P.B.SIDDHARTHA COLLEGE OF ARTS & SCIENCE
DEPARTMENT OF CHEMISTRY
M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
III SEMESTER

Paper Code & Title: 22CH3T1: ORGANIC SPECTROSCOPY

No. of hours per week: 04 **Total credits: 04**
Total marks: 100 **(Internal: 30 M & External: 70M)**

Course: Organic Spectroscopy (code 22CH3T1)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	Memorize the basic principles and theory involved in molecular absorption spectroscopy.	2,7
2	Comprehend the advanced concepts of molecular absorption spectroscopy.	1,2,5
3	Apply the knowledge of spectroscopy in establishing the structure of organic molecules.	1,5,7
4	Analyze the spectral data to ascertain the structure of unknown molecules.	1,4,2

UNIT- I

UV- Visible Spectroscopy:

Mechanics of measurement – Energy transitions – Simple chromophores – Auxochrome, Absorption shifts (Bathochromic shifts, Hypsocromic shift, Hyper chromic shift, Hypo chromic shift). UV absorption of Alkenes – polyenes, unsaturated cyclic systems .

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 λmax values for simple molecules using Woodward -Fieser rules.

UNIT – II

IR Spectroscopy:

Mechanics of measurement – Fundamental modes of vibrations -Stretching and bending vibrations – Factors effecting vibrational frequency-hydrogen bonding.

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 (1HNMR – First Order PMR):

Introduction:Nuclear spin- Basic principle of -NMR - nuclear resonance –saturation-Larmor's frequency-Relaxation- Instrumentation(Cw and FT) 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

Mass Spectrometry I

Introduction- ionization methods-EI, CI, ES, MALDI and FAB – advantages and disadvantages-molecular ion peak and its importance, meta stable peak, Nitrogen rule and extension of nitrogen rule. Determination of Molecular weight and determination of molecular formulae- Isotopic Peaks-Identification of single chlorine atom and double chlorine atom single bromine atom and double bromine atoms in organic compounds. Instrumentation.

UNIT – V

Mass Spectrometry II

Fundamental fragmentation process- Stevenson's rule- radical site initiated cleavage-charge site initiated cleavage- two bond cleavage- Retrodielalder cleavage- Mc-Lafferty rearrangement and other cleavages. Mass spectral fragmentation of alkanes, cycloalkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, phenols, thiols, ethers, carbonyl containing compounds (Aldehydes, ketones, esters and carboxylic acids), nitrogen compounds, alkyl chlorides and alkyl bromides, Examples of mass spectral fragmentation of organic compounds with respect to their structure determination.

Text books/ Reference 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, 6th Ed. John Wiley and Sons.
3. Spectroscopic methods in organic chemistry - D. H. Williams and I. Flemming Mc.Graw 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.

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DEPARTMENT OF CHEMISTRY
M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
III SEMESTER

Paper Code & Title: 22CH3E1: ORGANIC REACTION MECHANISM

No. of hours per week: 04 **Total credits: 04**
Total marks: 100 **(Internal: 30 M & External: 70M)**

Course: Organic Reaction Mechanism (code 22CH3E1)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Acquire sound knowledge of oxidations, reductions, molecular rearrangements, pericyclic reactions and photo chemistry.	2
2	Understand the concepts involved in oxidations, reductions, molecular rearrangements, pericyclic reactions and photo chemistry.	1,7
3	Apply the conceptual knowledge gained in oxidations, reductions, molecular rearrangements, pericyclic reactions and photo chemistry in chosen fields.	1,5,6
4	Analyse and categorise the various types oxidations, reductions, molecular rearrangements, pericyclic reactions and photo chemistry in a given reactions.	1,7,4

UNIT-I

Oxidations

Definition and types of Oxidations, oxidations with ruthenium tetroxide, NBS, iodobenzenediacetate, Tl(III) nitrate, Chromium (VI) oxidants, Lead tetra acetate, SeO_2, MnO_2, Ag_2CO_3, Oppenauer oxidation, perhydroxylation using $KMnO_4$, OsO_4, HIO_4, oxidation with iodine silver carboxylate (Woodward and Prevost conditions), Definition & mechanism of epoxidation by peracids.

UNIT-II

Reductions

Definition and types of reductions, reduction by dissolving metals - Reduction with metal and liquid ammonia (Birch Reduction of aromatic compounds), Reduction with metal acid - Clemensons reduction, Reduction by hydride transfer reagents, Aluminium alkoxide - Meerwein Pondorf Verley Reduction, $LiAlH_4$, $NaBH_4$, Diisobutylaluminium hydride(DIBAL), Sodium cyano borohydride, trialkyl borohydrides, Reduction with diimide,. Wolff-Kishner reduction.

UNIT-III

Molecular Rearrangements

Migration to electron deficient carbon atom**.** Pinacole-Pinacolone rearrangement, Wagner-Meerwein rearrangement, Dienone-Phenol rearrangement, Benzil-Benzilic acid rearrangement, Favorski rearrangement Arndt Eistert rearrangement, Sommelet – Hauser rearrangement.

Migration to electron deficient hetero atom:.Wolf, Hofmann, Curtius, Lossen, Schmidt, Beckmann rearrangement, Baeyer-Villiger rearrangement, Stevens, Neber rearrangements. Fries, Fischer-Hepp, Orton, Bamberger, Dakin, Cumene Hydroperoxide rearrangement.

UNIT-IV

Pericyclic Reactions – I:

Definition, classification of pericyclic reactions, Molecular Orbital energy level diagrams, electronic configuration in ground and first excited states of Ethylene, 1,3-Butadiene, 1,3,5 – Hexatriene, allyl system, stereo chemical notations – suprafacial, antarafacial, conrotatory and disrotatory modes, Woodward and Hoffmann selection rules.

Electrocyclic reactions: Mechanism, Stereochemistry of (4n) and (4n+2) π systems. PMO, FMO and correlation methods.

Cyclo additions: Mechanism, stereochemistry of (2+2) and (4+2) π systems, PMO, FMO and correlation methods.

Sigmatropic rearrangements: Classification, mechanism for FMO and PMO approach under thermal and photo chemical conditions. (Detailed treatment of Claisen, Cope rearrangements fluxional molecules, aza-cope rearrangements).

UNIT-V

Photochemistry:

Photochemical processes: Energy transfer, sensitization and quenching. Singlet and triplet states and their reactivity. Photochemistry of olefins – conjugated olefins, Aromatic compounds– isomerisation–additions. Photochemistry of carbonyl compounds – Norrish type I and II reactions – Paterno – Buchi Reaction.

Photoreduction, Photochemical rearrangements–Photo Fries rearrangement, Di-π-methane rearrangement.

Reactions of unactivated C – H bonds: The Hoffmann Loffler freytag reaction, Barton reaction, photolysis of organic nitrites, photolysis of N – nitrosoamides.

References:

1. Molecular reactions and Photochemistry by Charles Dupey and O. Chapman, Prentice Hall.
2. Reaction mechanism in organic chemistry. 3rd edition, S.M.Mukherji & singh.
3. Advanced Organic Chemistry-Reactions, Mechanisms and Structure, Jerry March, John Wiley and sons, 6th edition.
4.. Advanced Organic Chemistry, F.A. Carey and R.J Sundberg, Plenum.
5. Modern methods of organic synthesis, Cambridge University press, 3rd edition, W.Carruthers.
6. Organic Reaction Mechanisms, V.K.Ahluwalia, 4th edition, Narosa.
7. Reactions, rearrangements and reagents.S.N.Sanyal,4th edition.
8. Organic Photo chemistry and Pericyclic reactions' M.G.Arora Anmol Publications Pvt. Ltd.
9. Fundamentals of Photochemistry by K.K.Rohatgi–Mukherjee New Age international publishers.

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DEPARTMENT OF CHEMISTRY
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III SEMESTER

Paper Code & Title: 22CH3E2: ORGANIC SYNTHESIS

No. of hours per week: 04 **Total credits: 04**
Total marks: 100 **(Internal: 30 M & External: 70M)**

Course: Organic Synthesis (code 22CH3E2)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the concepts, principles and theories related to formation of C – C single bond, C – C double bond, Diel's Alder related reactions. Protecting groups and disconnection approach in organic synthesis.	2
2	Understand the role and significance of formation of C – C single bond, C – C double bond, Diel's Alder related reactions. Protecting groups and disconnection approach in organic synthesis.	1,7
3	Apply the conceptual knowledge gained in formation of C – C single bond, C – C double bond, Diel's Alder related reactions. Protecting groups and disconnection approach in organic synthesis as and when required.	1,6,4
4	Analyze the role of various reagents in carrying out the organic reactions like formation of C – C single bond,C – C double bond, Diel's Alder related reactions.Protecting groups and disconnection approach in organic synthesis.	1,3,5

UNIT-I

Formation of carbon-carbon single bonds:

Alkylation of relatively acidic methylene groups, alkylation of ketones, alkylation of enolates, enamine and related reactions, umplong (dipole inversion).

Allylic alkylation of alkenes, alkylation of α-thiocarbanions- α-selenocarbanions, formation of carbon carbon single bonds by the addition of free radicals to alkenes, synthetic applications of carbenes and carbenoids.

UNIT-II

Formation of carbon-carbon double bonds

Pyrolytic syn elimination reactions sulphoxide-sulphenate rearrangement, synthesis of allyl alcohols, the witting reaction, alkenes from sulphones, decarboxylation of β-lactones, alkenes from aryl sulphonyl hydrazones, claisen rearrangement of allyl vinyl ethers.

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

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 and furans.

Intra molecular Diels –Alder reactions, stereochemistry and mechanism of Diels – Alder reaction, retro Diels – Alder reaction, catalysis by lewis acids, photosensitized Diels- Alder reactions and 1,3-dipolar cycloaddition reactions, the ene reaction.

UNIT-IV

Disconnection approach

Introduction to Retro-synthetic analysis, Disconnection approach with suitable examples, Definitions: FGI, Disconnection, synthons, synthetic equivalent, reagent, target molecule, General

strategy: choosing a disconnection, greatest simplification, symmetry, high yielding steps, recognizable starting materials.

Chemo, regio and stereo selectivity with examples. One group C-C disconnections-Alcohols, carbonyl compounds, alkene synthesis, two group disconnections: 1,3 – dicarbonyl compounds, α,β – unsaturated carbonyl compounds.

UNIT-V

Protecting groups:

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

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

References:

1. Modern methods of Organic synthesis , W. Carruthers Cambridge Press (3rd edition)
2. Principles of Organic synthesis by, ROC Norman, 3rd edition, CRC press.
3. Modern Method of Organic Synthesis ,Carruthers and Coldham Sachinkumar Ghosh, Canbridge New Central Book Agency,1st edition.
4. Advances in Organic Reaction mechanism and structure, J. March, 6th edition, McGrew Hill
5. Organic Synthesis: Ratna kumar kar, vol – II, NCBA Publications.

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III SEMESTER

Paper Code & Title: 22CH3E3: NATURAL PRODUCTS

No. of hours per week: 04 **Total credits: 04**
Total marks: 100 **(Internal: 30 M & External: 70M)**

Course: NATURAL PRODUCTS (code 22CH3E3)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the concepts related to Alkaloids, Terpenoids, Steroids, Flavonoids and Isoflavonoids and Pigments.	2
2	Understand the chemical role of Alkaloids, Terpenoids, Steroids, Flavonoids and Isoflavonoids and Pigments.	1,7
3	Execute the conceptual knowledge gained in the areas of Alkaloids, Terpenoids, Steroids, Flavonoids and Isoflavonoids and Pigments.	1,6
4	Analyze the role of methods involved in structure elucidation of Alkaloids, Terpenoids, Steroids, Flavonoids and Isoflavonoids and Pigments.	1,7

UNIT-I

Alkaloids: Introduction, Definition, occurrence, role of alkaloids in plants, classification, isolation and general methods for structural elucidation of alkaloids. Structure elucidation and synthesis of Morphine, Quinine, Ephedrine and Nicotine.

UNIT-II

Terpenoids: Introduction, Definition, nomenclature, classification, isolation, isoprene rule and general methods for structural elucidation of Terpenoids. Structure elucidation and synthesis of Zingiberene, farnesol and α - Terpeneol.

UNIT-III

Steroids: Introduction, Definition, nomenclature, classification. Occurrence, isolation, physiological action, structure elucidation and synthesis of Cholesterol, Androsterone, Progesterone, and Testosterone.

UNIT-IV

Flavonoids and Isoflavonoids: Introduction, Definition, classification, isolation, physiological action, structure elucidation and synthesis of Kaempferol and Quercetin.

UNIT-V

Pigments: Introduction, classification of natural pigments, introduction and classification of carotenoids, functions of carotenoids in plants and animals, structure and synthesis of α – carotene and β – carotene.

References:

1. Organic Chemistry, Vol:2, I.L.Finar, 5th Edition.
2. Chemistry of Natural Products,K.W.Bentley
3. ChemistryofNaturalproductsbyP.S.KalsiKalyaniPublishers.1983, low cost university edition.
4. Chemistry and physiology of alkaloids by Manske Vol.I&II, VII

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M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
III SEMESTER

Paper Code & Title: 22CH3E4: ASYMMETRIC SYNTHESIS, PHOSPHORUS & SULPHUR REAGENTS, SYNTHETIC POLYMERS, BIOMOLECULES & BIO ORGANIC CHEMISTRY

No. of hours per week: 04 **Total credits: 04**
Total marks: 100 **(Internal: 30 M & External: 70M)**

Course: ASYMMETRIC SYNTHESIS, PHOSPHORUS & SULPHUR REAGENTS, SYNTHETIC POLYMERS, BIOMOLECULES & BIO ORGANIC CHEMISTRY (code 20CH3T3B)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the concepts of asymmetric synthesis, formation of carbon double bond, synthetic polymers, biomolecules and bio inorganic chemistry.	1,2,4,7
2	Comprehend various organic synthesis.	1,2,4,7
3	Apply the conceptual knowledge gained in determining the mechanism involved in asymmetric synthesis, as well as reactions involving various reagents.	1,2,7
4	Analyse as to how far various reagents are useful in carrying out asymmetric synthesis and other organic reactions.	1,3,4
5	Evaluate the role of various reagents in asymmetric synthesis and other organic reactions.	1,2,6,7

UNIT – I

Asymmetric Synthesis

Topocity - Prochirality- Substrate selectivity - Diastereoselectivity and enantioselectivity-Substrate controlled methods-use of chiral substrates - examples

Auxiliary controlled methods-Use of chiral auxiliaries-Chiral enolates-alkylation of chiral imines – Stereoselective Diels-Alder reaction

Reagent controlled methods-Use of chiral reagents-Asymmetric oxidation-Sharpless epoxidation-Asymmetric reduction-Use of lithium aluminium hydride and borate reagents.

UNIT – II

Phosphorus Reagents

Formation of carbon-carbon double bonds-Functional group transformations – deoxygenation reactions-reactivity as electrophiles- conversitoon of alcohols to alkyl halides, Witting reaction and nucleophiles - Corey-Winters reaction, Michaelis-Arbusov reaction-Perkow reaction and Mitsnobu reaction.

Sulphur Reagents- Sulphur ylides, stabilized and non-stabilized – Preparation and reactivity Pummerer reaction – sulphonyl carbanions-Julia reaction.

UNIT – III

Synthetic Polymers

Polymer Reactions-Addition and condensation polymerization processes- Bulk, Solution, Suspension and Emulsion polymerization.

Stereospecific Polymers-Preparation and significance- classification of polymers based on physical properties-Thermoplastics-Thermosetting plastics-Fibers and elastomers- General applications.

Preparation of Polymers-Preparation of Polymers based on different types of monomers Industrial applications-olefin polymers-Diene polymers-nylons-Glyptal resins-Urea-formaldehyde, phenol-formaldehyde and melamine resins- Epoxy resins - Ion exchange resins.

UNIT – IV

Biomolecules

Peptides and Proteins-Methods of peptide synthesis, sequence determination, structure of oxytocin, proteins-classification, structure, conformation and properties. Nucleic acids- Nucleosides,

Nucleotides, DNA and RNA, structure and conformations, replication, translation of genetic material, genetic code, gene expression, gene mutation, protein synthesis.
ons, replication, translation of genetic material, genetic code, gene expression, gene mutation, protein synthesis.

UNIT – V

Bioorganic Chemistry

Carbohydrates: Structure and biological functions of mucopolysaccharides, glycoproteins, and glycolipids- Role of sugars in biological recognition- Blood group substances

Enzymes: Nomenclature and classification, properties, factors affecting enzyme catalysis, enzyme inhibition- reversible and irreversible inhibition. Uses of enzymes in food drink industry and clinical laboratories.

References:

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
2. Polymer Chemistry by V.R.Goweriker, N.V.Viswanathan, Jayader Sreedhar, New Age International (P) Limited, Publishers.
3. Advanced Organic Chemistry, F.A. Carey and R.J Sundberg, Plenum.
4. Principles of Organic Synthesis, R.O.C. Norman and J.M Coxon, Blackie
5. Structure and Mechanism in Organic Chemistry C.K.Inglod, Cornell University Press.
6. Modern Synthetic Reactions, H.O. House, W.A. Benjamin.

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III SEMESTER

Paper Code & Title: 22CH3E5: Retro Synthetic Analysis

No. of hours per week: 04 **Total credits: 04**
Total marks: 100 **(Internal: 30 M & External: 70M)**

	Course: Retro Synthetic Analysis (code 22CH3E5)	
S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	Understand the basic concepts of Retro synthetic analysis	1,7
2	Apply the knowledge of Retro synthetic analysis in designing new synthetic strategies	1,4,6
3	Analyse the approach of Retro synthetic analysis are useful in designing the synthesis.	1,5,7
4	Evaluate whether the synthetic route will result in the desired product or not.	1,5,6,3
5	Memorize the basic concepts related Retro synthetic analysis.	2,7

UNIT-I

Disconnection Approach – Principles : Introduction, Terminology:
Retrosynthesis, Target Molecule (TM), synthon, synthetic equivalent,functional group interconversion (FGI). Linear and convergent synthesis. Criteria for selection of target. Order of events in retro synthesis with reference to Salbutamol, Proparcaine and Dopamine. Chemoselectivity, Regioselectivity, reversal of polarity and cyclizations.

UNIT-II

C-X disconnections:
one group C-X disconnections (Carbonyl derivatives, ethers, sulphides and alcohols), Two group C-X disconnections (1,1-difunctionalised, 1,2- difunctionalised and 1,3 - difunctionalised compounds), Control in carbonyl condensations, selective organic transformations: chemoselectivity, regioselectivity, stereoselectivity, enentioselectivity, cyclization reactions, amine synthesis.

UNIT-III

C-C Disconnections One group C-C Disconnections:
Alcohols and carbonyl compounds (1,1-C-C, 1,2-C-Cand 1,3-C-C), Alkene synthesis,use of acetylenes and aliphatic nitro compounds in organic synthesis. Two group C-C Disconnections: Diels-Alder reactions, 1,3 difunctionalized compounds and α, β-unsaturated compounds, controlin carbonyl condensations, 1,5 difunctionalized compounds, Michael addition.

UNIT-IV

Protecting Groups :
Protection and deprotection of hydroxyl, carbonyls, amines, carboxylicacids, alkenes and alkynes

UNIT-V

Ring Synthesis Introduction to ring synthesis, saturated heterocycles, synthesis of three, four, five and six membered rings and their fused anologs, Robinsonannelation.

Course outcome: Students opting this course will have through knowledge on retrosynthesis and designing organic synthesis making use of retrosynthetic analysis.

Reference Books:

1. Organicsynthesesviaboranes/HerbertC.Brown;withtechniquesbyGaryW. Kramer,
2. AlanB.Levy,M.MarkMidland.NewYork:Wiley,1975
3. Some Modern Methods of Organic Synthesis W. Carothers, Third Edition, Cambridge University Press, Cambridge, 1988.
4 .Organic Synthesis: The disconnection approach, S. Warrant John Wiley & sons, NewYork, 1984.
5. ModernSyntheticReactions,HerbertO.House,SecondEdition,W.A.Benzamine Inc. Menio Park, California, 1972.
6. PrincipleofOrganicSynthesis-R.O.C.NormanandJ.M.Coxon.(ELBS)
7. OrganicSynthesis:Specialtechniques.V.K.AhulwaliaandRenuAggarwal.
8. OrganicSynthesisbyCWillisandMWillis 9. Problemsonorganicsynthesisby StuartWarren

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III SEMESTER

Paper Code & Title: 22CH3E6: ENVIRONMENTAL CHEMISTRY AND ANALYSIS

No. of hours per week: 04 **Total credits: 04**
Total marks: 100 **(Internal: 30 M & External: 70M)**

Course: ENVIRONMENTAL CHEMISTRY AND ANALYSIS (code 22CH3E6)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the concepts of environmental and its analysis.	1,3
2	Understand the basic significance of segments of environment and soil erosion, soil fertility as well as soil analysis	1,2,4
3	Apply the knowledge of environmental chemistry in addressing the present environmental conditions.	1,2,6
4	Analyse different problems related to environmental issues.	2,4,7
5	Evaluate that how far the existing solutions related to environmental issues can be useful to overcome the novel problems of environment.	1,6,4

UNIT- I

Significance of basic segments of Environment-Nomenclature in the study of Environmental Chemistry., SOIL CHEMISTRY & POLLUUTION STUDIES: Principles of weathering-effect of temperature, water, air, plants and animals on weathering., Soil formation/development-factors affecting soil development-physical properties of soil; soil colloids-ion exchange proerties.,Soil fertility, productivity- Soil nutrients-micro and macro.

UNIT- II

STUDY OF WATER POLLUTION AND MONITORING AND TREATMENT METHODS OF WATER POLLUTANTS: Hydrosphere-water resources-hydrological cycle-unique properties of water- water quality parameters., Pollution from Domestic water ,industrial, agricultural, solid waste, shipping, radioactive waste & thermal pollution , Effect of specific pollutants like mercury, lead, arsenic, selenium, nitrates, oil.,

Unit- III

Effects of soaps, detergents, pesticides, hydrocarbon with regard to water pollution: Techniques of water treatment-Primary, secondary and tertiary methods-use of coagulants-flash distillation-solar stills, ion exchange reverse osmosis, electro dialysis.

UNIT -IV

STUDY OF AIR POLLUTION AND MONITORING AND TREATMENT METHODS IN CASE OF AIR POLLUTION: Atmospheric sources and emission of air pollutants-carbon monoxide-sulphur ,oxides-oxides of nitrogen,organic pollutants and photo chemical smog-particulates-acid rain and radioactive substances. Continuous monitoring of air pollutants-Principles,Monitoring instruments,monitoring of sulphur dioxide,hydrogen sulphide,oxides of nitrogen, oxides of carbon, hydrocarbons, ozone and suspended particulate matter and radioactive substances.

UNIT-V

ENVIRONMENTAL CHEMICAL ANALYSIS: Analysis of soil: Sampling,determination of moisture,total nitrogen, phosphorus, silicon, lime, humus, nitrogen, alkali salts., Analysis of water samples : Dissolcved oxuygen,Chemical oxygen demand ,Biological oxygen demand,Phosphates,nitrogen compounds.analysis of metalic constitutents, Analysis of Air samples: carbon mono oxide,carbon dioxide,sulphur dioxide,hydrogen sulfide,oxides of nitrogen,ammonia,ozone, hydrocarbons and aromatic hydrocarbons.,

SUGGESTED BOOKS:

1.Environmental Chemsitry by A.K.De, Wiley Eastern Limited, New Delhi
2.A Text Book of Environmental Chemistry by O.D.Tyagia and M.Mehra-Anmol Publicaitons,
3.Environmental Pollution Control and Engineering by C.S.Rao , Wiley Eastern Limited,
4.Environmental Chemistry by P.S.Sindhu,-New Age International Publishers
5.A Text Book of Environmental Chemistry and Poolution Control by S.S.Dara ,S.Chand & Co
6.Environmental Pollution Analysis by S.M.Khopkar, Wiley Eastern Limited, New Delhi
7.Aanalytical Agricultrual Chemistry by S.L.Chopra & J.S.Kanwar -- Kalyani Publishers
8.Mannual of soil, plant, water and fertilizer analysis, R.M.Upadhyay and N.L 5harma, Kalyani Publishers, New Delhi
9. Environmental Chemistry by B.K.Sharma- Goel Publishing House, Meerut.
10.Soil Chemical Analysis by M.L.Jsackson,Prentice-Hall India Pvt Ltd, New Delhi

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III SEMESTER

Paper Code & Title: 22 OECH 301 : POLYMER CHEMISTRY

No. of hours per week: 03 **Total credits: 03**
Total marks: 100 **(Internal: 30 M & External: 70M)**

	Course: POLYMER CHEMISTRY (code 22OECH 301)	
S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	Memorize the basic concepts of polymers and its reaction mechanisms involved in polymer synthesis and kinetics of these reactions.	2,7
2	Understand the basic concepts of segments of polymers, its synthesis, isolations, purification and degradation.	1,7
3	Apply the knowledge of polymers in addressing the present social needs.	1,4,6
4	Analyse the different synthetic routes related to polymers.	1,5,7
5	Evaluate weather the polymer material is related to the fundamentals of polymer structure so that they can make simple predictions for design.	1,5,6,3

Unit-I

Introduction, Classification of polymers, Polymerization, chain polymerization, step polymerization, Co polymerization, Free radical chain polymerization, cationic polymerization, anionic polymerization, Polymerization Techniques, Graft and Block Copolymers.

Unit-II

Polymer Synthesis,Isolation and Purification of polymers, Polymer Fractionation, Molecular weight determination,Molecular weight determination curve, Processing Techniques.

Unit-III

Polymer Reactions–Introduction, Hydrolysis, Acidolysis, Aminolysis, Hydrogenation, Addition and Substitution Reactions, Cyclisation reactions, Cross-linking Reactions.

Unit-IV

Polymer Degradation – Definition, Types of Degradation, Thermal Degradation, Mechanical Degradation, Degradation by Ultrasonic Waves, Photodegradation, Degradation by High-Energy Radiation, Oxidative Degradation, Hydrolytic Degradation.

Unit-V

Plastics, Fibres, Elastomers-Polyethylene, Polystyrene, PolyEsters, PolyAcrylonitrile Polyurethanes, Polyvinyl Chloride, Polyisoprenes. Resins–Phenol Formaldehyde Resin, Urea Formaldehyde and Melamine–Formaldehyde Resins,Epoxy Polymers, Silicon Polymers.

Reference Books:

1. Textbook of Polymer Science by Frod,W.Billmayer,

2. An Introduction to Polymer Chemistry by Moore.

3. Polymer Chemistry-An Introduction by M.P.Stevens.

4. Polymer Science –VRGowariker, NVViswanathan, JayadevSreedhar.

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III SEMESTER

Paper Code & Title: 22CH OE 302 : BASIC BIO CHEMISTRY

No. of hours per week: 03 **Total credits: 03**

Total marks: 100 **(Internal: 30 M & External: 70M)**

Course: BASIC BIO CHEMISTRY (code: 22CH OE 302)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	Memorize the basic concepts related to chemistry in daily life like – chemistry Laboratory safety symbols, environmental chemistry, bioinorganic chemistry, vitamins, antibiotics and hormones.	2,7
2	Understand the concepts like chemistry Laboratory safety symbols, environmental chemistry, bioinorganic chemistry, vitamins, antibiotics and hormones.	1,2,6
3	Apply the knowledge gained in the concepts like chemistry Laboratory safety symbols, environmental chemistry, bioinorganic chemistry, vitamins, antibiotics and hormones in future job roles.	1,4,7

Course Learning Objective(S): The main objective of this paper is to give a basic and updated knowledge for the students on Chemistry Laboratory safety symbols – Meaning, Environmental Chemistry, Bioinorganic Chemistry, Biological functions of Hormones and Medicinal chemistry.

Unit-I: Chemistry Laboratory safety symbols – Meaning:
Corrosive, carcinogenic, Harmful, toxic, dangerous to environment, Explosive, flammable, Narcotic, Oxidizing, Lachrymatory, Radioactive, irritant, gases under pressure, general laboratory safety precautions.

Unit-II: Environmental Chemistry:
Ambient air quality standards, Acid rain, Smog, Greenhouse effect, Bhopal gas tragedy, Vishakhapatnam polymer industry tragedy, Renewable and Nonrenewable energy resources, DO, COD, BOD, Toxicity of lead, mercury, arsenic and Cadmium.

Unit-III: Bioinorganic Chemistry:
Essential elements, biological significance of Na, K, Mg, Ca, Fe, Metalloporphyrin – Structure and functions of hemoglobin, Myoglobin.

Unit-IV: Biological functions of Hormones:
Introduction,Types of harmones, Role of Anderstrone, Progestrone and thyroxin, action of cortisone, Insulin.

Unit-V: Medicinal Chemistry:

The role of vitamins – K,E,D,C,B – complex, classification of antibiotics, mechanism of antibiotics action - role of ampicillin, chloromycetin and amoxicillin as antibiotics.

Text books/ Reference books:

1. Laboratory safety for Chemistry Students by Robert H. Hill and David Finster

2. A Text book of Environmental chemistry by W. Moore and F.A. Moore

3. Environmental Chemistry by Samir K. Banerji

4. Organic Chemistry by G. Mare Loudan, Purdue University

5. Unified Chemistry by O.P. Agarwal, Paper-III, JPNP Publications.

6. Hormones and Endocrine system – Kleine, Rossemanith.

7. Principles of Biochemistry-Leninger.

8. Essentials of Medical pharmacology- K. D. Tripathi.

P.B.SIDDHARTHA COLLEGE OF ARTS & SCIENCE
DEPARTMENT OF CHEMISTRY
M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
III SEMESTER

Paper Code & Title: 22CH3L1: ORGANIC PREPARATIONS

Course: Organic Preparations (22CH3L1)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	Memorize the principle involved in various organic preparations.	2,7
2	Understand the mechanism involved in organic preparation.	1,2
3	Apply the knowledge of organic preparations in their chosen field.	3,4,6

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. Green Procedures for organic qualitative analysis and organic compound preparations (atleast 6 preparations).

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M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
III SEMESTER

Paper Code & Title: 22CH3L2: MIXTURE ANALYSIS

Course: Mixture Analysis (22CH3L2)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	Get familiarized with the tests involved to identification of various functional groups.	2,7
2	Understand the theory involved in identification and separation of the given organic mixture based on the solubility	1,2,7
3	Apply the knowledge to identify various functional groups present in the given organic compound by following a systematic procedure.	3,4,6

Analysis of organic binary mixtures: Separation and identification of organic binary mixtures

(The students must be given training in at least 10 mixtures with different functional groups).

Note: For semester end examinations the student has to submit at least two solid derivatives for each individual component.