UNIVERSITY OF MADRAS
DEPARTMENT OF ORGANIC CHEMISTRY
SCHOOL OF CHEMICAL SCIENCES
GUINDY CAMPUS, CHENNAI-600 025
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M. Sc ORGANIC CHEMISTRY SYLLABUS
CHOICE BASED CREDIT SYSTEM (CBCS)

I Semester: Courses Offered by Department of Organic Chemistry

Course Code	Course Title	Core/Elective	Credits
CHE C201	Stereochemistry and Organic Reaction Mechanism	Core	3

Unit I: Stereochemistry (20 h)

Chirality, Symmetry elements, Asymmetric and Dissymmetric chiral molecules. Calculation of number of optical isomers. Stereochemistry of mono and di-substituted cyclopropane, cyclobutane, cyclopentane and cyclohexane. Stereochemistry of tri-substituted cyclopentane, tri-substituted pentane and tetra-substituted hexane. Description of various types of optically active compounds including allenes, cumulenes, spiranes, biphenyls, *trans*-cyclooctene.

Compounds containing two asymmetric centres-Erythro and threo isomers. Conversion of Fischer projection into perspective forms. Erythro and Threo-Inter conversion of Fischer to Sawhorse and Newman projections. Zig-Zag representation of glucose. Interpretation of homotopic, enantiotopic and diastereotopic atoms and faces. Prochiral chiral carbon. R & S nomenclature of simple compounds, allenes, spiranes and biphenyls. Stereospecific and Stereoselective reactions. Asymmetric Synthesis-Crams rule. Conformational analysis of cyclohexane. Conformational analysis of di-substituted cyclohexanes.

Unit II: Aliphatic Nucleophilic Substitution (20 h)

Mechanism of nucleophlic substitution reaction: SN^1, SN^2 and SN^i mechanisms. Solvent and leaving group effects and neighbouring group participation (NGP). Substitution at carbonyl, vinylic and bridgehead system. Substitution with ambident nucleophiles- "O" Vs "C"alkylation. Role of LDA, crown ethers and phase transfer catalysts (PTC) in nucleophilic substitution reactions.

Generation of enolates, enolate selectivity (Kinetic Vs Thermodynamic), alkylation of enolates and stereochemistry of enolate alkylation. Mechanism of ester ester hydrolysis (only BAC^2, AAC^2 and AAL^1). Alkylation of active methylene compounds. Asymmetric alkylation (Evans, Enders and Meyers procedures). Preparation and synthetic utility of enamines, Finkelstein reaction Wurtz coupling.

Unit III Aromatic electrophilic and nucleophilic substitution (20 h)

Aromatic electrophilic substitution: mechanism of nitration, sulfonation, Friedel-Crafts alkylation and acylation reactions. Synthesis of di- and tri-substituted benzenes from benzene or mono-substituted benzenes. Hammett and Hammett-Taft equation. Haworth reaction (for naphthalene), Scholl reaction, Vilsmeier-Haack formylation, Gattermann reaction, Reimer-Tiemann and Bischler-Napieralski reactions.

Aromatic nucleophilic substitution in aryl halids by Meisenheimer complex mechanism and benzyne mechanism. Various methods of benzyne generation and reactions of benzynes (inter and intramolecular). Reactions of aryldiazonium salts. Zeigler alkylation, Vicarious Nucleophlic Substitution (VNS), Chichibabin and Schiemann reactions.

Reference books:

1. Stereochemistry of Organic compounds-E. N. Eliel
2. Stereochemistry and Mechanism through solved problems-Kalsi. A
3. Organic Reactions: Stereochemistry and Mechanism-Kalsi. A
4. Stereochemistry of Organic Compounds-Eliel & Wilen
5. Stereochemistry of Organic Compounds: Principles and Applications-Nasipuri-Eliel & Wilen

6. Organic Chemistry Vol 2: Stereochemistry and the Chemistry of Natural product- I. L. Finar
7. Advanced Organic Chemistry –Jerry March
8. Advanced Organic Chemistry-Part A and B-F. Carey & R. J. Sundberg
9. Advanced Organic Chemistry–Smith & March
10. Organic Chemistry–Clayden, Greeves & Warren
11. Organic Chemistry–M. B. Smith
12. Principles of Organic Synthesis-Norman & Coxon
13. Organic Synthesis-Stuart Warren

Course Code	Course Title	Core/Elective	Credits
CHE C202	Organic Chemistry Practical I	Core	3

I. Single Stage Preparations (50 h)

Preparation of *p*-benzoquinone, 2, 5-ditertiarybutylhydroquinone, 4,6-dimethylcoumarin, dibenzyllidene acetone, 2,4-dinitrotoluene and benzhydrol.

II. Double Stage Preparations (50 h)

Preparation of *p*-bromoacetanilide, *p*-nitroacetanilide, *m*-nitrobenzoic acid, symmetric tribromobenzene and 2,4,6-tribromo iodobenzene

Reference book:

Vogel's Text book of Practical Organic Chemistry

Course Code	Course Title	Core/Elective	Credits
CHE E201	Name Reactions in Organic Chemistry	Elective	3

Unit I

Carbon-Carbon bond formation reactions-Perkin, Knovenagel, Wittig, Wittig-Horner, Vislmeier Haack, McMurray, Glacer, Mannich, Pschorr, Simmons-Smith and Thorpe reactions.

Unit II

Heterocycle forming reactions-Paal-Knorr synthesis of pyrroles; Hantsch synthesis of pyridines, Madelung, Reissert and Bischler synthesis of indole; Skraup, Friedländer , Doebner-Miller and Konard-Limpatch synthesis of quinoline. Pomerantz-Fritsch synthesis of isoquinoline.

Unit III

Name reactions on Substitution and Substituents-Chichibabin reaction, Eschweiler Clark reaction, Polonowski reaction, Reissert reaction, Sommlett reactions, Mitsunobu reaction, Leukart reaction, Bucherer reaction, Willegerodt reaction and Willegerodt-Kindler reaction.

Reference books:

1. Advanced Organic Chemistry –Jerry March
2. Advanced Organic Chemistry-Part A and B-F. Carey & R. J. Sundberg
3. Advanced Organic Chemistry–Smith & March
4. Organic Chemistry–Clayden, Greeves & Warren
5. Organic Chemistry–M. B. Smith

==========End of I Semester==========

II Semester: Courses Offered by Department of Organic Chemistry

Course Code	Course Title	Core/Elective	Credits
CHE C203	Organic Reaction Mechanism	Core	3

UNIT – I: Addition and Elimination reactions (20 h)

Electrophilic addition to carbon–carbon double and triple bonds. Nucleophilic addition to carbon–carbon multiple bonds. Generation and addition of carbenes-Michael addition and Robinson annulation.

Nucleophilic addition to –C=O bond- A study of Mannich, benzoin, Darzen's glycidic ester, Stobbe and Knovenegal condensation reactions-Wittig, Wittig-Horner olefination reaction- Julia & Peterson alkene synthesis.

Elimination reactions: E_1, E_2, E_{1cb} and E_i-elimination. Conformation of mechanism; solvent, substrate, leaving group effects-Saytzeff's *Vs* Hoffman elimination; Chugaev and Cope elimination.

UNIT – II: Molecular Rearrangements and Name reactions (20 h)

A study of mechanism of the following rearrangements: Beckmann, Curtius, Hoffmann, Schmidt, Lossen, Wolff, Pinacol, Wagner Meerwin, Demyanov, Dienone-Phenol, Favorski, Benzidine, Claisen, Cope, Sommlet-Hauser, Pummerer and Von-Richter rearrangements.

A study of the following name reactions: Dieckmann cyclization, Hoffmann-Loffler Freytag reaction, Shapiro reaction, Eschenmoser-Tanabe and Ramburg-Backlund reactions.

UNIT – III: Oxidation and Reduction reactions (20 h)

Oxidation with Cr and Mn reagents; Oxidation with LTA, DDQ and SeO_2; Oxidation using DMSO either with DCC or Ac_2O or Oxalyl chloride; Oxidation using Dess Martin reagent. Hydroxylation of olefinic double bonds (OsO_4, $KMnO_4$); Woodward and Prevost oxidation. Epoxidation using peracids including Sharpless epoxidation, Ozonolysis.

Reduction with $NaBH_4$, $LiAlH_4$, $Li(^tBuO)_3AlH$, DIBAL-H, Red-Al, Et_3SiH and Bu_3SnH; Reduction using selectrides, Birch reduction.

Hydrogenation (homogenous and heterogeneous), hydration of carbon-carbon double and triple bonds.

Asymmetric reduction of carbonyl functions (Corey's procedure).

Reference books:

1. Advanced Organic Chemistry –Jerry March
2. Advanced Organic Chemistry-Part A and B-F. Carey & R. J. Sundberg
3. Advanced Organic Chemistry–Smith & March
4. Organic Chemistry–Clayden, Greeves & Warren
5. Organic Chemistry–M. B. Smith
6. Principles of Organic Synthesis-Norman & Coxon

7. Organic Synthesis-Stuart Warren
8. Modern Organic Synthesis-H. O. House
9. Oxidation in Organic Synthesis-V. K. Ahluwalia

Course Code	Course Title	Core/Elective	Credits
CHE E203	Functional Group Transformation in Organic Chemistry	Elective	3

Unit I-Functional group transformations using oxidizing reagents

Use of Chromium reagents (CrO_3, $K_2Cr_2O_7$, CrO_2Cl_2, PCC, PDC and PFC). Use of Manganese reagents ($KMnO_4$, MnO_2, CTAP). Use of RuO_4, $KBrO_3$, DMSO, NCS, $NaIO_4$, peracids and boranes.

Unit II-Functional group transformations using reducing reagents

Use of $NaBH_4$, $NaCNBH_3$, $LiAlH_4$ and Bu_3SnH; Use of Sn/HCl, Zn/HCl, Hydrazine, Li-NH_3, Na/alcohol, Pd/H_2 and Raney Ni.

Unit III-Functional group transformations using miscellaneous reagents

Use of $SOCl_2$, PBr_3, PPh_3-CCl_4, LiBr, NaI, NBS, PPh_3-X_2, Lawesson's reagent, Mitsunobu reagent, CH_2N_2, $TMSCHN_2$ and Barbier-Weiland degradation. Conversion of aldehyde to ketone and vice versa; Conversion of aldehyde to cyanide, Conversion of cyanide to ester, Conversion of ketone/aldehyde to phenol; conversion of ketone to enone.

Reference books:

1. Advanced Organic Chemistry –Jerry March
2. Advanced Organic Chemistry-Part A and B-F. Carey & R. J. Sundberg
3. Advanced Organic Chemistry–Smith & March
4. Organic Chemistry–Clayden, Greeves & Warren
5. Organic Chemistry–M. B. Smith

==========End of II Semester==========

III Semester: Courses Offered by Department of Organic Chemistry

Course Code	Course Title	Core/Elective	Credits
CHE C601	Physical Methods in Chemistry	Core	4

Unit I (Analytical, Inorganic and Physical Chemistry)

Unit II (Analytical, Inorganic and Physical Chemistry)

Unit III-NMR (Organic Portion: 20 h)

Origin of NMR spectrum-Nuclear spin states – NMR active nuclei – Nuclear magnetic moment–Larmor equation – Absorption of energy and Resonance – Population density of nuclear spin states. Saturation phenomena – Relaxation mechanisms, Bloch equation (only significance and derivation not required). Comparison of CW and FT instrument–Chemical shift - Standards in NMR – Shielding and Deshielding – Factors affecting chemical shift – electronegativity, hybridization, hydrogen bonding - anisotropic effect – double, triple bond, aromatic compounds and carbonyl compounds. Spin-spin coupling – splitting origin and rules – factors affecting coupling constant: cis, trans, gem, ortho, meta, para coupling – exchange with deuterium. Vicinity of the proton, Long range coupling, Karplus equation and curve. ^{1}J, ^{2}J, ^{3}J, ^{4}J and ^{5}J coupling in NMR, order of NMR spectrum. Spin systems: Two interacting nuclei: A_2, AB, AX, AA'BB', dd, pair of doublet, AB quartet. Three interacting nuclei: AMX, ABX, ABC systems (only pattern is required). ^{13}C NMR – difficulties in recording ^{13}C NMR: Homo nuclear and heteronuclear coupling. Decoupling technique: SFORD and Off Resonance decoupled spectrum identification of various types of carbon using ^{13}C NMR. APT & DEPT spectrum (DEPT-45, DEPT-90 and DEPT-135).

^{19}F NMR – Precessional frequency and heteronuclear coupling. Identification of organofluoro compounds (CF_3CO_2Et and CF_3CH_2OH) using NMR. ^{31}P NMR – Chemical

shift and heteronuclear coupling. Identification of organo phosphorus compounds such as $(CH_3)_3P$, $(C_2H_5O)_2P{=}O$ and Ph_3P. P-P bond in NMR.

Unit IV (UV, IR and MS: 10 h)

(Organic Portion only half of the unit and remaining half of unit by Inorganic Chemistry)

Electronic absorption-Beer-Lamberts law, Types of electronic excitation. Chromophore and Auxochrome-Bathochromic and Hypsochromic shift. UV-vis spectra of simple organic compounds such as alkenes, phenols, anilines, carbonyl compounds and 1,3-diketones.

Infrared Spectra: Identification of functional groups in Organic Compounds, Finger print region. Inter and Intramolecular hydrogen bonding

Origin, basics and bloc diagram of Mass spectrum-Various types of Ionization techniques-Stability of Molecular ions, Meta stable ions. Base peaks and Isotope peaks. Fragmentation patterns of organic molecules such as benzenes, phenyl halides, phenols, benzyl alcohols, benzyl halides, aliphatic alcohols, aliphatic as well as aromatic aldehydes, ketones, acids, esters and amides. Fragmentation patterns of aliphatic/aromatic nitro and amine compounds. Fragmentation patterns of heterocyclic compounds (furan, pyrrole and pyridine only). McLafferty rearrangements of organic molecules.

Structural determination of Organic Compounds using UV, IR, NMR and Mass Spectra.

Reference books:

1. Organic Spectroscopy–William Kemp
2. Spectroscopy of organic compounds – P.S. Kalsi
3. Spectrometric identification of Organic compounds-Silverstein, Bassler & Morrill
4. Spectrometric identification of Organic compounds-Silverstein & Webster
5. A complete introduction to NMR Spectroscopy-Roger S. Macomber
6. Organic Spectroscopy Principles & Applications-Jag Mohan
7. Introduction to Spectroscopy-Pavia, Lampman and Uriz

Course Code	Course Title	Core/Elective	Credits
CHE C204	Organic Chemistry Practical II	Core	3

Double Stage Organic Preparations (120 h)

Course Code	Course Title	Core/Elective	Credits
CHE C205	Organic Chemistry Practical III	Core	3

Multi-Stage Organic Preparations (120 h)

Course Code	Course Title	Core/Elective	Credits
CHE E601	Biological Chemistry	Elective	3

Unit I (Organic Chemistry: 20 h)

Studies in Carbohydrates: Hexoses : Glucose and Galactose and amino sugars**;** Disaccharides : Maltose, Sucrose, Cellulose structure**;** Polysacharides : Starch, Cellulose, Glycogen structure**;** Glycoaminoglycans: Hyaluronic acid, Dermatan sulphate, Chondratin Sulphate, Heparin**;** Glyco Proteins: N-Linked and O-Linked glycoproteins

Lipids and Membranes: Molecular structure of lipids. Fatty Acids, TriglyceridesTypes of membrane lipids, Membrane Structure-Fluid Mosaic model of membranes.. Transport in membranes- Passive, Facilitated and Active Transport.

Proteins: Amino acids. Protein structure, Disulphide bond determination. Analysis of N-terminal and C-terminals in a polypeptide. Sanger method, Edman degradation, Enzymatic analysis etc.

Primary, secondary and teritiary structure of proteins. Peptide bond. Synthesis of poly peptides and the importance of protecting groups. Structure of collagen, myoglobin and haemoglobin.

Nucleic Acids: Nucleoside and nucleotide. Nucleo bases and hydrogen bonding. Double helical structure, Types of RNA. Replication of DNA (Semiconservative), Transcription and Translation process. Deciphering of Genetic code.

Unit II-IV (Inorganic, Physical and Analytical Chemistry)

Reference books:

1. **Biochemistry-Zubay**

2. **Biochemistry-Leninger**
3. **Organic Chemistry-John McMurray**
4. Organic Chemistry Vol 2: Stereochemistry and the Chemistry of Natural product- I. L. Finar

Course Code	Course Title	Core/Elective	Credits
CHE E604	Chemistry of Heterocycles & Asymmetric Synthesis	Elective	3

Unit I (20 h)

Five member heterocyles with one heteroatom: Furan, pyrrole and thiophene. Synthesis, reactions including lithiation, aromatic character. Comparative study of their reactivity.

Unit II (20 h)

Five member heterocyles with two heteroatoms: Imidazole, oxazole, thiazole and their benzo analogues-Synthesis, reactivity including lithiation and aromatic character. Comparative study of their reactivity. Isoxazole, isothiazole and pyrazole-Synthesis and reactivity including lithiation. Indole, benzo[*b*]thiophene and benzo[*b*]furan-Synthesis and reactivity including lithiation.

Unit III (20 h)

Six member heterocycles with one heteroatom: Pyridine-Synthesis and reactivity; Pyridine-N-oxide-Synthesis and reactivity; Quinoline and Isoquinoline-Synthesis and reactivity. Pyrimidines and Purines-Synthesis and reactivity (lithiation also included)

Unit IV (20 h)

Selectivity, Resolution-Kinetic resolution reactions, Desymmetrization, Asymmetric Induction, Chiral auxiliary. Generation of Asymmetric synthesis-Substrate-Auxiliary-Reagent and Catalyst Control.

Auxiliary controlled Alkylation of chiral enolates, Evans oxazolidones, chiral hydrozones and chiral imines. Enders RAMP/SAMP and chiral sulfoxide. Asymmetric Diels's Alder reaction, Simmon's-Smith reaction and Aldol reaction.

Asymmetric oxidation [dihydroxylation, epoxidation Sharpless, Jacobsen, Shi] and Asymmetric reduction (Noyori, Corey, Pfaltz)-Boranes reduction.

Reference Books

1. Heterocyclic Chemistry-Joule & Mills
2. Heterocyclic Chemistry-R. K. Bansal
3. Organic Chemistry Vol 2: Stereochemistry and the Chemistry of Natural Product-I. L. Finar
4. Name reactions in heterocyclic Chemistry-Jack Li
5. Organic Chemistry-Clayden & Warren
6. Asymmetric Synthesis-H. B. Kagan
7. Principles of Asymmetric Synthesis-R. E. Gawley & J Aube
8. Asymmetric Catalysis in Organic synthesis-Noyori, R.

==========End of III Semester==========

IV Semester: Courses Offered by Department of Organic Chemistry

Course Code	Course Title	Core/Elective	Credits
CHE C206	**Orbital Symmetry, Photochemistry, Aromaticity and Non-conventional techniques in Organic Synthesis**	**Core**	**4**

Unit I (20 h)

Basic concept of conservation of orbital symmetry, electrocyclic and cycloaddition reactions, correlation diagram, FMO, PMO treatment. Ring closure reaction focusing system such as butadiene, pentadienylanion, pentadienyl cation, allyl anion, allyl cation, hexatriene, heptatrienyl cation, heptatrienyl anion, and octatetraene. Application of electrocyclic reactions in synthesis of terpenes, steroids and alkaloids. Stereoselectivity, regioselectivity, periselectivity and site selectivity in cycloaddition.

1,3-dipolar cycloaddition, click reaction, 2 + 2, 4 + 2, 4 + 4, 6 + 2, and 6 + 4 cycloaddition reactions. Secondary orbital interactions in cycloadditions. Normal and Inverse electron demand Diels-Alder reaction.

Unit II (20 h)

Sigmatropic and Cheleotropic reactions, correlation diagram, FMO & PMO treatment. Hydrogen migration. Carbon migration with symmetric and asymmetric centre. C-C bond migration, Orbital treatment for Cope, Claisen and 2,3-Sigmatropic reaction. Extrusion of CO_2, CO, SO_2 orbital symmetry treatment. Applications of sigmatropic and cheleotropic reaction in organic synthesis. Combination of cheleotropic reaction with cycloaddition.

Unit III (20 h)

Organic photochemistry: Principles of photochemistry, Fate of excited state: Physical and Chemical process; [2 + 2] photochemical cycloaddition; Paterno-Büchi reaction; Photochemistry of cyclohexadienones, Norrish type I & II reactions. Oxidation and reduction reactions: Reaction with singlet oxygen. Selected reactions: Photo Fries, Barton, di-π methane, oxa & aza di-π methane rearrangements.

Unit IV (20 h)

Aromaticity-Study of benzenoid and non-benzenoids compounds in the light of Huckel's rule. Aromaticity of annulenes.

Basic principles of non-conventional techniques: Microwave, Sonication, Ball-milling techniques in organic reaction. Organic reactions in aqueous phase; Ionic liquids and their applications in organic synthesis. Tandem, cascade and domino reactions in organic synthesis. Concept of green chemistry. Atom economy

Reference books:

1. Organic Chemistry Vol 2: Stereochemistry and the Chemistry of Natural product- I. L. Finar
2. Organic Chemistry-Bruice
3. Organic Chemistry-John McMurry
4. Pericyclic Reactions-Suniil Kumar, Vinod Kumar & S. P. Singh

5. Principles of Organic Synthesis-Norman & Coxon
6. Organic Synthesis-Stuart Warren
7. The Logics of Chemical Synthesis-Corey & Cheng

Course Code	Course Title	Core/Elective	Credits
CHE C207	Chemistry of Natural Products	Core	4

Unit I: Alkaloids (20 h)

Total Synthesis of Alkaloids: Preussin, Swainsonine, Horsifiline, Epibatidine, Camptothecin, Ellipticine, Ibogamine and Reserpine (Racemic as well as Chiral Syntheses wherever applicable)

Unit II: Steroids (20 h)

Total Synthesis of Steroids: Androsterone, Testosterone, Estrone, Estradiol, 2-Methoxyestradiol and Progesterone (Racemic as well as Chiral Synthesis wherever applicable)

Conversion of Cholesterol into the above mentioned steroids.

Chiral as well as Racemic synthesis of Prostaglandins PGE_1, PGE_2 and PGE_3

Unit III: Terpenes (20 h)

Total Synthesis of Terpenes: Cedrene, Caryophyllene and Longifolene (Racemic as well as Chiral Synthesis wherever applicable). Menthol, Hirsutene, Capnellene, Silphiperfolene and 5-Oxosilphiperfolene (Racemic as well as Chiral Syntheses wherever applicable).

Unit IV: Biosynthesis (20 h)

Biosynthesis of Alkaloids, Steroids, Terpenes and Prostaglandins

Reference books:

1. Organic Chemistry Vol 2: Stereochemistry and the Chemistry of Natural product-I. L. Finar
2. Advanced Organic Chemistry-Part A and B-F. Carey & R. J. Sundberg
3. Principles of Organic Synthesis-Norman & Coxon
4. Organic Synthesis-Stuart Warren

5. The Logics of Chemical Synthesis-Corey & Cheng
6. Classics in Total Synthesis: K.C. Nicolau & Sorenson
7. Organic Chemistry-John McMurray

Course Code	Course Title	Core/Elective	Credits
CHE E204	Modern Synthetic Methodology and Spectrometric Identification of Organic Compounds	Elective	3

Unit I (15 h)

UV Spectra of organic molecules-Basic concepts-Types of electronic transitions and Substituent and Solvent effects on λ_{max} values of organic compounds. Application of Woodward-Fieser rules for calculation of λ_{max} values of dienes as well as α,β-unsaturated ketones. IR spectroscopy–Position of IR absorption frequencies of organic compounds. NMR Spectrsocopy-Basic concepts-Interpretation of ^{1}H and ^{13}C NMR spectral data of simple organic compounds.

Unit II (15 h)

Interpretation of mass spectral splitting pattern of organic compounds–Determination of structure of organic compounds using UV, IR, NMR and Mass spectral data.

Unit III (15 h)

Synthons (acceptor and donor)-Retrosynthetic analysis, Umpolung, antithesis, chiron. C-C bond forming reactions (alkylation as well as enamine alkylation). Aldol, directed aldol condensation, Michael Additions-Robinson annulations, Cycloaddition methodology in synthesis, Synthesis of cyclic structures.

Unit IV (15 h)

Synthesis of dicarbonyl compounds, Sulfur and Sulfonium ylides and their reactions, C=C bond forming reactions (Wittig, Wittig-Horner, Peterson and Julia olefination). Protective groups in Organic Synthesis

Reference books:

1. Spectrometric identification of Organic compounds-Silverstein, Bassler & Morrill
2. Spectrometric identification of Organic compounds-Silverstein & Webster
3. A complete introduction to NMR Spectroscopy-Roger S. Macomber
4. Introduction to Spectroscopy-Pavia, Lampman and Uriz
5. Organic Synthesis through Disconnection Approach–P. S. Kalsi
6. Organic Chemistry–Clayden
7. Organic Chemistry–M. B. Smith
8. Principles of Organic Synthesis-Norman & Coxon
9. Organic Synthesis-Stuart Warren
10. The Logics of Chemical Synthesis-Corey & Cheng
11. Classics in Total Synthesis: K.C. Nicolau & Sorenson

Course Code	Course Title	Core/Elective	Credits
CHE E603	Novel reagents in Organic Synthesis	Elective	3

Unit I (Organic Chemistry 15 h)

Application of following d & p block elements in organic synthesis: Synthetic utility of Samarium iodide, Ruthenium (Ring Closing Metathesis-RCM) Zirconium (Schwartz's reagent) and Cobalt (Pauson-Khand reaction and Nicholas reaction) in organic synthesis. Asymmetric Reformatsky reaction using Samarium. Homogeneous hydrogenation. Application of Titanium in organic synthesis – Mc Murry coupling. Tin in organic synthesis. Use of Bu_3SnH and Tin mediated carbon-carbon bond formation in the synthesis of cyclic and acyclic molecules.

Unit II (Organic Chemistry 15 h)

Role of Palladium and Nickel catalyst in organic reactions. Both Pd(0), Ni(0) and Pd(II), Ni(II) complexes are included. Typical reaction involving Heck, Negishi, Suzuki-Miyaura, Kumada, _Sonogashira, Stille and Hiyama coupling for the carbon-carbon bond formation. Buchwald-Hartwig coupling for the carbon-heteroatom bond formation reactions.

Unit III (Organic Chemistry 15 h)

Silicon compounds. Use of trimethylsilyl chloride and t-butyldimethylsilyl chloride as a productive group. Use of trimethylsilyl iodide and trimethylsilyl cyanide. Vinylsilanes-Silyl Peterson olefination reaction. Trichloro silane and triethyl silane as reducing agents. Role of trimethylsilyl group in the generation of reactive diene like ortho-quinodimethane. Generation and reactions of α and β silyl-carbanions.

Unit IV (Taught by Inorganic Chemistry 15 h)

Metal carbonyl reactions-substituted metal carbonyls, cis-labilising effect, metal-metal bonded carbonyl and cluster-insertion reaction-CO insertion, CO_2 insertion, SO_2 insertion, methyl migration, phenyl migration, carbon hydrogen bond activation-Oxo reaction, Wacker process and Reppe synthesis-photochemical reaction of metal carbonyls-Chromium, Manganese, Iron, Rhenium and Ruthenium. Oxidative addition-Hydrogen, organic halides.

Reference Books

1. Palladium Reagents and Catalysts-Jiro Tsuji
2. Organic Synthesis-Michael Smith
3. Some Modern Methods of Organic Synthesis-W. Carruthers
4. Transition Metals in the Synthesis of Complex Organic Molecules-Louis S. Hegedus
5. Applications of Transition Metal Catalysts in Organic Synthesis-Brandsma, L., Vasilevsky, S.F., Verkruijsse, H.D
6. Inorganic Chemistry-James E. Huhee
7. Inorganic Chemistry-Keith F. Purcell and John C. Kotz
8. Inorganic Chemistry-Cotton & Wilkinson

==========End of IV Semester==========

Name of the Topic	Name of the Faculty
Stereochemistry, Chemistry of heterocycles, Natural products (Alkaloids & Terpenes), Spectroscopic determination of Organic compounds, NET coaching	Dr. A. K. Mohanakrishnan
Aliphatic nucleophilic substitution, Photochemistry, Aromaticity, Non-conventional techniques in Organic synthesis , Novel reagents in Organic synthesis	Dr. K. Parthasarathy
Oxidation and Reduction, Chemistry of heterocycles, Assymmetric synthesis, Natural products (Steroids & biosynthesis)	Dr. R. Anandhan
Molecular rearrangement and name reactions, NMR spectroscopy, Orbital symmetry	Prof. P. Rajakumar, UGC BSR Faculty Fellow
Aromatic elctrophlic and nucleophlic substitution, Addition and Elimination, Bioorganic Chemistry, Modern synthetic methodology	Prof. R. Raghunathan, Retired Professor