Detailed syllabi: M.Sc II Yr

Semester-III

S.No.	Paper	Name of course	Paper code	Contact Hours per week	Max marks		Total
					Sessionals	End Semester	
1.	Paper-I	Applied Organic Chemistry-I	CY-611	03	30	70	100
2.	Paper-II	Advanced Organic Chemistry-I	CY-613	03	30	70	100
3.	Paper-III	Spectroscopic Analysis-I	CY-615	03	30	70	100
4.	Paper-IV	Chemistry of Natural Products	CY-617	03	30	70	100
5.	Paper-V	Pharmaceutical Chemistry	CY-619	03	30	70	100
6.	Paper-VI	Medicinal Chemistry-I	CY-621	03	30	70	100
7.	Lab work	M.Sc. III Sem.Lab	CY-623P	18	90	210	300

Semester-IV

S.No.	Paper	Name of course	Paper code	Contact Hours per week	Max marks		Total
					Sessionals	End Semester	
1.	Paper-I	Applied Organic Chemistry-II	CY-612	03	30	70	100
2.	Paper-II	Advanced Organic Chemistry-II	CY-614	03	30	70	100
3.	Paper-III	Spectroscopic Analysis-II	CY-616	03	30	70	100
4.	Paper-IV	Bio-Organic Chemistry	CY-618	03	30	70	100
5.	Paper-V	Medicinal Chemistry-II	CY-620	03	30	70	100
6.	Lab work	M.Sc. IV Sem Lab	CY-622P	18	90	210	300

Semester-III

Paper – I (Applied Organic Chemistry-I) [CY – 611]

1. **Heterocyclic Chemistry:**Polyheterocyclic ring systems viz
   (a) Azoles, Oxazoles, Isoxazoles, Pyrazoles, Imidazole ans Thiazole
   (b) Pyrimidines and Pteridines
   (c) Condesed ring systems : Acridine, Quinazoline, Phenothiazine
   (d) Purines : Uric acid, Adenine, Guanine, Caffeine etc.

2. **Organic Reagents:**Preparation, Properties and use of following reagents:Diisopropylamide, Diazomethane, Lithium Aluminium hydride, Ozone, Osmium tetroxide,Potassiumpermanganate, Leadtetracatate, Raney nickel, Sodiumborohydride, N –bromosuccinimide, Dicyclohexylcarbodiimide, Lithium tritert-butyloxyaluminium hydride.

3. **Macromolecules:**Illustration of principles with reference to polymeric materials, Polymer structure and physical properties, Thermoplastic and thermosetting resins, polysaccharides,fibers, rubbers(natural and synthetic),DNA,RNA, Engineering polymers, liquid crystalline polymers, conducting polymer.

References:

1. Reactions and reagents in organic synthesis: O.P.Agarwal, goel publishing house
2. Synthetic organic chemistry: O.P.Agarwal, goel publishing
3. Mechanism in organic chemistry: Peter Syke
4. Advanced organic chemistry: March; Wiley.
5. Synthetic reactions: House.
6. Organic chemistry: R.T Morrison and R.N Boyd P.H. Ltd.
7. Topics in organic chemistry: Fieser & Fieser, Reinhold.
8. Organic chemistry Vol I& II: I.L. Finar, Elbs with Longmann Pub.
9. Polymer Science:V.R. Gowariker, N.V. VIshwanathan & J. Sreedhar, new age International Pvt Ltd.
10. Text book of Polymer Science: Billimayer F.W.,John wiley & Sons

M.Sc. 3th sem.

Paper-II (Advanced Organic Chemistry) [CY – 613]

1. **Pericyclic reactions:**

   Molecular orbital symmetry, frontier orbitals of ethylene, 1, 3 Butadiene, 1,3,5-Hexatriene, allyl system, classification of Pericyclic reactions FMO approach. Electrocyclic Reactions: Conrotatory and disrotatory motions (4n) and (4n+2), allyl systems and secondary effects. Cycloadditions: Antarafacial and suprafacial additions, notation of cycloadditions, (4n) and (4n+2) systems with a greater emphasis on (2+2) and (4+4)-cycloadditions, (2+2)-additions of ketones secondary effects of substitutes on the rates of cycloadditions and chelotropic reactions.

   FMO approach for the explanation of sigma tropic rearrgements under thermal and photochemical conditions. Suprafacial and Antarafacial shifts of H-Sigmatropic shift involving carbon moieties, retention and inversion of configurations, (3-3) and (5-5) sigmatropic rearrangements detailed treatment of Claisen and Cope rearrangements fluxional tautomerism, aza-Cope rearrangements and Barton reaction.

   Organic Photochemistry

   Introduction and principles of photochemistry, singlet and triplet states, dissipation of photochemical energy, photosensitization, quenching, quantum efficiency and quantum yield, photochemistry of carbonyl compounds; Photochemistry of carbonyl compounds $n-\pi$, $\pi=\pi*$ transitions Norrish type I and Norrish type II cleavages, paterno-Buchi reaction , photochemistry of unsaturated olefin systems, Cis-trans isomerization and dimerization hydrogen abstractions, photochemistry of butadiene, di-pi methane rearrangement, De meyo rearrangement.

2. **Rearrangements**

   Favorksii rearrangement, Naber rearrangement, Arndt-Eistrt synthesis, Shapiro reaction, Benzil-benzilic acid rearrangement.

References:

1. Organic Chemistry: R T Morrison and R.N. Boyd, Prentice Hall Ltd.
2. Advanced Organic Chemistry: Jerry March, Wiley
3. Organic Chemistry, Vol-1 &2 , I L Finar, Elbs with Longmann Pub.
4. Fundaments of Photochemistry: K KRohtagi- Mukherjee, Wiley Eastern Ltd.
5. Photo Chemistry: Gurdeep Raj, Goel Publication
6. Organic Chemistry Mechanism: Peter Sykes.
7. Organic Chemistry Vol-1 & 2, J. Singh, LDS yadav, PragatiPrakashan
8. Synthetic organic chemistry: O P Agarwal, Goel Pub.

Paper-III (Spectroscopic Analysis-I) [CY – 615]

1. **Electron Spin Resonance Spectroscopy:** Hyperfine Coupling, spin polarization for atoms and transition metalions, spin-orbit coupling and significance of g-tensors, application totransition metal complexes (having one unpaired electron) including biological systems and to inorganic free radicals such as PH_4, $F_2^-$and $[BH_3]^-$.

2. **Ultraviolet and Visible Spectroscopy:**Various electronic transitions(185-800 nm), Beer-Lambert law, effect of solvent on electronic transition, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes,conjugsted polyenes, Fiber – Woodward rules for conjugated dienes ad carbonyl compounds, ultraviolet spectra of aromatic and heterocyclic compounds, Steric effect in biphenyls.

3. **Infrared spectroscopy:**Instrumentation and sample handling, Characteristic vibrrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (ketones,aldehydes, esters,amides, acids, lactones,lactams and conjugated carbonyl compounds), effect of hydrogen bonding and solvent effecton vibrational frequencies, overtones, combination bands and Fermi resonance, FTIR, IR of gaseous, solids and polymeric materials.

References:

1. Spectroscopy: B. K. Sharma, Goel publishing house.
2. Molecular spectroscopy : Sindhu, TMH Pub Co.Ltd.
3. Instrumental methods of chemical analysis
4. Organic spectroscopy: Kemp, Macmillan publication
5. Spectroscopy of organic compounds: P. S. Kalsi, New Age Interbational Ltd.
6. Spectroscopy Identification of organic compounds: Silverstein, Bassler & Morrill, J. Wiley.
7. Spectroscopy methods in organic chemistry: William & Flemming, TMH Co.Ltd.
8. Organic Spectroscopy: Dyer

Paper – IV (Chemistry of Natural Products)[CY – 617]

1. **Vitamins:** Introduction, Classification and Chemistry of Vitamin A, B_1, B_2, B_6, Folic acid, Vitamin C, D, E, and K

2. **Steroids:** Introduction, classification and chemistry of cholesterol , oecterone, testosterone, androgens & progesterone

3. **Antibiotics:** Introduction, structure of major antibiotics eg penicillin, cephalosporins, tetracyclines, choramphenicol, streptomycin and quinolone antibiotics (ciprofloxacin and norfloxacin)

4. **Lipids:** Fats, oils and waxes, fattyacids, Characterizationand their physic – Chemical properties, Interduction to Phosolipids – Lecithins, Cephalins, Sphingomleins & glycolipids.

References:

1. Organic Chemistry: R.T. Morrison and R.N. Boyd P.H. Ltd.
2. Topics in Organic Chemistry: Fieser and Fieser, Reinhold.
3. Organic Chemistry: Vol. I & II: I.L.Finar, Elbs with Longmann Pub.
4. Natural Products: O.P.Agarwal, goel publishing house

Paper – V (Pharmaceutical Chemistry)[CY – 619]

1. **Basic Principles of medicinal Chemistry:** Introduction, Characteristic of drugs therapeutic index, mechanism of chemotherapeutic action metabolic antagonism with examples.

2. **Principles of Drug Design:** Introduction, relationship between Molecula structure & Biological activity, Physiological properties of Drugs, viz acid base Properties relative acid strength(pKa), Degree of ionization, Water so ubility, of drug, Hydrogen bond, Stereochemistry, & drug action, Optical isomerism & biological activity, geometrical isomerism & biological activity, Bioisosterism and isosteric modification in drug design, (classical & non classical) isosteric modifications, general introduction of QSAR.
   Synthetic procedures for selected drug, uses , structure, Activity Relationship (SAR) including Physicochemical aspects etc.

3. **CNS stimulants:** Nikethiamide, Ethamivan, Benigride, Doxiprarr, Biphenyl ethylanmine derivatives, eg. Amphetamine, Fenfluramine hydrochloride, Chlorophentermine hydrochloride, Phenmetrazinehydrochloride, Caffeine, Theophyline.

4. **Antihelmintics:** Phenolic compounds viz 4 – N Hexyl REsorcinal, Bithional, Piperazine derivatives, Heterazan, Antepar, Thiiabenidazole viz Mintezole.

5. **Anti Spasmodic & antiulcer:** Dicycloamine, Piperidolate(Dactil), Propantheline, Mepiperphenidol, H_2 Receptor antagonist eg Cimetidine & Ranitidine.

References:

1. Medicinal Chemistry: Foye
2. Wilsons & Gisvold's Text Book of Organic, Medicinal& Pharmaceutical Chemistry
3. Medicinal Chemistry (All volumes): Burger
4. Medicinal Chemistry: Ashutosh Kar
5. Medicinal Chemistry: S.N. Singh

Paper –VI (Medicinal Chemistry-I)[CY – 621]

Synthetic procedure for selected drugs, mode of action, structure activity relationship (SAR) Physicochemical and steric aspect etc.

1. **General anesthetics and local anesthetics:**General Anesthetics Ether, ethyl chloride, cyclopropane, vinyl ether, fluoroxene , halothene, nitrous oxide, chloroform, thiopental sodium, thiomylal sodium, hydoxy dione sodium succinate ,fentyle citrate, tribromo ethanol, Paraldehyde, ketamine hydrochloride local anaesthetic :Amino ethyl benzoate, Butamben Orthocain, Procain hydrochloride, tetracaine Aminoethyl benzoate, Butamben, orthocain, procain hydrochloride, tetracain hydrochloride, Butacain sulphate, Cyclomethyl sulphate, lignocain hydrochloride, prilocain hydrochloride, mapivacane hydrochloride, Bupivacane hydrochloride, Pyrrocaine hydrochloride,Isomethaquin hydrochloride.

2. **Opoid analgesics :** Morphene Sulphate, codeine, Dihdro Codeine Phpshate, Levorphenol tartar ate, dextromethorphine hydro bromide, Metazocene, Cycloazocine, Pentazocine, Fentyl citrate, Pethidine hydrochloride, Methadone hydrochloride, Tramadol hydrochloride, Naloxone hydrochloride.

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3. **Antitussives** Benzonatate, Levopropoxyphene Napsylate.

4. **Anticonvulsants:**Phenobarbital, Phenytoin, Ethotoin, Methytoin, Trimethadione, Paramethadione, Phensuximide, Mesusuxinimide, Ethosuximide, Pyrimidone, Phrnacemide,carbamazepine .

5. **Insulin and oral Hypoglycemic agents**: Insulin, Chlorpropamide, Tol butamide ,Phenformin,Metformin

References:

1. Medicinal Chemistry: Foye
2. Wilsons & Gisvold's Text Book of Organic, Medicinal& Pharmaceutical Chemistry
3. Medicinal Chemistry (All volumes): Burger
4. Medicinal Chemistry: Ashutosh Kar
5. Medicinal Chemistry: S.N. Singh

Semester-IV

Paper – I (Applied Organic Chemistry-II) [CY – 612]

1. **Organometallics:** Principles, preparation, properties and applications of following in organic Synthesis with mechanistic details :
   Li. Mg, Hg, Cd and Zn compounds

2. **Pyrones:**Anthocyanines, Flavones, Isoflavones, Flavanones, Depsides, Coumarins,Quinones.

3. **Polyaromatic hydrocarbons:**Introduction, Isolated systems or polyphenyl compounds (diphenly, diphenic acid, Diphenylmethane, triphenylmethane, triphenylcarbinol, trihenylmethyl chloride and hexaphenylethane), condensed ring systems (Naphthalene, Anthracene, Phenanthrene), carcinogenic hydrocarbons.

References:

1. Reactions and reagents in organic synthesis: O.P.Agarwal, goel publishing house
2. Synthetic Organic Chemistry: O.P.Agarwal, Goel publishing
3. Mechanism in organic chemistry: Peter Syke
4. Advanced organic chemistry: March Wiley.
5. Synthetic reactions: House.
6. Organic chemistry: R.T Morrison and R.N Boyd P.H. Ltd.
7. Topics in organic chemistry: Fieser & Fieser, Reinhold.
8. Organic chemistry Vol I& II: I.L. Finar, Elbs with Longmann Pub.
9. Polymer Science: V.R. Gowariker, N.V. Vishwanathan & J. Sreedhar, New Age International Pvt Ltd.

Paper-II (Advanced Organic Chemistry-II) [CY– 614]

1. **Retrochemistry**
   Disconnection approach, basic principles, FGI, synthons and synthetic reagents of organic compounds, guidelines for choosing disconnection, C-X disconnection, two C-X disconnection, one and two group C-C disconnection, Diel's alder reaction.

2. **Green chemistry**
   Introduction, education and need of Green chemistry, Basic principles of green chemistry, prevention or minimization of hazardous products, choice of solvents. Sonochemistry, microwave induced reactions, polymer supported reagents viz. polymer supported per acids, chromic acid, PNBS, polystyrene anhydride, carbodiimide, polymer supported catalysts viz. polystyrene aluminium chloride, polystyrene super acid catalyst, polymer supported photosensitizes, polymer supported PTC, green chemistry in sustainable development.

3. **Commercial polymers**
   Organic polymers: Commercial polymers, synthesis and application of polyethylene, polyvinyl chlorides, polyamides, polyesters, phenolic resins and epoxy resins, Functional polymers: Fire retarding polymers and conducting polymers.

References:

1. New trends in green chemistry: V K Ahluwalia, M. kidwai, Anmaya Pub.
2. Introduction of green chemistry: Albert Matlack, CRC.
3. Organic Chemistry: Disconnection approach: S. Warren, Wiley
4. Organic Chemistry: J. Clayden, oxford university press
5. Workbook for Organic Synthesis: The Discon. Approach: S. Warren, Wiley.
6. Green Chemistry:Gurtu and Gurtu, PragatiPrakashan.
7. A Text book of Polymer Science: F W Billmayer, Wiley
8. Polymer science: V R Gowarikar, New Age Pub.
9. Organic Polymer Chemistry: J. Singh, PragatiPrakashan
10. Organic Chemistry: J. Singh and LDS yadav, PragatiPrakashan.

Paper – III (Spectroscopic Analysis- II)[CY – 616]

1. **Nuclear Magnetic Resonance Spectroscopy:**General Introduction and definition Chemical shift –spine interaction, shielding mechanism. Mechanism of measurement, Chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nucleri (alcohols, phenols, enols, carboxylic acids, amines, amidesand mercapto), chemical exchange, effect of deuteration, complex spin – spin interaction between two, three, four and five nuclei (first order spectra), virtual coupling, stereochemistry, hindered rotation, Karplus curve- variation of coupling constant with dihedral angle, Simplification spectra, nuclear magnetic double resonance, contact shift reagents, solvent effects fourier transform technique.

2. **Carbon – 13 Spectroscopy:**General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), coupling constants.

3. **Mass spectroscopy:**Introduction ion production – EI, CI, AND FAB, factors affecting fragmentation, ion analysis, ion abundance, mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement, nitrogen rule, high resolution mass spectroscopy, Example of mass spectral fragmentation of organic compounds with respect to their structure determination.

References:

1. Spectroscopy: B. K. Sharma, Goel publishing house.
2. Molecular Spectroscopy : Sindhu, TMH Pub Co.Ltd.
3. Instrumental methods of chemical analysis
4. Organic spectroscopy: Kemp, Macmillan publication
5. Spectroscopy of organic compounds: P. S. Kalsi, New Age Interbational Ltd.
6. Spectroscopy Identification of organic compounds: Silverstein, Bassler & Morrill, J. Wiley.
7. Spectroscopy methods in organic chemistry: William & Flemming, TMH Co.Ltd.
8. Organic Spectroscopy: Dyer

Paper – IV (Bio-Organic Chemistry)[CY – 618]

1. **Adrenergic Harmones & Drugs:** Adrenoreceptor agonist and SAr of Adrenomimetics, Main Clinical use of adrenoreceptor – Bronchodialatorsviz Salbutamol, ISoprenatine, Ephedrine, Adrenaline.

2. **Anti Histaminics:** H_1 receptor antagonists, Mepyramine, Thionylamine, Zolamine, Carbionxamine, Doxylamine, Propylamine derivates viz Pheniramine maleate. Chloropheniramine maleate, unsaturated derivatives eg. Triprolidine7 Prrobutamine.

3. **Autocoid:** Ephedrine, Epinephrine, Isoprenaline, Methoxamine Hydrochloride, Metaraminol, Oxymetazoline, phenylpropylamine hydrochloride.

4. **Nonsteroidal Antilnflammatory Drug:** Hetero art acetic analogues viz Indomethacin, Tolwetin, Aryl acetic acid analogues eg Ibuprofen, Naphthalene acetic acid analoges viz Naproxan, Anthranilic acis analogues eg. Mefenamic acid & Flufenamic acid, Pyraziles eg. Phenyl butazones & Oxyphenbutazones, SAlicy;ic acid analogues eg. Aspirin, P – amino Phenol Anologues eg, Paracetamol.

5. **Diuretic agent:** Thiazide, Chlorothiazide, Benzthiazide, Cyclothiazide, Hydro chlorthiazide, Methyclothiazide, Trichlor Methiazide, Bendriflumothiazide

References:

1. Medicinal Chemistry: Foye
2. Wilsons & Gisvold's Text Book of Organic, Medicinal& Pharmaceutical Chemistry
3. Medicinal Chemistry (All volumes): Burger
4. Medicinal Chemistry: Ashutosh Kar
5. Medicinal Chemistry: S.N. Singh

Paper –V (Medicinal Chemistry-II)[CY – 620]

1. **Antiperkinsonism drugs:** Biperden hydrochloride, hydrochloride cyycrimine hydrochloride, Trihexyl Phenidyl hydrochloride, Procyclidine hydrochloride,Benzotropine Napslate, ethopropazine hydrochloride, L-Dopa.

2. **Cardiovascular drugs:**Hydralzine hydrochloride, Methyl dopa Captopil, Diazoxide, Quinidine, Sulfate, Diisopyramide, Lorcainide, Procainamide, Propanol, BretyliumTosylate

3. **Antineoplastic agents:**Mechlorethamine hydrochloride, Mephalan, Chlorambucil, Busulfan,triethyenemelamine, Carmustin Lomustin, Methotrexate, Mercaptopurin, Cytrabin, Vinblastineand,Vincrirstin(Only activity),Pipobroman, Testolactone

4. **Thyroid and antithyroid drugs:** Thyroxine ThioImidazoles, Methylthiouracil & Propyl thiouracil.

5. **Diagnostic agents:** Iopanoic acid, indigotin,Disulphonate Sodium, Evan blue, Fluorescein Sodium.

References:

1. Medicinal Chemistry: Foye
2. Wilsons & Gisvold's Text Book of Organic, Medicinal& Pharmaceutical Chemistry
3. Medicinal Chemistry (All volumes): Burger
4. Medicinal Chemistry: Ashutosh Kar
5. Medicinal Chemistry: S.N. Singh