End Semester examination for evaluation.
7. The project report should contain the following chapters.

Chapter-I: Introduction; Chapter-2: Review of literature, Chapter-3: Scope of research problem
Chapter-4: Materials and method Chapter-5: Result discussion Chapter-6: Conclusion and suggestion;
Chapter-7: Bibliography.

8. Along with the project report the student should submit the approved project proposal and the originality certificate duly signed by the student and the supervisor.
9. Certificate of originality: This is to certify that the project titled---------- is an original work of the student and is being submitted in partial fulfillment for the award of M.Sc. degree of V.Deb Autonomous College, Jeypore .This report has not been submitted earlier either to this college or any other institution for the fulfillment of the requirements of the courses of study.
10. Mark distribution.

Content & Relevance of the Project	Project Report	Presentation	Viva-voce
20	40	20	20