

Organic Chemistry
M Sc Semester 3
CHE2301OC (3 Credits)
Organic Synthesis & Stereochemistry

Unit 1

Organic synthesis: Retrosynthesis, synthons and synthetic equivalents, functional group interconversion, Synthesis of amines, regiospecific, chemospecific and stereospecific reactions, umpolung methods. principles and applications of protective groups in protection of hydroxyl, amino, carbonyl and carboxyl groups, synthetic strategies for cyclic compounds, retrosynthesis and synthetic approaches to some complex molecules such as camphor, longifoline, prostaglandins etc

Unit 2

Carbon-carbon bond forming reactions: Knoevenagel condensation, Darzens condensation. Michael addition, Wittig reaction, Mannich reaction, Stork enamine synthesis, Baylis-Hillman reaction, applications of organometallics: use of Grignard reagent, organo-lithium and –copper-lithium complexes.

Unit 3

Stereochemistry: Homotopic and heterotopic atoms, prochiral systems chirality, molecules with more than one chiral centre, threo and erythro isomers, optical purity, optical activity in absence of chiral carbon, helical molecules, adamantoids, catenanes, Conformational analysis of fused bicyclic, tricyclic and bridged ring systems, effect of conformations on reactivity in acyclic and cyclic compounds, Cram's and Prelog's rules, stereospecific and stereoselective reactions.

Reference Books:

1. Designing Organic Syntheses : A Programmed Introduction to the Synthon Approach S. Warren, Wiley 1991
2. Organic Synthesis, C. Willis and M. Wills, Oxford Science Publications, 1994.
3. Modern Synthetic Reactions, H.O. House, W.A. Benjamin, (1972).
4. Advanced Organic Chemistry, Part-B, F.A. Carey and R.J. Sundberg, Kluwer Academics, 2001.
5. Compendium of Organic Synthetic Methods, Vol. I and III, Harrison and Harrison.
6. The Logic of Chemical Synthesis, E. J. Corey and X-M. Cheng, John Wiley 1998
7. Classics in Total Synthesis; K.C. Nicolaou and E.J. Sorensen, VCH;1996.
8. Classics in Total Synthesis II: More Targets, Strategies, Methods; K.C. Nicolaou and S.A. Snyder, Wiley-VCH, 2003.
9. Organic Synthesis Workbook II; C Bittner, A.S Busemann, U Griesbach, F. Haurert, W R. Krahnert, A. Modi, J. Olschmke, P.L. Steck; Wiley-VCH, 2001

10. Principles of Organic Synthesis, R. Norman and J.M. Coxon, Chapman & Hall, 1993.
11. Some Modern Methods of Organic Synthesis, W. Carruthers, Cambridge University Press, 1986.
12. Organic Synthesis, M.B. Smith, McGraw-Hill, 1994.
13. Organic Synthesis, The Disconnection Approach, S. Warren, Wiley, 1982.
14. Organic Reaction Mechanism, V.K. Ahluwalia, R.K. Parasher, Narosa Publishing House.
15. Organic Chemistry; J Clayden, N Greeves, S Warren, P Wothers, O U P, 2000.
16. Stereochemistry of Carbon compounds, E.I. Eliel.
17. Stereochemistry of Organic compounds IInd Edition, D. Nasipuri.
18. Stereochemistry of Carbon Compound, P.S. Kalsi.

Organic Chemistry
M Sc Semester 3
CHE2302OC (3 Credits)

Organic Spectroscopy

Unit 1

Infrared Spectroscopy: Introduction, characteristic vibrational frequencies for alkanes, alkenes, alkynes, aromatics, alcohols, ethers, phenols, amines and nitro compounds, carbonyl compounds, aldehydes, ketones, esters, amides, acids, anhydride, lactones, lactams and conjugated carbonyl compounds, Effect of hydrogen bonding, ring size and solvent.

UV-Visible spectroscopy: Electronic excitations, UV absorption by dienes, carbonyl, conjugated and extended conjugated and unsaturated alkenes and carbonyl compounds, aromatic systems, polyynes, biphenyls, Woodward–Fieser rules for conjugated dienes and enones. Optical rotatory dispersion and circular dichroism.

Unit 2

Mass spectrometry: Introduction, factors affecting fragmentation, Double McLafferty rearrangement, retro Diels-Alder fragmentation, ortho effect, fragmentation pattern of hydrocarbons (Cyclic), ethers, thioethers, halides, alcohols, phenols, aldehydes, ketones, carboxylic acids, esters, amides, nitro compounds, nitriles etc. Analysis of mass spectra GCMS and LCMS techniques. HRMS, .Applications of mass spectrometry.

Unit 3

Nuclear Magnetic resonance: Nuclear Magnetic Resonance, Larmour frequency, chemical shift, factors influencing chemical shift, chemical shift values and correlation for protons bonded to carbon and hetero nuclei. Spin–spin interactions, coupling constant ‘J’ and the spin systems involving two, three and four nuclei, first and second order spectra, geminal, vicinal and long range coupling, dynamic exchange of proton, simplification of complex spectra, double resonance, shift reagents. Nuclear Overhauser effect.

1. An Introduction to Spectrometric Method of Identification of Organic Compounds Vol I & II. ,F. Scheinmann, Oxford Pergamon press, (1970.)
2. Application of Absorption Spectroscopy of Organic Compounds ,J.R. Dyer, Prentice Hall of India, (New Delhi, 1964)
3. Spectroscopic Methods in Organic Chemistry, Flemming and Duddly Williams, McGraw Hill, London (1966).
4. Organic Spectroscopy , William Kemp, Macmillan Press, London.
5. Spectroscopy of Organic Compounds; P S Kalsi; W. Eastern, N. Delhi (1993).
6. Introduction of Mass spectroscopy, F.W McLafferty, W.A Massachusetts, Benjamin. 2nd Edition 1974.
7. Spectroscopic Methods in Organic Chemistry, D.H. Williams, I. Fleming, Tata McGraw-Hill, 2004.
8. Organic Structural Spectroscopy, J.B. Lambert, H.F. Shurvell, D.A Lightner, R.G. Cooks, Prentice-Hall, 1998.

Organic Chemistry
M Sc Semester 3
CHE2303OC (3 Credits)

Drugs

Unit 1

Anticancer agents: Introduction, mode of action, synthesis and uses of alkylating agents, nitrogen mustards, melphalan, chlormbucil, cyclophosphamide, 5-fluorouracil, 6-mercaptopurine, mitomycin-C, paclitaxel, capecitabine (prodrug), tamoxifen, camptothecin. Recent developments in cancer therapy, hormone therapy, gene therapy and natural products in cancer therapy.

Unit 2

Antimalarials Drugs: Malaria cycle, classification of antimalarials, quinine, chloroquine, primaquine, pamaquine, pyrimethamine and its analogues, proguanil, newer antimalarials, mefloquine and artesamic acid derivatives, structure-activity relationship and mode of action.

Cardiovascular drugs: Natural glycosides, digitalis, digitoxin, dobutamine hydrochloride, vasodilators, amyl nitrite, nitroglycerin, isosorbide dinitrate, nifedipine, verapamil, diltiazem, calcium channel blockers, dipyridamole, papaverine, cyclandelate. Antiarrhythmic drugs, procainamide hydrochloride, lidocaine hydrochloride, verapamil

General and Local Anaesthetics: Mode of action, volatile and nonvolatile anaesthetics, benzocaine, xylocaine, procaine, viadril, haloethane, avertin, pentothal sodium, thiamoylal sodium.

Unit 3

Antibiotics: Introduction, penicillins, importance of lactam ring, structural elucidation and synthesis of penicillin-G, amoxicillin, ampicillin, SAR and mode of action.

Cephalosporin C, structural elucidation, synthesis, cephalosporin derivatives and their activity, 7-aminocephalosporanic acid. Streptomycin: production, structural elucidation, mechanism of action, SAR. Diuretics: Introduction, classification, mercurial diuretics, mercaptomerin sodium, meralluride, mode of action. loop diuretics, bumetanide, furosemide, clopamide. Antifungal Agents: Nitrofurazone, furazolidone and 5-fluorocytosin.

Reference Books:

1. Berger's Medicinal chemistry (Vol. 1-8), VII Edition, J Abraham, Wiley
2. Medicinal Chemistry, Ashutosh Kar, New Age International Publishers.
3. Synthetic Drugs, G. R. Chatwal
4. Instant Notes: Medicinal Chemistry, G. L. Patrick, Viva Books.
5. Medicinal Chemistry: An Introduction; G Thomas; John Wiley.
6. Medicinal Chemistry Principles and Practice, F.D. King, RSC, 1994..
7. Principles of Medicinal Chemistry, , William O. Foye, Thomas L. Lemke, and David A. Williams, Lea & Febiger, Philadelphia, IV Edition, 1995.
8. The Organic Chemistry of Drug Design and Drug Action; R B Silverman; Acad. press.
9. Supramolecular Chemistry J M Lehn, Wiley-VCH
10. Supramolecular Chemistry: J W Steed, J L Atwood; John Wiley 2002
11. Principles and Methods in Supramolecular Chemistry; H-J Schneider, A Yatsimirsky; John Wiley, 2000

Organic Chemistry
M Sc Semester 3

Practical Courses

CHE2304OCAdvanced Organic chemistry practicals-1(04 Credits)

CHE2305OCAdvanced Organic chemistry practicals-2 (04 Credits)

a) Minor Estimation: Estimation of Glycine, Ascorbic acid and Formaldehyde.

b) Three stage preparations:

Aniline to p-nitroaniline

Phthalic anhydride to 2-iodo benzoic acid

Hydroquinone to 6,7-dihydroxy-4-methyl coumarine

Acetanilide to sulphanilamide

Benzaldehyde to benzil.

Glycine to glycylglycine

4-Nitrotolune to ethyl -4-aminobenzoate (benzocaine)

Acetyl glycine to 3-amino coumarin

Anthranilic acid to acridone

Acetophenone to 4-bromo acetanilide

Examination:

1) Minor Estimation and One new three stage preparation (Mid Semester)

2) One of the three stage preparations already done during the semester.

**Organic Chemistry
M Sc Semester 3
Elective Courses**

CHE2301OE (2 Credits)

Pericyclic reactions.

Unit 1

Pericyclic reactions: Orbitals, molecular orbital symmetry, molecular orbital of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl systems, concerted reactions, classification of pericyclic reactions, derivation of selection rules through construction of correlation diagrams for cycloaddition reactions and for electrocyclic reactions with $4n$ and $4n+2$ π electrons, conrotatory and disrotatory motions for electrocyclic ring opening and ring closure. FMO approach for derivation of Woodward-Hoffman selection rules for cycloaddition and electrocyclic reactions, suprafacial and antarafacial cycloadditions. secondary effects and stereochemistry of cycloadditions; $2s+2a$ cycloaddition of ketenes.

Unit 2

Further Topics in Pericyclic reactions: 1,3-Dipolar cycloaddition reactions, classification and applications. Sigmatropic reactions, suprafacial and antarafacial rearrangements, $[1,j]$ sigmatropic rearrangement of hydrogen, $[1,j]$ and $[i,j]$ sigmatropic reactions of carbon, selection rules for $[i,j]$ -sigmatropic rearrangements using FMOs. The Cope and the Claisen rearrangements, fluxional tautomerism, the ene reaction, the Sommelet-Hauser rearrangement.

Reference Books:

1. Pericyclic reactions-A Textbook: Reactions Applications and Theory. S Sankararaman, Wiley-VCH 2005.
2. Photochemistry and Pericyclic Reactions; Jagdamba Singh & Jaya Singh; New Age Pubs. II Edn. 2006.
3. Pericyclic Reactions, S.M. Mukherjee
4. Pericyclic Reactions, G.B. Gill, M.R. Wills, Chapman and hall (1974).
5. The Conservation of Orbital Symmetry, R.B. Woodward, R. Hoffmann, Verlag Chemie Academic Press (1970).
6. Organic Reactions and Orbital Symmetry, T.L. Gilehrst.

**Organic Chemistry
M Sc Semester 3
Elective Courses**

CHE2302OE (2 Credits)

Asymmetric Synthesis and Stereochemistry.

Unit 1

Introduction to asymmetric synthesis, Glossary of the terms. Methods to determine optical induction in asymmetric reactions, function of chiral auxiliaries in asymmetric synthesis, with some examples. Bio-catalysed asymmetric transformations with examples. chiral phase transfer catalysis. Asymmetric Reductions: Modified boranes, hydroborations, asymmetric hydrogenations. Introduction Kinetic and Dynamic Kinetic Resolution.

Unit 2

Asymmetric oxidations: Asymmetric synthesis of epoxides, Jacobsen asymmetric epoxidation, Sharpless dihydroxylation.

Asymmetric Aldol reaction, Michael addition and Cycloaddition reactions. Organolithium alkylations of enolates. Chiral Lewis acids, Chiral Organocatalysis.

Octant rule, axial haloketone rule and their applications, correlative methods for configurational assignments, Cram's and Prelog's rules.

Reference Books:

1. Asymmetric Synthesis, A. Aitken, S.N. Kilenyi (Eds), Blackie Academic and Professional. 1994.
2. Principles of Asymmetric Synthesis, R.E. Gawley, J. Aubé, Pergamon, 1996.
3. Asymmetric Synthesis- The essentials, M. Christmann and S. Bräse (Eds), Willey-VCH, 2nd Ed. 2007.
4. Classics in Stereoselective Synthesis, E.M. Carreira, L. Kvaerno, Willey-VCH, 2009.
5. Enantioselective Chemical Synthesis: Methods, Logic and Practice, E.J. Corey, L. Kurti, 2010.
6. Stereoselective Synthesis in Organic Chemistry; Atta-Ur-Rahman, Springer-Verlag N Y, 1994.

**Organic Chemistry
M Sc Semester 3
Elective Courses**

CHE2303OE (2 Credits)

Terpenes, Alkaloids and Natural Pigments

Unit 1

Terpenoids: Classification of *terpenes*, general methods of structure elucidation, isoprene rule, structure elucidation of camphore, β -santonin, abietic acid, zingiberene and squalene. Alkaloids: Classification, occurrence, isolation, nomenclature and physiological action, general methods of structure elucidation and degradation. Structure, stereochemistry and biosynthesis of ephedrine, morphine, cocaine and reserpine.

Unit 2

Natural Pigments: Classification, Chemistry of anthocyanins- Structural elucidation and synthesis of cyanin and pelargonin, Flavanols: quercetin. Carotenes: structure and synthesis of β -carotene, Porphyrins, structures and synthesis of, haemin and chlorophyll.

Reference Books:

1. The Molecules of Nature, J.B. Hendrickson.
2. Chemistry of Natural Products Vol. I to IV, K.W. Bentley.
3. Organic Chemistry, Vol II, I.L. Finar, Pearson Edu India
4. Organic Chemistry of Natural Products, Chatwal Vol. I & II. Himalaya Publs
5. Chemistry of Natural Products, K. Nakanishi.
6. Introduction of Flavonoids, B.A. Bohm, Harwood, Academic Publishers

**Organic Chemistry
M Sc Semester 3
Elective Courses**

CHE2304OE (2 Credits)

Supramolecular Chemistry, Pheromones and prostaglandins

Unit 1

Supramolecular Organic Chemistry: Introduction, host-guest interactions, classification of host-guest compounds, intermolecular forces, nature of supramolecular interactions, molecular recognition, chiral discrimination, molecular receptors and design principles, template effect, biomimetic chemistry, cryptands, cyclodextrins, calixarenes, catenanes and rotaxanes, molecular capsules, molecular self-assembly.

Unit 2

Pheromones: Introduction and applications, total synthesis of 3,11-dimethyl-2- nonacosanone and its 29-hydroxy derivative, grandisol, exobravicomine, frontaline and juvenile hormone. Introduction to plant hormones: structure determination and synthesis of auxins.

Prostaglandins: Introduction. Occurance, nomenclature, classification and physiological effects, synthesis of PGE₂ and PGF_{2α}, biosynthesis and biological importance.

Reference Books:

1. Supramolecular Chemistry J M Lehn, Wiley-VCH
2. Supramolecular Chemistry: J W Steed, J L Atwood; John Wiley 2002
3. Principles and Methods in Supramolecular Chemistry; H-J Schneider, A Yatsimirsky; John Wiley, 2000.
4. The Molecules of Nature, J. B. Hendrickson.
5. Chemistry of Natural Products Vol. I to IV, K.W. Bentley.
6. New Trends in Natural Product chemistry, Atta – Ur- Rahman and M.I. Choudhary, Harwood Publ.

**Organic Chemistry
M Sc Semester 3
Elective Courses**

CHE2305OE (2 Credits)

Bioorganic Chemistry

Unit-1

Enzymes and enzymatic processes: Introduction to enzymes, specificity and regulation, nomenclature, classification, concepts and identification of active sites by the use of inhibitors, mechanism of enzyme action, orientation and steric effects, specific examples of enzyme mechanism for chymotrypsin, ribonuclease and carboxypeptidase A, kinds of reactions catalysed by enzymes, some isomerization and rearrangement reactions, enzyme catalyzed carboxylation and decarboxylation, coenzymes, structure and biological functions of coenzyme A, thiamine pyrophosphate, NAD^+ , NADP^+ , techniques of immobilization of enzymes, applications of immobilized enzymes in food and drink industry

Unit 2

Biosynthesis: Acetate hypothesis, sikimic acid pathway mevalonic acid pathway, biosynthesis of geranyl pyrophosphate and its conversion to α -pinene, thujene, borneol, menthone and carotenes. Biosynthesis of glycine, isoleucine, phenylalanine and tyrosine.

Nucleic acids, structure of DNA and RNA, role and significance of ATP and ADP. Structure and synthesis of peptides. Glycolysis, Crab's cycle & Oxidative Phosphorylation.

Reference Books:

1. Fundamentals of Enzymology, N C. Price, L Stevens, Oxford Uni. Press, N Y 1998
2. Immobilised Enzyme & Cells, A Rosevear, J. F. Kennedy, J M S Cabral. Adam Hilger, 1987. Philadelphia
3. Topics in Enzymes and Fermentation Biotechnology, Alan Wiseman, 1979. Ellis Harwood Ltd. (John Wiley & Sons)
4. Immobilized Enzymes : An introduction and applications in biotechnology M D. Travan. John Wiley.
5. Enzyme structure and mechanism : A Fersht, W.H. Freeman, Natural Products : Chemistry and Biological Significance, J. Mann, R.S. Davidson, D.V. Banthrope and J.B. Harborne, Longman, Essex.
6. Biogenesis of Natural Compounds, P. Bernfield.
7. Biochemistry, A.H. Lehninger
8. Outline of Biochemistry, Cornn and Stump
9. Introduction to Modern Bio-Chemistry, P. Karlson

**M Sc Semester 4
Organic Chemistry**

CHE2401OC (3 Credits)

Photochemistry, Free Radicals, Transition Metals in Synthesis

Unit 1

Photochemistry: Photo induced cis-trans isomerisation in olefins, photochemistry of vision, photochemistry of aromatic compounds and anilides. 1,2-, 1,3 - and 1,4- additions in benzene, photo-Fries rearrangement. Photolysis of nitrite esters; Barton reaction, di- $\square\square$ methane rearrangement, oxa-di- $\square$ -methane rearrangement, singlet oxygen oxygenations.

Unit 2

Free Radical reactions: Methods of generation: Gomberg, photochemical and redox methods. Types of free radical, mechanism at aromatic substrate, reactivity in attacking radicals, free radical substitution reactions, halogenation, oxidation, coupling of alkynes and arylation of aromatics with diazonium salts, Gomberg reaction, Sandmeyer reaction, Pschorr ring synthesis, Hunsdiecker reaction, Hoffmann–Löffler-Freytag reaction.

Unit 3

Transition metal mediated organic synthesis: Metal-ligand complexes, 18 electron rule. Use of palladium: Heck reaction, aromatic palladation, Suzuki coupling, Stille & Kourmada coupling reactions, Sonogashira reaction, Wilkinson's catalysts, Wacker process. Cobalt complexes: Pauson–Khand reaction, Volhardt co-trimerization, hydroformylation using cobalt octacarbonyl.

Use of titanium and ruthenium complexes: Tebbe reagent, Ziegler-Natta catalyst, Grubb's catalyst, olefin, ring closing and ring opening metathesis

Reference Books:

1. Introduction to Organic photochemistry J D Coyle
2. Photochemistry and Pericyclic Reactions; Jagdamba Singh & Jaya Singh; New Age Pubs. II Edn. 2006
3. Photochemistry, Kan.
4. Organic Photochemistry, A. Padwa, CRC Press 1991
5. Elements of Organic Photochemistry, Rohatgi Mukherji.
6. Molecular Reactions and Photochemistry, C.H. Depuy and O.L. Chapman.
7. Modern Molecular Photochemistry, N.J. Turro (1978).
8. Organometallic reagents in synthesis / Paul R. Jenkins
9. Organometallics in organic synthesis / Ei-ichi Negishi

**M Sc Semester 4
Organic Chemistry**

CHE2402OC (3 Credits)

Natural Products Chemistry

Unit 1

Vitamins: Introduction, isolation, structural elucidation, synthesis and biological importance of vitamin-B₆, pyridoxine biological function of pyridoxal phosphate, important; biochemical transformation with mechanism. Vitamin-B₂, FMN, FAD, vitamin-B₁-thiamine, involvement in essential metabolic process with mechanism, acidity of thiazolinium ion. Vitamin-C and its physiological function. Vitamin-K₁ and K₂, vitamin E; α and β -tocopherols.

Unit 2

Chemistry of Steroids: Occurrence, classification and nomenclature, Diel's hydrocarbon, isolation, structure elucidation and synthesis of cholesterol, androsterone, progesterone, estrone and testosterone.

Unit 3

Carbohydrates: Introduction, deoxy and amino sugars. Dissacharides, maltose, sucrose, melibiose and cellobiose. Properties, structural elucidation and synthesis, of sucrose and maltose, inversion of sucrose.

Polysachnarides: Introduction, inulin, glycogen, chitin, pectin. Structural elucidation of cellulose. Cellulose derivatives: rayon, arnel, cellulose nitrate. Structure of starch, occurrence, manufacture and properties of starch, amylose, and amylopectin.

Reference Books:

1. Chemistry of Natural Products Vol. I to IV, K.W. Bentley.
2. Organic Chemistry, Vol II, I.L. Finar, Pearson Edu India
3. Chemistry of Natural Products, Vol. I to IV, K.W. Bentley.
4. Organic Chemistry of Natural Products, Chatwal, Vol. I & II
5. Organic Chemistry of Secondary Plant Metabolism, Geissmann & Crout.
6. The Molecules of Nature, J.B. Hendrickson.

**M Sc Semester 4
Organic Chemistry**

CHE2403OC (3 Credits)

Oxidation- Reduction & Heterocyclic Chemistry

Unit 1

Oxidation: Redox reactions and their mechanism: oxidation of olefins, alcohols, vicinal diols, ketones, aldehydes, oxidative decarboxylation, selective oxidation using reagents such as: oxygen, ozone, osmium tetroxide, lead tetra acetate, selenium dioxide, DDQ, peroxides, per acids, chromium and manganese reagents, DMSO, Swern oxidation, DMDO, TEMPO, Prevost method, ruthenium tetroxide. Oppenauer oxidation.

Unit 2

Reduction: Principles of catalytic hydrogenation and metal hydride reductions, dissolving metal reductions, tri n-butyltinhydride, red aluminium and L and K selectride, selectivity in reductions, regiospecific reduction of alkenes, alkynes, aldehydes and ketones, Meerwein-Ponndorf-Verley reduction, reduction of β,α -unsaturated compounds, epoxides, nitro and nitroso compounds.

Unit 3

Heterocyclic chemistry: Nomenclature, Hantzsch-Widman rules for fused and bridge ring systems. Small ring heterocycles, methods of synthesis and reactions of oxiranes, aziridines and oxetanes. Synthesis of oxazoles, imidazoles, pyrimidines, and their nucleophilic and electrophilic substitution reactions. Synthesis and reactions of indole, benzothiofene and azepine.

Reference Books: Organic Synthetic Reactions, H.O. House, W.A. Benjamin, N.Y. 1972.

2. Compendium of Organic Synthetic Methods. Vol I & III., Harrison and Harrison
3. Reagents in Organic Synthesis, R.O. Norman.
4. Comprehensive Organic Chemistry, D. Barton and W.D. Ollis.
5. Heterocyclic Chemistry J Joule IV Edn. 2000
6. Heterocyclic Chemistry; J A Joule, K Mills, G F Smith; Stanley Thomas Ltd III edn.
7. Chemistry of heterocyclic compounds by A.A. Morten
8. Heterocyclic Chemistry by T.L. Gilchrist, Longman Scientific.
9. Principle of Modern Heterocyclic Chemistry by L.A. Pigniette
10. Heterocyclic compounds by Arun Deb.
11. Principles of modern heterocyclic chemistry L A Paquette W A Benjamin.
12. Modern Heterocyclic chemistry, J Barluenga, J Alwarez-Builla Wiley-VCH 2011.
13. Name Reactions in Heterocyclic Chemistry, J J Li, Wiley(India) 2005

M Sc Semester 4
Organic Chemistry

Practical Courses

CHE2404OC Advanced Organic chemistry practicals-3 (3 Credits)

CHE2405OC Advanced Organic chemistry practicals-4 (2 Credits)

- a) Major estimation: Molecular weight of carboxylic acids, quinine/cinchonine, Kjeldahl Method of Estimation of Nitrogen
- b) Spotting of organic compounds 16-20 Compounds with a variety of Structural Features to be analysed systematically and derivatives to be prepared wherever possible.
- c) Structural elucidation by Interpretation of Spectral Charts.

Examination:1 One of the Major estimations.

Examination 2: a) Organic Spotting and
 b) Structure elucidation from Spectral Chart

**M Sc Semester 4
Organic Chemistry**

**CHE2406OC
Comprehensive Viva Voce Examination (2 Credits)**

Comprehensive Viva voce Examination by Internal and External Examiners at the end of the IV semester.

M Sc Semester 4
Organic Chemistry

CHE2407OC
Dissertation (3 Credits)

Dissertation work. To be evaluated by a panel of internal examiners at the end of the IV semester.

**M Sc Semester 4
Organic Chemistry**

**CHE2408OC
Special Practical and Assignment (3 Credits)**

Preparation of liquid crystalline compounds with varying alkyl chain-3

Thin Layer Chromatography

Column chromatography-3-4 Mixtures Separation

Photosynthesis of benzpinacol

Photosynthesis of anthracene dimer

Microwave synthesis of methyl-phenyl-pyrazolone.

Extraction of piperine from black pepper

Grignard synthesis of alcohol

Extraction and quantitative estimation by Absorption Spectroscopy of Cyanin Chloride from red rose

**M Sc Semester 4
Organic Chemistry
Elective Courses**

CHE2401OE (2 Credits) Dyes and Neuroactive agents

Unit 1

Dyes: Classification, azodyes, methyl orange, naphthol-blue black 6B, tartrazine, bismark brown, congo red, direct deep black, rosanthrene stilbene, and diamond black F. *Triphenyl methane dyes*: malechite green, rosaniline, aniline blue and aurin. *Vat dyes*: Anthraquinone and indigoid dyes, alizarine, cyanin green, indanthrone blue, pyranthrone, benzanthrone, reactive dyes, indigotin, indigosol-O. *Fluorescent dyes*: Tinopal B, Blankophore R

Unit 2

CNS active drugs: a) *Sedatives and hypnotics*: Barbiturates and non-barbiturates, structure activity relationship, mode of action. b) *Anticonvulsants*: Barbiturates, hydantoins, oxadinediones and succinimides, structure-activity relationship. c) *Antianxiety agents*: Meprobamate, mephenoalone, benzodiazepines, diazepam. d) *Antipsychotic agents*: phenothiazines, butyrophenones and haloperidole. e) *CNS Stimulants*: caffeine, theophylline, nikethamide, etamivan, methamphetamine and their mode of action. f) *Hallucinogenic agents*: Mescaline, hermine, ditran, lysergic acid derivatives.

Reference Books:

1. Synthetic dyes Vol. I to VII, K. Venketraman
2. A text Book to synthetic dyes, by O.D. Tyagi and M. Yadav Anmol Publisher
3. Synthetic Drugs, G. R. Chatwal
4. Berger's Medicinal chemistry (Vol. 1-8), VII Edition, J Abraham, Wiley
5. Medicinal Chemistry, Ashutosh Kar, New Age International Publishers.

**M Sc Semester 4
Organic Chemistry
Elective Courses**

CHE2402OE (2 Credits)

Medicinal Chemistry

Unit-1

Drugs and Drug Design Introduction, drug targets, procedure for drug design, pro-drug, concepts of lead compounds, natural sources and synthetic sources, lead modification, structure activity relationship (SAR), quantitative structure activity relationship (QSAR), LD₅₀, ED₅₀, therapeutic index, synthetic considerations, stereochemistry, combinatorial synthesis, computer aided drug design, patenting, manufacture and process development.

Unit-2

Common Drugs:

Antibiotics: Narrow and broad spectrum antibiotics

Sulpha drugs: Introduction, mode of action, prontosil, synthesis and uses of marfanil, silver sulphadiazine, sulphafurazole, succinoyl sulphathiazole, cibazole, phthaloyl sulphacetamide, sulphapyrazine.

Anti-viral agents: Introduction to viruses, difference from bacteria, HIV & AIDS, synthesis and applications of thymidine, idoxy uridine, thiosemicarbozones, methisazone, pyrimidine derivatives, 2-thiouracils, acyclovir,.

Antipyretic-Analgesic-Ani-inflammatory Drugs; Introduction, Synthesis and uses of aspirin with its mechanism of action Ibuprofen, Naproxen novalgin, melubrin, phenylbutazone, phenacetine and paracetamol.

Reference Books:

1. Berger's Medicinal chemistry (Vol. 1-8), VII Edition, J Abraham, Wiley
2. Medicinal Chemistry, Ashutosh Kar, New Age International Publishers.
3. Synthetic Drugs, G. R. Chatwal
4. Instant Notes: Medicinal Chemistry, G. L. Patrick, Viva Books.
5. Medicinal Chemistry: An Introduction; G Thomas; John Wiley.
6. Medicinal Chemistry Principles and Practice, F.D. King, RSC, 1994..

**M Sc Semester 4
Organic Chemistry
Elective Courses**

CHE2403OE (2 Credits)

Spectroscopy and Structural Elucidation

Unit-1

Carbon-13 NMR and 2D NMR: Introduction, Carbon-13 NMR spectroscopy, theory and comparison with proton NMR, range and reference, resolution, multiplicity, off-resonance spectra, broad band decoupling, nuclear Overhauser effect (nOe). nOe signal enhancement, factors influencing carbon shifts, correlation of chemical shift of aliphatic, olefinic, alkyne, aromatic, heterocyclic and carbonyl carbons. Effect of chiral centre on PMR.

Introduction to advanced techniques such as DEPT, two dimensional NMR spectroscopy, COSY, TOCSY, NOESY, HMBC and HMQC and HSQC. .

Unit-2

Combined applications of UV, IR, mass and NMR in structure determination of simple molecules with examples and further application towards structural elucidation, spectral problems and problem solving exercises.

Reference Books:

1. An Introduction to Spectrometric Method of Identification of Organic Compounds Vol I & II , F. Scheinmann, Oxford Pergamon press, (1970.)
2. Application of Absorption Spectroscopy of Organic Compounds ,J.R. Dyer, Prentice Hall of India, (New Delhi, 1964)
3. Organic Spectroscopy, William Kemp, Macmillan Press, London.
4. Spectrometric Identification Organic Compounds, R. M. Silverstein, G.C. Basslerand T.C. Morrill, John Wiley & sons, 6th Edition.(1999).
5. Spectroscopic Methods in Organic Chemistry, D.H. Williams, I. Fleming, Tata McGraw-Hill, 2004.
6. Organic Structural Spectroscopy, J.B. Lambert, H.F. Shurvell, D.A Lightner, R.G. Cooks, Prentice-Hall, 1998.
7. Organic Structures from Spectra, L D Field, S Sternhell, J R Kalman, John Wiley
8. Complete Introduction to Modern NMR Spectroscopy; R S Macomber, Wiley Interscience
9. Basic One and Two Dimensional NMR Spectroscopy; H Friebolin; John Wiley 2004