

M.Sc., CHEMISTRY (ORGANIC CHEMISTRY SPECIALIZATION)

Effective for the students admitted from the year 2016-2017

SEMESTER - I

PAPER – I : General Chemistry

Code:- OCH101

UNIT-I

Data analysis :

A) Classification of errors - Determinate and Indeterminate errors - Minimization of errors - Accuracy and precision- Distribution of random errors - Gaussian distribution - Measures of central tendency.

B) Measures of precision - Standard deviation - Standard error of mean - student's t-test - Confidence interval of mean - Testing for significance - Comparison of two means–F-test - Criteria of rejection of an observation - propagation of errors - Significant figures and computation rules - Control charts - Regression analysis - Linear least squares analysis.

UNIT-II

Methods of purification:

A) Distillation: Basic principles. Distillation types, continuous distillation, Batch distillation, fractional distillation, vacuum distillation and steam distillation

Drying Techniques: Drying of Hexane, Benzene, Toluene, Xylene, Tetrahydrofuran, DMF, DMSO, Methanol, Ethanol, Diethylether and Dioxane.

B) Solvent extraction: Basic principles. Different types of extraction. Selection of solvents. Avoiding emulsion formation. Basic concepts on Soxhlet extraction.

Crystalization Techniques : Different kinds of crystallization, Single crystal generation and analysis of crystal structure.

UNIT-III

Adsorption and Partition chromatography

A) Introduction to chromatography. Different types of Chromatography. Adsorption chromatography-adsorbents, solvents, solutes, apparatus.

Column chromatography-stationary phase, Mobile phase, packing of column, advantages and disadvantages.

B) Thin layer chromatography: Basic Principles. Common stationary phases, Methods of preparing TLC plates, Selection of mobile phase, Development of TLC plates, Visualization methods, R_f value. Application of TLC in monitoring organic reactions. Identification and quantitative analysis.

Paper chromatography: Basic Principles. Ascending and descending types. Selection of mobile phase, Development of chromatograms, Visualization methods. Application of paper chromatography in the identification of sugars and amino acids.

UNIT-IV

Gas chromatography & HPLC

A) Gas chromatography: Basic Principles. Different types of GC techniques. Selection of columns and carrier gases. Instrumentation, detectors. RT Values.

B) High Performance liquid chromatography (HPLC): Basic Principles. Normal and reversed Phases. Selection of column and mobile phase. Instrumentation. detectors; RT values. Applications in the separation, identification and quantitative estimation of organic compounds..

UNIT-V

Titrimetric Analysis:

A) Classification of reactions in titrimetric analysis- Primary and secondary standards- Neutralisation titrations-Theory of neutralisation indicators-Mixed indicators- Neutralisation curves- Displacement titrations.

B) Precipitation titrations-Indicators for precipitation titrations-Volhard method-Mohr method-Theory of adsorption indicators-Oxidation reduction titrations-Change of electrode potentials during titration of Fe(II) with Ce (IV)-Detection of end point in redox titrations-Complexometric titrations.

REFERENCES:

1. Vogel's text book of quantitative analysis. Addition Wesley Longmann Inc.
2. Quantitative analysis R.A Day and A.L.Underwood. Prentice Hall Pvt.Ltd.
3. Principles of Instrumental Analysis by D. A. Skoog, F. J. Holler and T. A. Nieman, Harcourt College Pub.
4. Separation Techniques by M. N. Sastri, Himalaya Publishing House (HPH), Mumbai.
5. Introduction to Organic Laboratory Techniques-D. L. Pavia, G. M. Lampman, G. S. Kriz and R. G. Engel, Saunders College Pub (NY).
6. Instrumental methods of Chemical Analysis by H. Kaur, PragatiPrakasan, Meerut.
7. Protein Purification-Principles and practice, III Edn- R. K. Scopes, Narosa Publishing House , Delhi.

UNIT-I

A) Introduction to Exact Quantum Mechanical Results :Schrodinger equation importance of wave function ,Operators, Eigen values and Eigen functions, derivation of wave equation using operator concept . Discussion of solutions of Schrodinger's equation to some model systems viz. particle in one dimensional box (applications), three dimensional box ,Rigid rotator system and the Hydrogen atom .

B) Approximate Methods - Variation theorem, linear variation principle perturbation theory, (first order and non degenerate) . Application of variation method to the Hydrogen atom .

UNIT-II

A) Metal π - complexes: preparation, structure and bonding in Nitrosyl, Dinitrogen and Dioxygen complexes

B) Chemistry of non- transition elements - Inter halogen compounds, Halogen oxides and oxyfluorides. Noble gas compounds with special reference to clathrates. Spectral and Magnetic properties of Lanthanides and Actinides. Analytical applications of Lanthanides and Actinides. Synthesis, properties and structure of B-N, S-N, P-N cyclic compounds and intercalation compounds.

UNIT-III

A) Structure and Bonding - $p\pi$ - $d\pi$ bonding - Evidences (in non-transition metal compounds). Concept of Hybridization, Bent's rule , energetics of Hybridisation, concept of Resonance. Non-valence cohesive forces, Hydrogen bonding.

B) VSEPR theory, Walsh diagrams for linear(Be H₂) and bent (H₂O) molecules . Molecular Orbital theory, Symmetry of Molecular orbitals, Molecular orbitals in triatomic(Be H₂) molecules and ions (NO₂-) and energy level diagrams.

UNIT-IV

A) Metal –ligand bonding - Crystal Field Theory of bonding in transition metal complexes – Splitting of d-orbitals in octahedral, tetrahedral, square planar and Trigonal bipyramidal and Square pyramidal fields.Tetragonal distortions - Jahn Teller effect .

B) Applications and limitations of CFT . Experimental evidences for covalence in complexes .Molecular Orbital Theory of bonding for Octahedral, tetrahedral and square planar complexes. π -bonding and MOT - Effect of π - donor and π -acceptor ligands on Δ_o . Experimental evidence for π - bonding in complexes .

UNIT-V

A) Metal – ligand Equilibria in solutions - Step wise and over all formation constants .Trends in stepwise constants (statistical effect and statistical ratio) . Determination of formation constants by Spectrophotometric method (Job's method) and pH metric method(Bjerrum's) .

B) Stability correlations - Irwing – William's series . Hard and soft acids and bases – Acid-base strength and HSAB.

Macrocyclic complexes - Crown ethers and Cryptates. Preparation and structures of Isopoly and Heteropoly acids and their salts .

Reference Books

1. Inorganic Chemistry Huheey, Harper and Row.
2. Physical methods in inorganic chemistry, R.S. Drago. Affiliated East-West Pvt. Ltd.
3. Concise inorganic chemistry, J. D. Lee, ELBS.
4. Modern Inorganic Chemistry , W. L. Jolly, McGrawHill.
5. Inorganic Chemistry , K. F. Purcell and J. C. Kotz Holt Saunders international.
6. Concepts and methods of inorganic chemistry , B. E. Douglas and D.H.M.C. Daniel, oxford Press.
7. Introductory quantum mechanics , A. K. Chandra
8. Quantum Chemistry ,R. K. Prasad.
9. Inorganic Chemistry ,Atkins, ELBS
10. Advanced Inorganic Chemistry ,Cotton and Wilkinson, Wiley Eastern
11. Quantum Chemistry ,R. K. Prasad.
12. Text book of Coordination chemistry ,K.SomaSekharrao and K.N.K. Vani, Kalyani Publishers .

UNIT-I

A) **Nature of Bonding in Organic Molecules:** Localised and Delocalized covalent bonds, Delocalised chemical bonding conjugation, cross conjugation, hyper conjugation, Tautomerism.

B) **Aromaticity:** Concept of Aromaticity, Aromaticity of five membered, six membered rings and fused systems.- Non benzenoid aromatic compounds:-cyclopropenyl cation, Cyclobutadienyldication, cyclopentadienyl anion-tropyllium cation and cyclooctatetraenyl dianion. Homoaromaticity, Anti aromaticity and pseudo aromaticity .

UNIT-II**Reactive intermediates:**

A) Generation, Structure, Stability, Detection and Reactivity of Carbocations, Carbanions, Free radicals, Carbenes, Nitrenes and Arynes.

B) Reactive Species: Generation and reactivity of Electrophiles, Nucleophiles, Dienophiles, Ylids, Enophiles.

Unit-III**Substitutions:****A. Aliphatic Nucleophilic substitutions:**

The SN^2 , SN^1 , mixed SN^1 and SN^2 and SN^i reactions : Mechanism, factors effecting substitution reactions. The neighbouring group mechanism, neighbouring group participation by σ and π bonds, anchimeric assistance.

B. **Aromatic substitution:** The SN^{Ar} , SN^1 and Benzyne mechanism. Reactivity- effect of substrate structure, leaving group and attacking nucleophile .Von Richter, Smiles, Sommelet-Hauser rearrangement.

Unit-IV

A) **Additions:** Addition to carbon – carbon multiple bonds, HX, X_2 , stereo chemistry of addition, formation and reaction of epoxides, syn and anti hydroxylation, hydrogenation(catalytic and Non catalytic), Cram's rule.

B) Eliminations

Types of elimination (E_1 , E_1CB , E_2) reactions, mechanisms, stereochemistry and orientation, Hofmann and Saytzeff's rules, Syn elimination versus anti elimination. Competitions between elimination and substitution. Dehydration, dehydrogenation, decarboxylative elimination, pyrolytic elimination, molecular rearrangement during elimination.

Unit-V

Green chemistry & Phase transfer catalysis

A) Green chemistry :Introduction, Principles& concepts of Green chemistry, Green Catalysis, Biocatalysis, renewable resources, Green Reagents, examples of green reactions-synthesis of Ibuprofen, Clean Fischer-Indole synthesis comparison of the above with conventional methods.

B) Introduction to Microwave organic synthesis, Applications: solvents (water and organic solvents), solvent free reactions (solid state reactions), Phase transfer catalysis-Principle, Types, advantages and applications, Crown ethers.

Reference Books :

1. Advanced organic chemistry, Reaction, mechanism and structure, Jerry March, John Wiley.
2. Advanced organic chemistry, F.A.Carey and R.J.Sundberg, Springer , New York.
3. A guide book to Mechanism in organic chemistry, Peter Sykes, Longman.
4. Organic chemistry ,I.L.Finar, Vol. I & II, Fifth ed. ELBS,1975.
5. Organic chemistry, Hendrickson, Cram and Hammond (McGraw – Hill).
6. Modern organic Reactions, H.O.House, Benjamin.
7. Structure and mechanism in organic chemistry, C.K.Ingold, Cornell University Press.
8. Principles of organic synthesis, R.O.C.Norman and J.M.Coxon, Blakie Academic &Professional.
9. Reaction Mechanism in Organic Chemistry, S.M.Mukherji and S.P.Singh, Macmillan.
10. Basic Principles of Organic Chemistry by J. B. Roberts and M. Caserio.

UNIT-I

Thermodynamics–I

A) Classical thermodynamics - Brief review of first and second laws of thermodynamics - Entropy change in reversible and irreversible processes - Entropy of mixing of ideal gases - Entropy and disorder – Free energy functions - Gibbs-Helmholtz equation - Maxwell partial relations

B) Conditions of equilibrium and spontaneity - Free energy changes in chemical reactions: Van't Hoff reaction isotherm - Van't Hoff equation - Classiuss Clapeyron equation - partial molar quantities - Chemical potential - Gibbs- Duhem equation - partial molar volume - determination of partial molar quantities - Fugacity - Determination of fugacity - Thermodynamic derivation of Raoult's law.

UNIT – II

A) **Surface phenomena and phase equilibria-** Surface tension - capillary action - pressure difference -across curved surface (young - Laplace equation) - Vapour pressure of small droplets (Kelvin equation) -Gibbs-Adsorption equation - BET equation - Estimation of surface area - catalytic activity of surfaces - ESCA , X- ray fluorescence and Auger electron spectroscopy.

B) **Surface active agents** - classification of surface active agents - Micellisation - critical Micelle concentration (CMC) - factors affecting the CMC of surfactants, micro emulsions - reverse micelles -Hydrophobic interaction.

UNIT – III

A) **Electrochemistry – I** - Electrochemical cells - Measurement of EMF - Nernst equation – Equilibrium constant from EMF Data - pH and EMF data - concentration cells with and without transference – Liquid junction potential and its determination - Activity and activity coefficients - Determination of solubility product from EMF measurements.

B) Debye Huckel limiting law and its verification. Effect of dilution on equivalent conductance of electrolytes - Anomalous behavior of strong electrolytes. Debye Huckel-Onsagar equation - verification and limitations - Bjerrum treatment of electrolytes - conductometric titrations..

UNIT – IV

A) **Chemical kinetics-** Methods of deriving rate laws - complex reactions - Rate expressions for opposing, parallel and consecutive reactions involving unimolecular steps. Theories of reaction rates -collision theory - Steric factor - Activated complex theory - Thermodynamic aspects – Unimolecular reactions - Lindemann's theory - Lindemann-Hinshelwood theory.

B) Reactions in solutions - Influence of solvent - Primary and secondary salt effects - Elementary account of linear free energy relationships - Hammett - Taft equation - Chain reactions - Rate laws of H_2-Br_2 , photochemical reaction of $H_2 - Cl_2$.Decomposition of acetaldehyde and ethane - Rice-Hertzfeld mechanism.

UNIT – V

A) Motion of molecules-Degrees of freedom –Energy associates with the degrees of freedom

Type of spectra

Microwave Spectroscopy: Classification molecules, rigid rotator model, effect of isotopic substitution on the transition frequencies, Intensities non-rigid rotator-Microwave spectra of polyatomic molecules.

B) Rotational Vibrational Spectroscopy: Harmonic oscillator, vibrational energies of diatomic molecules, zero point energy, force constant and bond strengths, anharmonicity Morse potential energy diagram. Vibration – rotation spectroscopy. PQR branches, Born–openheimer approximation, selection rules, normal modes of vibration group frequencies, overtones, hot bands, application of IR spectra to polyatomic molecules.

REFERENCES:

1. Physical Chemistry P.W.Atkins, ELBS
2. Chemical Kinetics - K.J.Laidler, McGraw Hill Pub.
3. Text Book of Physical Chemistry. Samuel Glasstone, Mcmillan Pub.
4. Physical Chemistry, G.W.Castellan. Narosa Publishing House
5. Thermodynamic for Chemists. Samuel Glasstone
6. Electrochemistry, SamuelGlasstone, Affiliated East West
7. Physical Chemistty,W.J.Moore, Prentice Hall
8. Atomic structure and chemical bond. Manaschanda. Tata McGraw Hill Company Limited.
9. Fundamentals of Molecular spectroscopy: by C.N.Banwell
10. Molecular spectroscopy by B.K.Sharma
11. Vibrational Spectroscopy by D.N.Sathyanarayana New Age Int. Pub.
12. Spectroscopy by Aruldas.

PRACTICALS FOR SEMESTER-I

PRACTICAL-I

Organic Chemistry Practical-1

Code: OCH105

1. General methods of separation and purification of organic compounds with special reference to:
 - (a) Solvent extraction – Separation of Binary mixtures like Carboxylic acid + Neutral organic compounds , Basic nature + Neutral organic compounds , Phenolic nature compounds + Neutral organic compounds etc.
 - (b) Fractional Distillation - Separate a mixture of Cyclohexane and Toluene.
 - (c) Steam distillation – Purification of O- Nitro phenol
 - (d) Distillation under reduced pressure – Purification of Glycerol
 - (e) Azotropic distillation – Moisture is removed from the sample by distillation as an azeotrope with benzene - Dean-Stark apparatus.
2. Reactions with Different Temperatures (-10^oC to 250^oC)
 - (a) Preparation of Phthalimide from Phthalic anhydride – High Temperature
 - (b) Preparation of p-nitro acetanilide – Low temperature
 - (c) Preparation of Iodoform – Room temperature
3. Column chromatography - separate the given mixture of o-and p-nitro aniline
4. Paper chromatography - separate the given mixture of sugars or amino acids
5. Thin layer chromatography - separate the given mixture of phenols or 2,4 DNP derivatives of carbonyls compounds.
6. Preparation of Sodium wire - To make Sodium Wire for solvent drying
7. Preparation of Sodium Granules
8. Preparation of sodium t-butoxide
9. Preparation of Grignard Reagent and its usage one reaction
10. Preparation of wittig reagent (ex. Preparation of triphenyl carbethoxy methyl phosphorane)
11. Preparation of Butyl lithium.

References:

1. A.I.Vogel, "A Text Book of Practical Organic Chemistry", Longman
2. A.I.Vogel, "Elementary Practical Organic Chemistry", Longman
3. F.G.Manu and B.C.Saunders, "Practical Organic Chemistry", Longman
4. Reaction and Synthesis in Organic Laboratory, B.S.Furniss, A.J.Hannaford, Tatchell, University Science Books mills valley
5. Purification of Laboratory chemicals, manual, W.L.F.Armarego EDD Perrin
6. Reaction and Synthesis in Organic Chemistry Laboratory, Lutz-Friedjan-Tietze, TheophilEicher, University Science Book

Practical – II

Inorganic Chemistry Practical -1

Code:OCH-106

I. Preparation of some complex compounds:

- Potassium trisoxalate ferrate (III)
- Mercury tetrathiocyanate cobalate (II)
- Trithiourea copper (1) sulphate
- Cis and trans potassium diaquo dioxalato chromium (III)
- Hexa ammine cobalt (III) chloride
- Nitro and Nitrite pentaammine Cobalt III chloride

(Minimum four Preparation)

II. Qualitative Analysis:

Semimicro analysis of six radical mixtures containing one interfering radical and one less familiar cation each, Interfering anions : Oxalate, tartrate, phosphate, chromate.

Less familiar Cations : Thallium, molybdenum, thorium, zirconium, vanadium, uranium. (Minimum three Mixtures)

References:

- Vogels Text Books of Qualitative analysis, Revised. J. Bassett, R.C. Denny, G.H. Jeffery and J.Mendhan.ELBS.
- Vogels Text Book of Quantitative analysis, revised. J. Bassett, R.C. Denny, G.H. Jeffery and J.Mendhan, ELBS.
- Synthesis and Characterisation of Inorganic Compounds, W.L.Jolly. Prentice Hall.
- Practical Inorganic chemistry by G. Pass and H. Sutcliffe Chapman and Hall.
- Practical Inorganic Chemistry by. K. SomasekharRao and K.N.K. Vani.

PRACTICAL – III

Physical Chemistry Practical -1

Code: OCH-107

- Determination of rate constant of the oxidation of iodide ion with persulphate ion.
- Relative strengths of acids by studying the hydrolysis of ethyl acetate / methyl acetate.
- Determination of equilibrium constant of $KI_3 \rightleftharpoons KI + I_2$ by partition coefficient method and determination of unknown concentration of potassium iodide.
- Distribution coefficient of Benzoic acid between Benzene and water.
- Determination of critical solution temperature of phenol-water system Study of the effect of electrolyte on the miscibility of phenol-water system

SEMESTER – II

PAPER – I, ORGANIC SPECTROSCOPY

Code: OCH201

UNIT-1

UV- Visible Spectroscopy::

- A) Mechanics of measurement – Energy transitions – Simple chromophores – Auxochrome, Absorption shifts (Bathochromic shifts, Hypsochromic shift, Hyper chromic shift, Hypo chromic shift). UV absorption of Alkenes – polyenes, unsaturated cyclic systems .
- B) UV absorption of Carbonyl compounds α,β -unsaturated carbonyl systems - UV absorption aromatic systems – solvent effects – geometrical isomerism – acid and base effects – typical examples – calculation of λ_{\max} values for simple molecules using Woodward -Fieser rules.

UNIT – II

IR Spectroscopy:

- A) Mechanics of measurement – Fundamental modes of vibrations -Stretching and bending vibrations – Factors effecting vibrational frequency-hydrogen bonding.
- B) Finger print region and its importance. Typical group frequencies for – CH, -OH, -NH, -CC, -CO and aromatic systems - Application in structural determination Examples – simple problems.

UNIT – III

Nuclear Magnetic Resonance Spectroscopy (^1H NMR – First Order PMR)

- A) **Introduction:-** Basic principle of -NMR Nuclear spin- nuclear resonance- saturation-Relaxation- Instrumentation (CW & FT)
- B) shielding and de shielding of magnetic nuclei- chemical shift and its measurements, factors influencing chemical shift, spin–spin interactions and factors influencing spin -spin coupling-Dynamic NMR- coupling constant J. and factors effecting J value.

UNIT – IV

- A) Determination of structure of organic compounds using PMR data.
- B) **Electron Spin Resonance Spectroscopy:**
Basic principles, zero field splitting and krammers's degeneracy, factors affecting the 'g' value. Isotropic and anisotropic hyperfine coupling constants – applications involving organic radicals.

UNIT – V

Mass Spectrometry : A) Introduction- ion production-EI, CI, ES, MALDI and FAB-molecular ion peak, meta stable peak, Nitrogen rule. determination of Molecular weight and formulae- Isotopic Peaks .

B) Mass spectral fragmentation of organic compounds, common functional groups, Mc-Lafferty rearrangement. Examples of mass spectral fragmentation of organic compounds with respect of their structure determination.

SUGGESTED BOOKS: .

1. Introduction to Spectroscopy – D. L. Pavia, G.M. Lampman, G. S. Kriz, 3rd Ed. (Harcourt college publishers).
2. Spectrometric identification of organic compounds R. M. Silverstein, F. X. Webster, 6thEd. John Wiley and Sons.
3. Spectroscopic methods in organic chemistry - D. H. Williams and I. Flemming McGraw Hill.
4. Absorption spectroscopy of organic molecules – V. M. Parikh
5. Nuclear Magnetic Resonance – Basic Principles- Atta-Ur-Rehman, Springer-Verlag (1986).
6. One and Two dimensional NMR Spectroscopy – Atta-Ur-Rehman, Elsevier (1989).
7. Organic structure Analysis- Phillip Crews, Rodriguez, Jaspars, Oxford University Press (1998)
8. Organic structural Spectroscopy- Joseph B.Lambert, Shurvell, Lightner, Cooks, Prentice-Hall (1998).
9. Organic structures from spectra –Field L.D., Kalman J.R. and Sternhell S. 4th Ed.John Wiley and sons Ltd.

UNIT-I

Non metal cages and metal clusters:

A) structure and bonding in phosphorous-oxygen, phosphorous-sulphur cages; structure and bonding in higher boranes with (special reference to B₁₂ icosahedra). Carboranes, metalloboranes, metallocarboranes.

Metal clusters:

B) Classification- LNCs and HNCs , Isoelectronic and Isolobal relationships , electron counting rules: Wade's and Lauher's rules. M-M multiple bonding; preparation, structure and bonding in dinuclear [Re₂Cl₈]²⁻ ion, trinuclear [Re₃Cl₉] , tetra nuclear W₄(OR)₁₆, hexa nuclear [Mo₆Cl₈]⁴⁺ and [Nb₆Cl₁₂]²⁺, Applications of clusters

UNIT-II

Organ metallic chemistry of transition metals:

A) Classification and electron counting rules, hapticity, synthesis, structure and bonding of Olefinic complexes, Acetylene complexes, ferrocene, dibenzene chromium, cyclo heptatriene and tropylium complexes of transition metals.

B) Reactions of organometallic compounds - oxidative addition reductive elimination, insertion and elimination. Applications of organometallic compounds-Catalytic hydrogenation, Hydro formylation, Zeigler- Natta catalyst for polymerization of olefins.

UNIT III

Reaction mechanism of transition metal complexes:

A) Kinetics of octahedral substitution, acid hydrolysis, base hydrolysis -conjugate base (CB) mechanism. Direct and indirect evidences in favour of CB mechanism. Anation reactions. Reactions without metal-ligand bond cleavage. Factors affecting the substitution reactions in octahedral complexes.

B) Trans effect on substitution reactions in square planar complexes. Mechanism of redox reactions, outer sphere mechanism, cross reactions and Marcus –Hush equation, inner sphere mechanism, complementary and non – complementary reactions.

UNIT IV

A) Term symbols and their derivation. Microstates, Hund's rules to predict ground terms and ground states. List of ground energy and higher energy terms from d¹ to d⁹ configurations

B) Electronic spectra of transition metal complexes Electronic configurations and Spectroscopic terms. Selection rules, Slater–Condon parameters, Racah parameters, Term separation energies for dⁿ configurations Correlation diagrams and Orgel diagrams. Tanabe-Sugano diagrams for d¹ to d⁹ configurations . Calculations of Dq ,B and β parameters . Charge transfer spectra.

UNIT-V

Bio-inorganic chemistry and Magnetic properties of complexes

A) storage and transport of dioxygen by Hemoglobin and Myoglobin. Vitamin B₁₂ and its importance..

B) Magnetic properties of transition metal complexes Types of magnetism, factors affecting Para magnetism, anomalous magnetic moments - Orbital and spin contribution , spin - orbit coupling and magnetic moments. Chiro optical properties , Cotton effect and Faraday effect .

References:

1. Inorganic Chemistry ,Huheey. Harper and Row.
2. Concise inorganic chemistry ,J. D. Lee, ELBS.
3. Inorganic chemistry ,K.F. Purcell and J.C. Kotz, Holt Saunders international
4. Organometallic chemistry ,R.C. Mehrotra and A. Singh. New Age International.
5. Advanced Inorganic Chemistry ,Cotton and Wilkinson, Wiley Eastern
6. Inorganic reaction mechanism ,Basolo and Pearson, Wiley Eastern
7. Bioinorganic Chemistry ,K. Hussan Reddy
8. Biological Aspects of inorganic chemistry , A. W. Addison, W. R. Cullen, D. Dorphin and G. J. James. Wiley Interscience.
9. Photochemistry of coordination compounds, V. Balzani and V. Carassiti. Academic Press.
10. Text book of Coordination chemistry by K. Soma Sekhar Rao and K. N. K. Vani, Kalyani Publishers.

UNIT – I

Stereochemistry:

A) Concept of Chirality: Recognition of symmetry elements and chiral structures (one and more than one chiral centers); D-L and R-S nomenclature, diastereoisomerism; Inter-conversion of Fischer, Newman and Sawhorse projections. Threo and Erythro isomers, - stereo specific and stereoselective synthesis. Asymmetric synthesis. - Optical activity in the absence of chiral carbon (biphenyls, allenes and spiranes). Chirality due to helical shape.

B) Racemic Modifications – Nature and formation of racemic modifications – by mixing, by synthesis, by racemization, by chemical transformations Geometrical isomerism- methods of resolution – E, Z- nomenclature – physical and chemical methods of determining the configuration of geometrical isomers. Stereochemistry of compounds containing nitrogen, sulphur and phosphorous.

UNIT-II.

Conformational analysis:

A) Conformation of acyclic molecules – alkanes and substituted alkanes – compounds having intramolecular hydrogen bonding, conformations around C-C and carbon hetero atom bonds having C-O & C-N. Conformations of monocyclic compounds – cyclohexane- chair, boat and twist boat cyclohexanes, energy profile diagram – Mono and di- substituted cyclohexanes.

B) Effect of conformation on reactivity in mono and di- substituted cyclohexane derivatives. Elementary treatment of fused and bridged ring systems – Decalines and Bornanes.

UNIT-III

A) Named reactions: Aldol (normal, crossed and directed), Claisen, Perkin, Stobbe, Knoevenagel, Darzen, Reformatsky and Benzoin condensations. Grignard, Cannizzaro, Wittig and Wittig-Horner reactions. Mechanism and stereochemistry of addition to C=O systems. Mechanism of Dakin reaction.

B) C-C and C=C bond forming reactions – Mannich, Reimer-Tiemann, Vilsmeier-Haack and Ullmann reactions. Stork-enamine reaction. Shapiro, Wittig-Horner, Peterson, Heck, Stille and McMurray reactions. Ring formation by Dieckmann, Thorpe and Acyloin condensations. Robinson ring annulation. Synthesis of small rings. Simon-Smith reaction.

UNIT-IV

Nanochemistry

A) Introduction, carbon nano tubes: structure of single and multi walled carbon nano tubes, synthesis-solid and gaseous carbon source-based production techniques, synthesis with controlled orientation.

B) Growth mechanism of carbon nano tubes-catalyst free growth, catalyst activated growth, properties-general, adsorption, electronic & optical, Mechanical and reactivity. Applications

UNIT-V

Protecting groups:

A) Theory and importance of functional group protection and deprotection in organic synthesis:-Protecting agents for the protection of functional groups: Hydroxyl group, Amino group, Carbonyl group and Carboxylic acid group

B) carbon-carbon multiple bonds; chemo- and regioselective protection and deprotection. Illustration of protection and deprotection in organic synthesis.

References:

1. Advanced organic chemistry –Reaction, mechanism and structure, Jerry March, John Wiley.
2. A guide book to Mechanism in organic chemistry, Peter Sykes, Longman.
3. Organic chemistry, I.L.Finar, Vol. I & II, Fifth ed. ELBS, 1975.
4. Stereo Chemistry of carbon compounds – E.L. Eliel.
5. Nano The Essentials: T.Pradeep, The mc Graw Hill
6. Principles of organic synthesis, R.O.C.Norman and J.M.Coxon, Blakie Academic & Professional.
7. Reaction Mechanism in organic chemistry, S.M.Mukherji and S.P.Singh, Macmillan.
8. Green chemistry Theory and Practice by Paul T. Anastas and John C.warner, Oxford University press.
9. Methods and reagents for Green chemistry, PietroTundo, Alvise Perosa, Fulvio Zecchini; Wiley interscience, John wiley& sons Inc.,
10. Protecting Groups in Organic Chemistry,P.J.Kocienski , Georg thiemever, Wiley interscience
11. Protecting Groups in Organic Chemistry, T.W.Greene, Wiley Interscience Publishers, New York

UNIT – I

Thermodynamics II : Third law and Statistical thermodynamics-

A) Nernst Heat theorem - Third law of thermodynamics - Its limitations - Determination of absolute entropy - concept of distribution - Thermodynamic probability and most probable distribution-Ensembles-Maxwell-Boltzmann distribution.

B) Partition function - Fermi-Dirac statistics - Bose Einstein statistics- Entropy and probability - Boltzmann-Plank equation - calculation of thermodynamic properties in terms of partition function - Application of partition function - Chemical equilibrium and partition function - Translational, rotational and electronic partition function - Entropy of Monoatomic gases (Sackur -Tetrode equation).

UNIT-II

Polymer chemistry

A) Classification of polymers - Free radical , ionic and Zeigler -Natta Polymerisation - kinetics of free radical polymerisation - Techniques of polymerisation - Glass transition temperature - Factors influencing the glass transition temperature. Number average and Weight average, Molecular weights –molecular weights determination

Raman Spectroscopy

B) Classical and quantum theories of Raman effects, pure rotational, vibrational and Vibrational – rotational Raman spectra, selection rules, mutual exclusion principle.

UNIT – III

Electrodes:

A) Reference electrode - Standard hydrogen electrode . Calomel electrode -Indicator electrodes: Metal-metal ion electrodes - Inert electrodes -Membrane electrodes - theory of glass membrane potential , potentiometric titrations, advantages of potentiometric titratons, applications.

Electro Chemistry-II :

B) Electrode potentials - Double layer at the interface - rate of charge transfer - Decomposition potential - Over potential - Tafel plots - Derivation of Butler-Volmer equation for one electron transfer - electro chemical potential.

UNIT-IV

Chemical kinetics and photo chemistry:

A) Branching Chain Reactions - Hydrogen-oxygen reaction - lower and upper explosion limits - Fast reactions - Study of kinetics by flow methods - Relaxation methods - Flash photolysis - Mechanism of homogeneous catalysis - Acid base catalysis -protolytic and prototropic mechanism . Enzyme catalysis - Michelis-Menten kinetics

Photochemical Reactions:

B) Quantum yield and its determination - Actinometry - Reactions with low and high quantum yields - Photo sensitisation - Exciplexes and Excimers - Photochemical equilibrium - Chemiluminescence - Kinetics of collisional quenching- Stern -Volmer equation - Photo Galvanic cells.

UNIT-V

Symmetry and Group theory in chemistry:

A) Symmetry elements, symmetry operation, definition of group, sub group, relation between order of a finite group and its sub group. GMT tables Abelian and non abelian groups. Point group. Schonfiles symbols, Find out Point group of a molecule (yes or no Method).

B) Representation of groups by Matrices (representation for the C_n , C_{nv} , C_{nh} , D_n etc. groups to be worked out, explicitly).Character of a representation. The great orthogonality theorem (without proof) and its importance. Character tables and their use. Construction of Character table- Application of group theory in IR and Raman spectroscopy.

References:

1. Physical chemistry, G.K.Vemulapalli (Prentice Hall of India).
2. Physical chemistry, P.W.Atkins. ELBS
3. Chemical kinetics - K.J.Laidler, McGraw Hill Pub.
4. Text book of Physical Chemistry, Samuel Glasstone, Macmillan pub.
5. Statistical Thermodynamics - M.C.Gupta.
6. Polymer Sceince, Gowriker,Viswanadham, Sreedhar
7. Elements of Nuclear Science, H.J.Arniker, Wiley Eastern Limited.
8. Quantitative Analysis, A.I. Vogel, Addison Wesley Longmann Inc.
9. Physical Chemistry-G.W.Castellan, Narosa Publishing House, Prentice Hall
10. Physical Chemistry, W.J.Moore, Prentice Hall
11. Polymer Chemistry - Billmayer
- 12.Fundamentals of Physical Chemistry, K KRohatgi-Mukherjee. Wiley Eastern Ltd publications.
13. Statistical Thermodynamics-M.Dole
14. Introductory Group Theory for Chemists – George Davidson
- 15 .Group theory for chemistry – A.K.Bhattacharya
- 16.Fundamentals of Molecular spectroscopy: by C.N.Banwell
- 17.Molecular spectroscopy by B.K.Sharma
18. Vibrational Spectroscopy by D.N.Sathyanarayana New Age Int. Pub.
19. Spectroscopy by Aruldas.

PRACTICALS FOR SEMESTER-II

PRACTICAL-I

Organic chemistry practical-2

Code: OCH 205

1. Preparation of organic compounds: Single stage preparations by reactions involving nitration, halogenation, oxidation, reduction, alkylation, acylation, condensation and rearrangement. (A student is expected to prepare at least 10 different organic compounds by making use of the reactions given above).
2. Preparation of organic compounds: Two stage preparations by reactions involving nitration, halogenation, oxidation, reduction, alkylation, acylation, condensation and rearrangement. (A student is expected to prepare at least 5 different organic compounds by making use of the reactions given above).
3. Systematic qualitative analysis of organic compounds with different functional groups (5)

References:

- 1 A.I.Vogel, "A Text Book of Practical Organic Chemistry", Longman
- 2 A.I.Vogel, "Elementary Practical Organic Chemistry", Longman
- 3 F.G.Manu and B.C.Saunders, "Practical Organic Chemistry", Longman
- 4 Reaction and Synthesis in Organic Laboratory, B.S.Furniss, A.J.Hannaford, Tatchell, University Science Books mills valley
- 5 Purification of Laboratory chemicals, manual, W.L.F.Armarego EDD Perrin
- 6 Reaction and Synthesis in Organic Chemistry Laboratory, Lutz-Friedjan-Tietze, TheophilEicher, University Science Book

Practical – II, Inorganic Chemistry Practical-2

Code: OCH 206

Quantitative analysis:

- a) Determination of Zn^{2+} with potassium Ferro cyanide (Volumetric)
- b) Complexometric titrations: Determination of Mg^{2+} , Ni^{2+} and hardness of water using EDTA.
- c) Determination of Fe^{3+} by photochemical reduction.
- d) Argentometry: Determination of chloride by argento metric titration using a) K_2CrO_4 (b) Fluorescence as indicators.
- e) Determination of nickel using dimethyl glyoxime, "Copper using ammonium thio cyanate, Zn using di ammonium hydrogen phosphate – gravimetrically (Minimum two Gravimetric experiment)

References:

1. Vogels Text Books of Qualitative analysis, Revised. J. Bassett, R.C. Denny, G.H. Jeffery and J.Mendhan.ELBS.
2. Vogels Text Book of Quantitative analysis, revised. J. Bassett, R.C. Denny, G.H. Jeffery and J.Mendhan, ELBS.
3. Synthesis and Characterisation of Inorganic Compounds, W.L.Jolly. Prentice Hall.
4. Practical Inorganic chemistry by G. Pass and H. Sutcliffe Chapman and Hall.
5. Practical Inorganic Chemistry by. K. SomasekharRao and K.N.K. Vani.

PRACTICAL-III, Physical Chemistry Practical -2**Code: OCH -207**

1. Potentiometric determination of Fe(II) with Cr (VI)
2. pH-metric determination of strong acid with strong base.
3. pH-metric determination of strong acid + Weak acid with strong base
4. Conductometric titration of strong acid with strong base
5. Conductometric titration of strong acid + Weak acid with strong base
5. Verification of Beers Law using potassium permanganate/Potassium dichromate.

SEMESTER- III

PAPER – I: Advanced organic spectroscopy

Code: OCH301

UNIT-I

- A) Spin system, Nomenclature of spin system, spin system of simple and complex PMR spectrum (Study of AB – A₂ – AB₂, ABX – ABC – AMX interactions)
- B) Simplification of complex spectra- nuclear magnetic double resonance, chemical shift reagents, solvent effects on PMR Spectrum . Advantages of Fourier transform technique, Nuclear Overhauser Effect (NOE).

UNIT-II

- A) ¹³C-NMR spectroscopy –Similarities and Difference between PMR and CMR-CMR recording techniques -BBC-BBD-SFORD-Gate pulse CMR spectrum.
- B) General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonylcarbon), coupling constants. Typical examples of CMR spectroscopy – simple problems.

UNIT-III

ORD& CD Curves

- A) Optical rotatory dispersion : Theory of optical rotatory dispersion – Cotton effect –CD curves-types of ORD and CD curves-similarities and difference between ORD and CD curves
- B) α- Halo keto rule , Octant rule – application in structural studies.

UNIT –IV

- A) 2D NMR spectroscopy – Definitions and importance of COSY, DEPT, HOMCOR, HETCOR,INADEQUATE, INDOR, INEPT, NOESY, HOM2DJ, HET2DJ, DQFCOSY.
- B) Study of COSY ,DEPT, HOMCOR, HETCOR, INADEQUATE INDOR INEPT ,NOESY HOM2DJ, HET2DJ, DQFCOSY simple organic compounds and problems.

UNIT-V

Structural Elucidation of Organic compounds Using UV, IR, ¹H-NMR, ¹³C-NMR and mass spectroscopy.

References :

1. Introduction to Spectroscopy – D. L. Pavia, G.M. Lampman, G. S. Kriz, 3rd Ed. (Harcourt college publishers).
2. Spectrometric identification of organic compounds R. M. Silverstein, F. X. Webster, 6th Ed. John Wiley and Sons.
3. Spectroscopic methods in organic chemistry - D. H. Williams and I Flemming McGraw Hill
4. Absorption spectroscopy of organic molecules – V. M. Parikh
5. Nuclear Magnetic Resonance – Basic Principles- Atta-Ur-Rehman, Springer- Verlag (1986).
6. One and Two dimensional NMR Spectroscopy – Atta-Ur-Rehman, Elsevier (1989).
7. Organic structure Analysis- Phillip Crews, Rodriguez, Jaspars, Oxford University Press (1998)
8. Organic structural Spectroscopy- Joseph B.Lambert, Shurvell, Lightner, Cooks, Prentice-Hall (1998).
9. Organic structures from spectra –Field L.D., Kalman J.R. and Sternhell S. 4th Ed. John Wiley and sons Ltd.

UNIT-I**Oxidations**

A) Introduction: Different oxidative processes. Hydrocarbons: alkenes, aromatic rings saturated C-H groups (activated and unactivated), Alcohols, diols, alkenes, epoxides, enantioselective epoxidation of allyl alcohols, diastereoselective epoxidation of homoallylic alcohols. ozonolysis, aldehydes, Ketones, Carboxylic acids, Amines, hydrazines, sulphides.

B) Oxidations with ruthenium tetroxide iodobenzenediacetate and Ti(III) nitrate, Lead tetra acetate, SeO_2 , MnO_2 , Ag_2CO_3 , Oppenauer oxidation, peracids., perhydroxylation using KMnO_4 , OsO_4 , HIO_4 , and $m\text{-ClC}_6\text{H}_4\text{COOH}$ and their applications.

UNIT-II**Reductions**

A) Introduction: Reductive process Hydrocarbons: alkenes, alkynes, and aromatic rings, Carbonyl compounds – aldehydes, ketones, acids and their derivatives Clemmenson reduction. Nitro, nitroso, azo and oxime group, Catalytic hydrogenations, Reduction by dissolving metals. Reduction with metal in liquid ammonia (Birch reduction).

B) Reduction with metal and acid. Reduction by hydride transfer reagents Aluminium alkoxide, LiAlH_4 , NaBH_4 , Diisobutylaluminium hydrides, Sodium cyano borohydride, trialkyl borohydrides, Reduction with diimide. Wolff-Kishner reduction.

UNIT-III**Molecular Rearrangements**

A. Migration to electron deficient carbon atom. Pinacole-Pinacolone rearrangement, Wagner-Meerwein rearrangement, Tiffenev-Demjanov ring expansion, Dienone-Phenol rearrangement, Benzil-Benzilic acid rearrangement, Favorski rearrangement and Claisen rearrangement.

B. Migration to electron deficient hetero atom: Wolf, Hofmann, Curtius, Lossen, Schmidt, Beckmann rearrangement, Baeyer-Villiger rearrangement, Stevens, Wittig, Neber rearrangements and rearrangement of amino ketones. Fries, Arylozo, Fischer-Hepp, Orton, Bamberger, Benzidine, Hydroperoxide and borane rearrangements.

UNIT-IV**Pericyclic reactions I**

A) Pericyclic reactions: Definition, classification, MO theory, Electronic configuration in ground and first excited states of aliphatic conjugated polyene system (upto 4 double bonds).

Cycloaddition Reactions: Mechanism and stereochemistry of PMO, FMO and correlation diagram methods for (2+2) and (4+2) cycloaddition reactions, Woodward-Hoffman rules.

B) **Electrocyclic Reactions:** Mechanism, stereochemistry, PMO, FMO, correlation diagram, Woodward-Hoffman rules.

Sigmatropic Rearrangement: Classification, Mechanism by PMO,FMO method, Woodward-Hoffman rules. Cope, claisen and Aza-cope rearrangements. Fluxional molecules.

UNIT-V

Photo chemistry

A. Photochemical processes. Energy transfer, sensitization and quenching. Singlet and triple states and their reactivity. Photoreactions of carbonyl compounds, enes, dienes, and arenes– Aromatic compounds–isomerisation–additions. Photochemistry of carbonyl compounds – Norrish type I and II reactions –Paterno – Buchi Reaction.

B. Photo reduction, Photochemical rearrangements – Photo Fries rearrangement, Di- π -methane rearrangement, Barton reaction and photo-Fries rearrangement reaction.

References:

- 1.Mechanism and structure in Organic Chemistry “ E.S.Gould Henry – Holt and Co, Newyork
- 2.Advances in Organic Reaction mechanism and structure J. March (McGrew Hill)
- 3.Aguide Book to Mechanism in Organic Chemistry” by P.Sykes
- 4.Synthetic approaches in organic chemistry by R.K.Bansal(Narosa Publications)
- 5.Some modern methods of synthesis by Carruthers (Cambridge).
6. G.A.Ozin, A.C. Arsenault *Nano chemistry*, RSC.
7. Diwan, Bharadwaj, *Nanocomposites*, Pentagon.
8. V.S.MuralidharanA.Subramania, *Nanoscience and Technology*, Ane Books.

UNIT-I**Formation of carbon-carbon single bonds:**

- A) Alkylations of relatively acidic methylene groups, alkylations of ketones, alkylations via enolate, enamine and related reactions, umplong (dipole inversion). The aldol reaction
- B) Allylic alkylation of alkenes, alkylation of α -thiocarbonions- α -selenocarbonions, formation of carbon carbon single bonds by the addition of free radicals to alkenes, sulphurylides, synthetic applications of carbenes and carbenoids.

UNIT-II**Formation of carbon-carbon double bonds**

- A) Elimination reactions sulphoxide-sulphonate rearrangement, synthesis of allyl alcohols, the witting reaction, alkenes from sulphones, decarboxylation of β -lactones, alkenes from arylsulphonyl hydrazones, claisen rearrangement of allylvinylethers.
- B) Stereo selective synthesis of tri and tetra substituted alkenes, fragmentation reactions, oxidative decarboxylation of carboxylic acids, stereospecific synthesis from 1,2-diols, reductive dimerization of carbonyl compounds.

UNIT-III

- A) Diels–Alder and related reactions: The dienophile, heterodienophile, oxygen as dienophile, The diene, acyclic dienes, heterodienes, 1,2-dimethylene cycloalkanes, vinyl cycloalkenes, and vinyl arenes, cyclic dienes, cyclopenta dienones, o–quinones, o-quinodimethanes.
- A. Intra molecular Diels –Alder reactions, stereochemistry and mechanism of retro Diels –Alder reaction, catalysis by lewis acids, asymmetric Diels-Alder reactions, photosensitized Diels-Alder reactions, The ene reaction, cycloaddition reactions with allyl cations and allyl anions and 1,3-dipolar cycloaddition reactions.

UNIT-IV**Reactions at unactivated C- H bonds**

- A) The Hoffmann – Loeffler – Freytag reaction, Cyclisation reactions of nitrenes, The Barton reaction and related processes, photolysis of organic nitrites and hypohalites, photolysis of N-nitrosoamides.
- B) Reaction of monohydric alcohols with lead tetraacetate, Miscellaneous reactions-unsaturated alcohols from hydroperoxides, cyclobutanols by photolysis of ketones, long- range functionalisation of unactivated carbons on the steroid nucleus.

UNIT-V**Disconnection approach**

- A) Introduction, Target selection, Retro-synthetic analysis, Disconnection approach with suitable examples, FGI, Disconnection product, Disconnection and synthon, synthetic equivalent strategic bond approach, chemo, regio and stereo selectivity with examples. One group C-X disconnections.
- B) One group C-C disconnections-Alcohols, carbonyl compounds, C-N Disconnections. Linear and convergent synthesis with example.

References:

1. Modern methods of Organic synthesis, W. Carruthers Cambridge Press
2. Organic synthesis by H.O.House
3. Modern Method of Organic Synthesis, Carruthers and Coldham Sachinkumar Ghosh, Cambridge New Central Book Agency
4. Reduction, Techniques and Applications in Organic Synthesis, Robert L. Augustine, Marcel Dekker Inc
5. Pharmaceutical Organic Chemistry, Rama Rao Nadendla, Vallabh Publications, New Delhi.
6. Advances in Organic Reaction mechanism and structure, J. March McGraw Hill

UNIT-I

Organoboranes:

A) Preparation of Organoboranes viz hydroboration with $\text{BH}_3\text{-THF}$, protonolysis, oxidation, isomerization, cyclization, rearrangements, alkylboranes, alkenylboranes, dicyclohexylboranes, disiamylborane, tetrylborane, 9-BBN and catacol boranes.

B) free radical reactions of organoboranes, reactions with α - bromoketones, α -bromoesters, functional group transformations of Organoboranes, the cyanoborate process and reaction of alkenylboranes and trialkenyl borates.

UNIT-II

Organosilanes:

A) Synthetic applications of organosilicon compounds, protection of functional groups, trimethylsilyl ethers, silylenoethers, trimethylsilyl chloride, dimethyl-t-butylsilyl chloride, trimethylsilyl cyanide, trimethylsilyliodide, trimethylsilyltriflate, Peterson olefination.

B) Synthetic applications of α -silylcarbanion and β -silyl carbonyl compounds, alkenylsilanes, allylsilanes, The β -effect, control of rearrangement of carbonium ions by silicon.

UNIT-III

Organo metallic reagents:

A. Preparation of Grignard reagents with alkyl, allyl and propargyl halides, alkylation, reaction with carbonyl compounds, esters, alcohols, amines, acids, carbon dioxide, carbon disulfide, sulfur dioxide. Preparation of alkyllithium, reagents, lithium diisopropyl amide (LDA), and uses in aromatic annulation and heteroaromatic annulations.

B). π -allylnickel complexes, preparation of 1,5-cyclic dienes, nickel carbonyl, Organocopper reagents; organocuprates, lithium organocuprates, Gilman reagents, oxidative coupling of terminal alkynes, alkylations. Organo palladium reagents, preparation of Palladium reagents, π -allylpalladium complexes, synthetic applications of organo palladium reagents.

UNIT-IV

Heterocyclic Chemistry : Synthesis and reactivity of the following systems

A) Pyrazole, Imidazole, Oxazole, Iso-Oxazole, Thiazole, Isothiazole,

B) Pyrazine, Pyrimidine, pyridazine, Indole, Carbazole, Carboline

UNIT-V

A) Natural products :

Definition, nomenclature & physiological action- Occurrence – isolation- general methods of structural elucidation- degradation- classification based on nitrogen heterocyclic ring. Synthesis and structural elucidation of Quinine. Synthesis & stereochemistry with special reference Zingiberine and Sankonin.

Synthesis and structural elucidation of flavonoids: Quercetin and Kaemferol.

B) Antibiotics: introduction, Classification, and synthesis of antibiotics. Synthesis of penicillin-G, Penicillin V, Streptomycin, Chloramphenicol & Terramycin.

References:

1. Some Modern Methods of Organic Synthesis W. Caruthers, Cambridge University Press, Cambridge.
2. Organic Synthesis viz Boranes, Herbert C. Brown Gray, W. Kramer Alan B. Levy and M. Mark Midland John Wiley & Sons, New York.
3. Hetero chemistry, T.L. Gilchrist, Longman science and tech
4. An introduction to the Chemistry of Heterocyclic Compounds, R.M. Acheson, Interscience Publishers, New York
5. Principle of Organic Chemistry, R.C. Norman, J.M. Coxan, Nelson Thomson
6. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Perleum
7. Heterocyclic chemistry by Jai Jack Lie, Springer publications.
8. Schlosser, M., Organometallics in Synthesis, A manual, John Wiley, New York, 1996.
9. Hegedus, L.S.; Transition metals in the synthesis of complex organic molecules, second edition, University Science, Book, CA, 1999.
10. Astruc, D.; Organometallic Chemistry and Catalysis, Springer Verlag, 2007. 11. Davies, S. G.; Organotransition metal chemistry: Applications to organic synthesis, Pergamon Press, New York, 1986.

PRACTICALS FOR SEMESTER-III

ORGANIC CHEMISTRY PRACTICAL-3

CODE:OCH 305

1. Preparation of organic compounds: Three stage preparations by reactions involving nitration, halogenation, oxidation, reduction, alkylation, acylation, condensation and rearrangement. (A student is expected to prepare at least five different organic compounds by making use of the reactions given above).
2. Preparation of organic compounds: four stage preparations by reactions involving nitration, halogenation, oxidation, reduction, alkylation, acylation, condensation and rearrangement. (A student is expected to prepare at least 5 different organic compounds by making use of the reactions given above).

ORGANIC CHEMISTRY PRACTICAL-4

CODE:OCH-306

Analysis of organic binary mixtures: Separation and identification of organic binary mixtures containing at least one component with two substituents. (A student is expected to analyze atleast 5 different binary mixtures).

ORGANIC CHEMISTRY PRACTICAL-5

CODE:OCH-307

Characterization of organic compounds using IR, UV-Vis, H^1 and C^{13} -NMR spectral methods. At least 30 molecules.

References:

1. Practical Organic Chemistry A.I.Vogel (Longmans)
2. Text Book of practical organic Chemistry F.G.Mann & B.C. Sanders.
3. A Manual of Practical Organic Chemistry Day Sitaramam & Govindachari
4. Organic Experiments L.F.Fieser.
5. Practical Organic Chemistry H.T.Openshaw
6. Systematic Identification of Organic Compounds, P.L.Shriner, R.C.Fuson & D.Y.Curtin.
7. Identification of Organic Compounds N.D.Cheronis & J.B.Entrilkin
8. Advanced Organic Synthesis by R.S. Monson Academic Press

SEMESTER IV

PROJECT WORK

The project will be assigned in the final semester and will last the entire semester. The project will be performed at the established industry (or) with one of the faculty research groups supervised by the faculty-in-charge of the laboratory. It may involve experimental and/or theoretical work as well as critical review of the literature. Each of the students has to carry out original research in a topic in accordance with the work chosen under the guidance and supervision of a teacher in the concerned Department of the College.

Dissertation must be submitted at the end of the semester which will be assessed by the external examiners. Dissertation must be prepared with introduction, Review of the literature, Experimental Session, Results and Discussion, Conclusion and References.

Instructions to question paper setters:

The syllabus of each theory paper has five units. While setting the question papers, equal weightage must be given to each of the units for choosing questions. Each question paper is for 3 hours duration, and the each paper external examination is for 70marks.