A.G & S.G. Siddhartha Degree **COLLEGE OF ARTS & SCIENCE**
DEPARTMENT OF PG CHEMISTRY
BOS Meeting 11-03-2024

1. Agenda:

Agenda for Board of studies in PG **Chemistry** on 11-03-2024 through online mode

1. Approval of programme structure for IV Semester for the batch of students admitted in the year 2022-2023 and onwards.
2. Approval of syllabus for IV semester and course outcomes (drafted in line with BTL) for the batch of students admitted in the year 2022-2023 as per revised guidelines / curriculum of Krishna University and with no revision of syllabus of II semester for the batch of students admitted in the year 2023-2024 and onwards.
3. Approval of two newly introduced courses one in Domain Specific courses (DSE) category and one in Skilled Elective Courses(SEC) category in IV semester for the batch of students admitted in the year 2022-2023 and onwards.
4. Approval of the syllabus of new MOOCs paper entitled Chemistry of Main Group elements with paper code 22CH4M2 for IV semester
5. Any other with the permission of the chair.

Resolutions/ Recommendations

Resolution –I

1. It is resolved and recommended to implement the programme structure for semester- IV as per R 22 regulations of Krishna University.

Resolution –II

2. It is resolved and recommended to approve the modified model question papers For IV semester.

Resolution - III

3. It is resolved and recommended to approve the newly introduced DSE paper entitled "Nano Chemistry", course code 22CH4E3 and SEC paper entitled "Energy environment and Soil Chemistry", course code 22CH4E3

Resolution - IV

4. It is resolved and recommended to approve the syllabus of new MOOCs paper entitled Chemistry of Main Group elements with paper code 22CH4M2 for IV semester.

Resolution –V

5. Resolved to implement the existing syllabus for both theory and practicals with no revision for Semester-II admitted batch 2023-24.

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Members Present:

S.No			**Signature**
1	**Dr.V.N.V.Kishore** Head, I/C Dept. of Chemistry(P.G) AG & SG S College, Vuyyuru	Chairman	
3	**Dr. D. Rama Sekhara Reddy** Department of Chemistry Krishna University,Machilipatnam	University Nominee	
4	**Prof. Koya Prabakar Rao** Department of Chemistry Vignan University, Guntur.	Subject Expert	
5	**Dr.A.V.D Nagendra Kumar** Associate professor Dept. of Chemistry Githam University	Subject Expert	
6	**Dr.G.Raja** Manager(Q.A) Biophore India pharamaceuticals. Hyderbad.	Representative from Industry	
7	**Nafesunnisa**	One Post Graduate Meritorious Aluminous nominated by the Principal	
8	**N.V.Srinivasa Rao** Department of Mathematics AG & SG S College, Vuyyuru.	Representative Science Faculty Other Dept	
9	**Dr.G.Giri Prasad** Dept. of Chemistry AG & SG S College, Vuyyuru	Member	
10	**Smt. Dilshad Begum** Dept. of Chemistry(P.G) AG & SG S College, Vuyyuru	Member	
11	**Smt. M.Rekha** Dept. of Chemistry(P.G) AG & SG S College, Vuyyuru	Member	

The courses of semesters II & IV are listed below

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY) II Semester

Course code	Course Name	Teaching Hours/ week			CORE / IDC/DSE/ SEC/ OEC/MOOCS	Internal Marks	External Marks	No. of Credits
		Lecture	Practical	Tutorial				
22CH2T1	Advanced Inorganic Chemistry	4	0	0	Core	30	70	4
22CH2T2	Adavanced Organic Chemistry	4	0	0	Core	30	70	4
22CH2T3	Advanced Physical Chemistry	4	0	0	Core	30	70	4
COMPULSORY 22PG201	**Research Methodology & IPR**	3	1	0	SEC	30	70	3
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
22CH2E1	Molecular Spectroscopy	4	0	0	DSE	30	70	4
CH2E2	Instrumental methods of Analysis	4	0	0	DSE	30	70	4
22CH2E3	Analysis of foods & Drugs	4	0	0	DSE	30	70	4
LAB PRACTICALS								
22CH2L1	Physical chemistry Practical	0	6	0	Core	30	70	3
22CH2L2	Organic chemistry Practical-II	0	6	0	Core	30	70	3
TOTAL FOR SECOND SEMESTER						**210**	**490**	**25**

.At the end of 2nd semester, every student must undergo summer Internship/ Apprenticeship/Project work/Industrial training/Research based Project work for Six weeks and must prepare a report concerned as per approved project guidelines, and submit the same to the University 14 days before the commencement of third semester end examinations

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
II SEMESTER (2023-2025)
Paper Code & Title: 22CH2T1: ADVANCED INORGANIC CHEMISTRY
2023-2025 Batch

Course Code	22CH2T1	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

Course: Advanced Inorganic chemistry (code 22CH2T1)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	Memorize the fundamental concepts of basic inorganic chemistry	2,7
2	Comprehend the basic and advanced concepts of inorganic chemistry like clusters, organo metallic chemistry, and bio inorganic chemistry.	1,2, 7
3	Apply the principles of organo metallic chemistry, reaction mechanisms, metallic clusters, electronic spectra in chosen job role.	1,6
4	Analyze the significance, similarities and differences of various concepts of inorganic chemistry.	1,7
5.	Evaluate the role of organo metallic compounds as catalysts in organic synthesis	1, 7

CO-PO MATRIX								
COURSE CODE 22CH2T1	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1	0	3	0	0	0	0	2
	CO2	2	2	0	0	0	0	1
	CO3	3	0	0	0	0	2	0
	CO4	3	0	0	0	0	0	2
	CO5	3	0	0	0	0	0	2

Unit-I: Non-metal cages and metal clusters:
Structure and bonding in phosphorous-oxygen, phosphorous-Sulphur cages; structure and bonding in higher boranes with (special reference to B12 icosahedra). Carboranes, metalloboranes, metallocarboranes. Classification- LNCs and HNCs**,** Isoelectronic and Isolobal relationships, electron counting rules: Wade's and Lauher's rules. M-M multiple bonding; preparation, structure and bonding in dinuclear [Re2Cl8] 2- ion, trinuclear [Re3Cl9], tetra nuclear W4(OR)16, hexa nuclear [Mo6Cl8]4+ and [Nb6Cl12]2-.

Unit-II: Organometallic chemistry of transition metals:
Classification and electron counting rules, hapticity, synthesis, structure and bonding of Olefinic complexes, Acetylene complexes, ferrocene, dibenzene chromium, cycloheptatriene and tropylium complexes of transition metals. Reactions of organometallic compounds – oxidativeaddition reductive elimination insertion and elimination.Applications of organometallic compounds, Catalytic hydrogenation, Hydroformylation, alkene polymerization.

Unit-III: Reaction mechanism of transition metal complexes:
Kinetics of octahedral substitution, acid hydrolysis, base hydrolysis-conjugate base (CB) mechanism. Direct and indirect evidences in favour of CB mechanism.Anation reactions. Reactions without metal-ligand bond cleavage. Factors affecting the substitution reactions in octahedral complexes. Trans effect on substitution reactions in square planar complexes. Mechanism of redox reactions, outer sphere mechanism, cross reactions and Marcus –Hush equation, inner sphere mechanism.

Unit-IV: Term symbols and Electronic spectra: Term symbols:
Term symbols and their derivation, Microstates, Hunds rules to predict ground terms and ground states. List of ground energy and higher energy terms from d1 to d9 configurations;
Electronic spectra of transition metal complexes:
Spectroscopic terms. Selection rules, Slator–Condon parameters, Racah parameters, Term separation energies for dn configurations, Orgel diagrams. Tanabe-Sugano diagrams for d1 to d9 configurations. Calculations of Dq, B and β parameters. Charge transfer spectra.

Unit-V: Bio-inorganic chemistry and Magnetic properties of complexes:
Storage and transport of dioxygen by Hemoglobin and Myoglobin, Vitamin B12 and its importance.
Magnetic properties of transition metal complexes:
Types of magnetism, factors affecting Para magnetism, anomalous magnetic moments - Orbital and spin contribution, spin-orbit coupling and magnetic moments chiro optical properties, cotton effect and Faraday effect.

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

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
II SEMESTER
Paper Code & Title: 22CH2T2: ADVANCED ORGANIC CHEMISTRY

Course Code	22CH2T2	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

Course: Advanced Organic chemistry (code 22CH2T2)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorise the basic concepts of organic chemistry	2,7
2	Understand the basic and advanced concepts of stereochemistry, conformational analysis green chemistry in establishing the mechanism of the reaction	1,2,7
3	Apply the concepts related to stereochemistry, conformational analysis, green and nano chemistry in establishing the mechanism of the reaction	1,6
4	Analyse the role of stereochemistry, nano chemistry and green chemistry in understanding the nature of the product	1,7
5.	Evaluate the role of stereochemistry, green principles and nano chemistry in establishing the mechanism of a reaction as well as in other areas of chemistry.	1, 7

CO-PO MATRIX								
COURSE CODE 22CH2T2	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1	0	3	0	0	0	0	2
	CO2	2	2	0	0	0	0	1
	CO3	3	0	0	0	0	2	0
	CO4	3	0	0	0	0	0	2
	CO5	3	0	0	0	0	0	2

Unit-I: Named reactions:

Aldol condensation, Benzoin condensation, Cannizzaro condensation, claisen condensation, Dieckmann condensation, Perkin condensation, Stobbe condensation, Reformatsky reaction, Mannich reaction, Reimer-Tiemann reaction, Vilsmeier-Haack reaction, Shapiro reaction, McMurray reaction, Michael addition reaction, Wittig reaction, Stork – Enamine reaction, Acyloin condensation, Robinson ring annulation and Simmon-Smith reaction.

Unit-II: Stereo Chemistry-I:

Concept of chirality, Recognition of Symmetry elements. Definition and classification of Stereoisomers, Enantiomer, Diastereomer, Homomer, Epimer, Anomer, Configuration and Conformation, Configurational nomenclature: D,L and R, S nomenclature. Molecular representation of organic molecules: Fischer, Newman and Sawhorse projections and their inter-conversions. Geometrical Isomerism.Cis-trans, E, Z- and Syn and anti nomenclature, Methods of determining configuration of Geometrical isomers using physical, spectral and chemical methods.

Unit-III: Stereo Chemistry-II:

Definition of Conformation, Conformational analysis of acyclic molecules – alkanes and substituted alkanes. Conformational analysis of monocyclic molecules – cyclohexane – chair, boat and twist boat - mono and disubstitutedcyclohexanes and conformation around carbon hetero atom bonds having C–O & C–N. Confirmation andintramolecular hydrogen bonding.

Unit-IV: Green chemistry:

Introduction to Green chemistry, Principles and concepts of Green chemistry, Green Catalysis, Biocatalysis, renewable resources, Green Reagents, examples of green reactions-synthesis of Ibuprofen, Clean Fischer-Indole synthesis comparison of the above with conventional methods. Introduction to Microwave organic synthesis: introduction, advantages and disadvantages. Applications: solvents (water and organic solvents), solvent free reactions (Solid state reactions).

Unit-V: Chemistry of Nanomaterials:

Introduction, carbon nanotubes: structure of single and multi-walled carbon nanotubes, synthesis-solid and gaseous carbon source-based production techniques, synthesis with controlled orientation. Growth mechanism of carbon nano tubes-catalyst free growth, catalyst activated growth, general properties and applications.

Reference Text books:

1. Advanced organic chemistry –Reaction, mechanism and structure, Jerry March, John Wiley.
2. A guide book to Mechanism in organic chemistry, Peter Sykes, Longman.
3. Organic chemistry, I.L. Finar, Vol. I & II, Fifth ed. ELBS, 1975.
4. Stereo Chemistry of carbon compounds – E.L. Eliel.
5. Nano, The Essentials: T. Pradeep, The Mc. Graw Hill & Co.
6. Principles of organic synthesis, R.O.C. Norman and J.M. Coxon, Blakie Academic & Professional.
7. Reaction Mechanism in organic chemistry, S.M. Mukherji and S.P. Singh, Macmillan.
8. Green chemistry Theory and Practice by Paul T. Anastas and John C. Warner, Oxford University press.
9. Methods and reagents for Green chemistry, PietroTundo, AlvisePerosa, FulvioZecchini, John Willey& sons Inc.

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
II SEMESTER
Paper Code & Title: 22CH2T3: ADVANCED PHYSICAL CHEMISTRY

Course Code	22CH2T3	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

Course: Advanced Physical chemistry (code 22CH2T3)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Remember the basic concepts of Physical chemistry.	1,2,
2	Understand the basic and advanced concepts of Physical chemistry like statistical thermodynamics, polymers, chemical kinetics, photochemistry, and radio chemistry	1,2,7
3	Apply the conceptual knowledge of theoretical statistical analysis ,electro chemical analysis, polymer science and radio chemistry	1,6,
4	Analyze the role and significance of statistical thermodynamics, Polymers, Electro Chemical methods, chemical kinetics, photochemistry and radio chemistry	1,7
5	Evaluate the role of concepts of Physical chemistry in allied subjects.	1,7

CO-PO MATRIX								
COURSE CODE 22CH4T3	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1	0	3	0	0	0	0	2
	CO2	2	2	0	0	0	0	1
	CO3	3	0	0	0	0	2	0
	CO4	3	0	0	0	0	0	2
	CO5	3	0	0	0	0	0	2

Unit-I: Third law of Thermodynamics and Statistical thermodynamics:

Nernst Heat theorem - Third law of thermodynamics - Its limitations - Determination of absolute entropy -Thermodynamic probability and most probable distribution, Entropy and probability - Boltzmann-Plank equation.Ensembles, Maxwell-Boltzmann distribution, Fermi-Dirac statistics, Bose Einstein statistics.Partition function - calculation of thermodynamic properties in terms of partition function - Chemical equilibrium and partition function - Translational, rotational and electronic partition function - Entropy of Monoatomic gases (Sackur-Tetrode equation).

Unit-II: Polymer chemistry and Raman Spectroscopy:

Classification of polymers - Free radical, ionic and Zeigler -Natta Polymerization - kinetics of free radical polymerization -Techniques of polymerization -Glass transition temperature - Factors influencing the glass transition temperature. Number average and Weight average, Molecular weights –molecular weights determinations – Membrane Osmometry, Light scattering phenomenon. Classical and quantum theories of Raman effects, pure rotational, vibrational and Vibrational- rotational Raman spectra, selection rules,mutual exclusion principle.

Unit-III: Electro Chemistry-II:

Reference electrode - Standard hydrogen electrode. Calomel electrode -Indicator electrodes: Metal-metal ion electrodes - Inert electrodes -Membrane electrodes - theory of glass membrane potential, potentiometric titrations, advantages of potentiometric titrations, Conductometric titrations. Electrode potentials - Double layer at the interface - rate of charge transfer - Decomposition potential - Over potential - Tafel plots - Derivation of Butler-Volmer equation for one electron transfer - electro chemical potential.

Unit-IV: Chemical kinetics and Photo chemistry:

Branching Chain Reactions – Hydrogenoxygen reaction - lower and upper explosion limits - Fast reactions - Study of kinetics by flow methods - Relaxation methods - Flash photolysis. Acid base catalysis –protolytic and prototropic mechanism.Enzyme catalysis - Michelis-Menten kinetics.

Photochemistry:

Quantum yield and its determination, Actinometry, Reactions with low and high quantum yields, Photo sensitization, Exciplexes and Excimers, Photochemical equilibrium, Kinetics of collisional quenching - Stern- Volmer equation.

Unit-V:

Radioactivity and Isotopes: Introduction to radioactivity, properties of alpha rays, beta rays and gamma rays, theory of radioactive disintegration, rate of disintegration, Geiger – Nuttal rule, radioactive equilibrium. Isotopes - radioactive and non-radioactive isotopes, group displacement law. Analysis of isotopes – Aston’s mass spectrograph, Dempster’s method, Bainbridge’s method.Separation methods of isotopes.Applications of Radio isotopes in Industry and medicine.

Text books/ Reference books:

1. Physical chemistry, G.K. Vemulapalli (Prentice Hall of India).
2. Physical chemistry, P.W. Atkins. ELBS**.**
3. Chemical kinetics - K.J. Laidler, McGraw Hill Pub.
4. Text book of Physical Chemistry, Samuel Glasstone, Macmillan pub.
5. Statistical Thermodynamics - M.C.Gupta.
6. Polymer Sceince, Gowriker,Viswanadham, Sreedhar.
7. Quantitative Analysis, A.I. Vogel, Addison Wesley Longmann Inc.
8. Physical Chemistry by G.W.Castellan, Narosa Publishing House, Prentice Hall.
9. Physical Chemistry by W.J. Moore, Prentice Hall.
10. Polymer Chemistry by Billmayer.
11. Fundamentals of Physical Chemistry by K K. Rohatgi-Mukherjee. Wiley Eastern Ltd publications.
12. Statistical Thermodynamics by M.Dole.
13. Fundamentals of photochemistry by Rohatgimukherjee, New Age international Publications.
14. Essentials of Nuclear chemistry by H.J.Armikar, New Age international Publications.

Course: Molecular Spectroscopy (code 22CH2E1)		
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.	1,2,7
3	Apply the knowledge of spectroscopy in calculating the bond length, identifying the functional group present in molecules.	1,6
4	Identify the role UV – visible spectroscopy in the determination of absorption maximum and ESR spectroscopy in studying the properties of paramagnetic substances.	1,7
5.	Evaluate the principles involved in molecular absorption spectroscopy.	1, 7

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
II SEMESTER Paper Code & Title: 22CH2E1: MOLECULAR SPECTROSCOPY

Course Code	22CH2E1	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

UNIT- I

Introduction to Molecular Spectroscopy: Motion of molecules-Degrees of freedom – Energy associated with the degrees of freedom-Type of spectra**.**

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

UNIT – II

Infrared spectroscopy:

Harmonic oscillator, vibrational energies of diatomic molecules, zero point energy, force constant and bond strengths, anhormonicity Morse potential energy diagram. Vibration – rotation spectroscopy. PQR braches, Born – oppenheimer approximation, Break down Born – openheimer approximation, normal modes of vibration group frequencies, overtones, hot bands, application of IR spectra to polyatomic molecules.

UNIT – III

Unit-II: Raman Spectroscopy:

Classical and quantum theories of Raman effects, pure rotational, vibrational and Vibrational-

CO-PO MATRIX								
COURSE CODE 22CH2E1	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1	0	3	0	0	0	0	2
	CO2	2	2	0	0	0	0	1
	CO3	3	0	0	0	0	2	0
	CO4	3	0	0	0	0	0	2
	CO5	3	0	0	0	0	0	2

rotational Raman spectra, selection rules, mutual exclusion principle, Resonance Raman spectroscopy, coherent antistrokes Raman Spectroscopy (CARS).

UNIT – IV

UV- Visible Spectroscopy:

Electronic Spectra of diatomic molecules, vibrational structure of an electronic transition, classification of bands, rotational fine structure of electronic vibrational transition. Electronic Spectra of Polyatomic Molecules.

UNIT – V

Electron Spin Resonance Spectroscopy:

Basic Principles, zero field splitting and kranners's degeneracy, factors affecting the 'g' value. Istropic and anisotropic hyperfine coupling constants, spin hamiltenia, spin densities measurement techniques - simple applications like methyl radical, ethyl radical etc.,

Text books/ Reference books:

1. Introduction to Spectroscopy – D. L. Pavia, G.M. Lampman, G. S. Kriz, 3rd Ed. (Harcourt college publishers).
2. Absorption spectroscopy of organic molecules – V. M. Parikh
3. Nuclear Magnetic Resonance – Basic Principles- Atta-Ur-Rehman, Springer-Verlag (1986).
4. Molecular spectroscopy by Kalidas&B.K.Sharma
5. Vibrational Spectroscopy by D.N.Sathyanarayana New Age Int. Pub.
6. Spectroscopy by Aruldas.
7. Symmetry & Spectroscopy of molecules by K.Veerareddy

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)

II SEMESTER

Paper Code & Title: 22CH2E2: INSTRUMENTALMETHODSOFANALYSIS

Course Code	22CH2E2	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

Course: Instrumental Methods of Analysis (code 22CH2E2)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	Memorize the basic principles of the modern methods of analysis.	2,7
2	Understand the basic and advanced concepts of modern methods (i.e Instrumental methods) of analysis.	1,2,7
3	Apply the instrumental methods of analysis in any chosen job role.	1,6
4	Interpret the role of these instrumental methods in the quantitativedetermination of constituents.	1,7
5	Evaluate the results of the analysis in assessing the nature and properties of molecules.	1,7

CO-PO MATRIX								
COURSE CODE 22CH2E2	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1	0	3	0	0	0	0	2
	CO2	2	2	0	0	0	0	1
	CO3	3	0	0	0	0	2	0
	CO4	3	0	0	0	0	0	2
	CO5	3	0	0	0	0	0	2

UNIT-I

Spectro-analyticalmethodsofanalysis:**Flamephotometry:**
Theory,instrumentation, combustion flames, detectors and analysis of Na, K, Ca, Mg.

Atomic AbsorptionSpectrometer: theory, instrumentation, flame and non-flame techniques, resonancelinesources,hollowcathodelamp,chemicalandspectral interferences, applications with specialreference to analysis of trace metalsin oils,alloysandtoxic metals in drinking waterandeffluents.

Inductively coupled plasma spectrometer (ICP-AES, ICP-MS):
Principles,
instrumentation,plasma,AESdetectors,quadrupolemassspectrometers,differencebetweenthetwodetectors,applications.

UNIT-II

ThermalmethodsofAnalysis:Thermogravimetry:Theory,instrumentation,applications with special reference to $CuSO_4.5H_2O$, $CaC_2O_4.2H_2O$, $CaCO_3$, $(COOH)2.2H2O$

Differential thermalanalysis: Principle, instrumentation, difference betweenTGandDTA-applicationswithspecialreferencetotheclaysandminerals,coals(fuels).

Differential scanningcalorimetry : Principle, instrumentation, applications to inorganic materials like chlorates and per chlorates, ammonium nitrate, organic compoundsand drugs.

UNIT-III

Electro analytical Methods-1: Polarographicanalysis:
Principle and Instrumentation, Dropping mercury electrode (DME),advantages and disadvantages of DME, qualitative and quantitative analysis of inorganic ions-Cu, Bi,Pb,Cd,Zn,ACpolarography,pulsepolarography.

Anodestrippingvoltametry:Principle,instrumentation,Hangingmercurydropelectrode,application intheanalysisofPbandCdinenvironmentalsamples,principleof cathode strippingvoltametry.

UNIT-IV

Electro analytical methods -2Electro gravimetric analysis:Principle,importanttermsin electrogravimetry, decomposition voltage or decomposition potential, over voltageandtheirimportance,instrumentation,electrolysisatconstantcurrent,determinationof $Cu^{2+}$by constant current electrolysis, electrolysis at controlled potentials, determination of Cu, Pb,Sn in brass and bronze by controlled potential electrolysis.

Coulometricanalysis: Principlesof coulometric analysis with constant current and controlledpotential,coulometric.analysiswithcontrolledpotential,applications of coulometric methods for the analysis of cations-As(III), Fe(II) and $I^-$and $S^{2-}$by using I_2 liberations and Ce^{4+} liberation in solutions

UNIT-V

Electro analytical methods-3 Amperometry: Introduction, principle, conditionsfor performing amperometric titrations, advantages, titrations with rotating platinum electrode,applications.

Biamperometry: Principle,biamperometrictitrationsanditscurves,applications.

Cyclicvoltametry: Basic principles,applications.

Referencebooks:

1. Instrumental methods of analysis- H.HWillard,MerittJr.andJ.ADean.
2. Principles of instrumental analysis-SkoogandWest.
3. Vogel's Textbook of Quantitative Inorganic analysis - J. Basset, R.C. Denney, G.H. Jeffereyand J.Madhan.
4. Instrumental methods of analysis-B.KSarma,GoelPublishingHouse,Meerut.
5. Instrumental methods of Analysis-ChatwalandAnand.
6. Instrumental methods ofAnalysis- EwingW.Wendtland.
7. Thermal Analysis ,John WileySons, NewYork.

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
II SEMESTER

Paper Code & Title: 22CH2E3: ANALYSIS OF DRUGS, FOODS, DAIRY PRODUCTS & BIOCHEMICALANALYSIS

Course Code	22CH2E3	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

Course: Analysis Of Drugs, Foods, Diary Products &Biochemical Analysis (code 22CH2E3)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	Memorize the basic principles of analysis drugs. Food, dairy products and biological analysis.	2,7
2	Understand the basic and advanced concepts of drugs. Food, dairy products and biological analysis.	1,2,7
3	Apply the analysis of drugs, foods, dairy products and biological analysis in any chosen job role.	1, 6
4	Interpret the role of the analysis of drugs, foods and biological analysis, quantitatively.	1, 7
5.	Evaluate the results of then analysis of drugs, foods, dairy products and to assess their quality.	1,,7

CO-PO MATRIX								
COURSE CODE 22CH2E3	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1	0	3	0	0	0	0	2
	CO2	2	2	0	0	0	0	1
	CO3	3	0	0	0	0	2	0
	CO4	3	0	0	0	0	0	2
	CO5	3	0	0	0	0	0	2

UNITI

Analysisofthefollowingdrugsandpharmaceuticalspreparations:(Knowledgeofmolecul arformula, structure and analysis) Analysis of analgesics and antipyretics like aspirin and paracetamolAnalysisof antimalerialslikecholoroquine.Analysisof drugsinthetreatmentofinfectionsandinfestations: Amoxycillin, chloramphenicol, metronidazole, penicillin, tetracycline. Anti tuberculousdrug-isoniazid.

UNITII

Analysisofthefollowingdrugsandpharmaceuticalspreparations:(Knowledgeofmolecula rformula,structureandanalysis)Analysisofantihistaminedrugsandsedativeslike:allegra,zyrte c(citirizine),alprazolam,trazodone,lorazepem.

UNITIII

Analysis of anti epileptic and anti convulsant drugs like phenobarbital and phenacemide. Analysis
ofdrugsusedincaseofcardiovasculardrugs:atenolol,norvasc(amlodipine),AnalysisofLipitor(atorvastatin)adrugforthepreventinofproductinofcholesterol.

Analysis of diuretics like: furosemide (Lasix), triamterene Analysis of prevacid (lansoprazole) a drugusedforthepreventionofproductionofacidsinstomach.

UNITIV

Analysis of Milk and Milk Products: Acidity, total solids, fat, total nitrogen, protenines, lactose,phosphate activity,casein,chlorideAnalysis offoodmaterials.
Preservatives: Sodium carbonate, sodium benzoate sorbic acid Flavoring agents - Vanilla, diacetyl,isoamyl acetate, limonene, ethylpropionate, allylhexanoate and Adulterants in rice and wheat, wheatflour,sago,coconutoil,coffeepowder,teapowder,milk.

UNITV

ClinicalAnalysisofBlood: Compositionofblood,clinicalanalysis,traceelementsinthebody.E stimationofblood chlolesterol,glucose,enzymes,RBC &WBC,Bloodgasanalyser.

ReferenceBooks:

1) F.J.Welcher-Standardmethodsofanalysis,
2) A.I.Vogel-AtextbookofquantitativeInorganicanalysis-ELBS,
3) F.D.Snell&F.M.Biffen-Commercialmethodsofanalysis-D.B.Taraporavala&sons,
4) J.J.ElvingandI.M.Kolthoff- Chemicalanalysis-Aseriesofmonographson
5) Analyticalchemistryanditsapplications--InterScience-VolItoVII.,
6) AanalyticalAgricultrualChemistrybyS.L.Chopra&J.S.Kanwar-KalyaniPublishers
7) Quantitativeanalysisofdrugsinpharmaceuticalformulationsby P.D.Sethi,CBSPublishersa ndDistributors,NewDelhi.

8) G.Ingram-Methods of organic elemental microanalysis-Chapman and Hall.
9) H.Wincciam and Bobbles (HenryJ)-Instrumental methods of analysis of food additives.,
10) H.Edward-
TheChemicalanalysisoffoods;Practicaltreatiseontheexaminationoffoodstuffsandthe detection of adulterants,
11) The quantitative analysis of drugs- D.C. Garratt-Chapman & Hall,
12) AtextbookofpharmaceuticalanalysisbyK.A.Connors-Wiley-International,
13) ComprehensivemedicinalchemistryEdCorwinHanschVol5,Pergamon Press.

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
II SEMESTER
Paper Code & Title: 22CH2L1: PHYSICAL CHEMISTRY PRACTICAL

Course Code	22CH2L1	I A Marks	30
No. of Lecture Hours / Week	3	End Exam Marks	70
Total Number of Lecture Hours	-	Total Marks	100
Seminar	-	Exam Hours	03

Course: Physical chemistry (code 22CH2L1)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorise the basic principles involved in various physical and chemical methods of determination	2,7
2	Comprehend the principles and theory involved in the determinations by physical and chemical methods	1,2,7
3	Exercise the procedural concepts in the determination of unknowns by physical and chemical methods	1,4, 6
4	Interpret the data obtained in the determinations by physical and chemical methods	1,5, 7
5.	Evaluate the accuracy of results obtained in the determinations by physical and chemical methods.	1, 3, 7

CO-PO MATRIX

	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
COURSE CODE 22CH2E3	CO1	0	3	0	0	0	0	2
	CO2	2	2	0	0	0	0	1
	CO3	3	0	0	2	0	2	0
	CO4	3	0	0	0	2	0	2
	CO5	3	0	2	0	0	0	2

List of experiments:

1. Relative strengths of acids by studying the hydrolysis of ethyl acetate / methyl acetate.
2. Determination of equilibrium constant of KI3 KI + I2 by partition coefficient.
3. Determination of unknown concentration of potassium iodide by partition coefficient method.
4. Distribution coefficient of Benzoic acid between Benzene and water.
5. Determination of critical solution temperature of phenol-water system.
6. Study of the effect of electrolyte on the miscibility of phenol-water system.
7. Determination of Coordination number of cuprammoniumcation.
8. Potentiometric determination of Fe(II) with Cr (VI).
9. Potentiometric determination of Fe(II) with Ce (IV).
10. pH-metric determination of strong acid with strong base.
11. Conductometric titration of strong acid with strong base.
12. Conductometric titration of strong acid + Weak acid with strong base.
13. Dissociation constant of weak acid (CH3COOH) by conductometric method.
14. Determination of cell constant.
15. Verification of Beers Law using potassium permanganate/Potassium dichromate.

Text books/ Reference books:

1. Experimental Physical chemistry by V.D. Athawale, ParulMathur, New Age International publishers.
2. Physical chemistry experiments by V. P. Kudesia, PragatiPrakasan publishers.
3. Advanced practical Physical chemistry by J.B. Yadav, Krishna's educational publishers.

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
II SEMESTER
Paper Code & Title: 22CH2L2: ORGANIC CHEMISTRY PRACTICAL-II

Course Code	22CH2L2	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	-	Total Marks	100
Seminar	-	Exam Hours	03

S.No	COURSE OUTCOMES	PO`S
	After completion of the course, the student will be able to :	
1.	Memorise the basic principles involved in organic compound analysis and synthesis.	2,7
2	Understand the importance of organic compound synthesis and identify various functional groups in the given organic compound.	1,2,7
3	Apply the systematic procedure in identifying the functional groups in an unknown organic compound.	1,4,6
4	Analyse the results obtained in compound analysis and mechanisms involved in synthesis.	1,5,7
5	Evaluate the role of intermediates in compound synthesis.	1,7,3

CO-PO MATRIX

	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
COURSE CODE 22CH2L3	CO1	0	3	0	0	0	0	2
	CO2	2	2	0	0	0	0	1
	CO3	3	0	0	2	0	2	0
	CO4	3	0	0	0	2	0	2
	CO5	3	0	2	0	0	0	2

List of experiments:

1. Preparation of organic compounds: Single stage preparations by reactions involving nitration, halogenation, oxidation, reduction, alkylation, acylation, condensation and rearrangement.

(A student is expected to prepare at least 5 different organic compounds by making

use of the reactions given above).

2. Preparation of organic compounds: Two stage preparations by reactions involving nitration,halogenation, oxidation, reduction, alkylation, acylation, condensation and rearrangement.

(A student is expected to prepare at least 5 different organic compounds by making use of the reactions given above).

3. Systematic qualitative analysis of organic compounds with different functional groups (5different compounds)

Text books/ Reference books:

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

A.G & S.G.Siddhartha **COLLEGE OF ARTS & SCIENCE**

DEPARTMENT OF CHEMISTRY

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY) SemIV(2022-2024)

Course Structure

Course Code	Core/DSE EIDC/Moocs/lab/project work	Title of the Paper	Instruction Hours Per Week			Credits	Evaluation		
			L	T	P		CIA MARKS	SEE MARKS	SEE DURATION
22CH4T1	Core	Advanced Organic Spectroscopy	4	--	--	4	30	70	3 hours
22CH4E1	DSE	Green Chemistry	4	--	--	4	30	70	3 hours
22CH4E2	DSE	Techniques for Modern Industrial Applications	4	--	--	4	30	70	3 hours
22CH4E3	DSE	Nano Chemistry	4	--	--	4	30	70	3 hours
22CH4E5	DSE	Antibiotics ,drugs, vitamins and steroid harmones	4	-	-	4	30	70	3hrs
22CH4E6	DSE	Seperation and Electro analytic techniques	4	-	-	4	30	70	3hrs
22CH4 E7	DSE	Analytical Chemistry	4			4	30	70	3hrs
22CH4E8	SEC	Energy environment and Soil chemistry	4			4	30	70	3hrs
22CH4E4	SEC	Organo Metallic Reagents	4	--	--	4	30	70	3 hours
22CH4E9	SEC	Hetero Cyclic Chemistry	4	-	-	4	30	70	3hrs
22CH4M2	MOOCs	Chemistry of Main Group elements	4			4	30	70	3hrs
22CH4L1	Pract-I	Organic Estimations	--	--	6	3	30	70	6 hours
22CH4P1	Project Work	Project Work	--	--	12	6	50	150 (100 + 50) (Project + Viva Voce)	---

Note: Highlighted papers are being taught.

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
IV SEMESTER (2022-2024)

22CH4T1: ADVANCED ORGANIC SPECTROSCOPY

Course Code	22CH4T1	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

Course: Advanced Organic Spectroscopy **(code CH4T1)**		
S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	Memorize the basic concepts of advanced organic spectroscopy	2,7
2	Sumarize the principle, theory and advanced aspects of ^{1}HNMR, ^{13}C NMR, 2D NMR, ORD & CD spectroscopic techniques.	1,2,7
3	Display the knowledge gained in the areas of ^{1}HNMR, ^{13}C NMR, 2D NMR, ORD & CD spectroscopic techniques in chosen job role.	1, 6
4	Interpret the spectral data of ^{1}HNMR, ^{13}C NMR, 2D NMR, ORD& CD in elucidating the structure of the molecule.	1, 7
5	Assess that how far the spectral data of ^{1}HNMR, ^{13}C NMR, 2D NMR, ORD &CD are useful in establishing the structure of the molecule.	1, 7

CO-PO MATRIX								
COURSE CODE 22CH4T1	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		H					M
	CO2	M	M					L
	CO3	H					H	
	CO4	H						M
	CO5	H						M

UNIT – I

Proton NMR Spectrscopy:

Determination of structure of organic compounds using PMR data. Spin system, Nomenclature of spin system, spin system of simple and complex PMR spectrum (Study of AB – A_2 – AB_2. ABX – ABC – AMX interactions)

Simplification of complex spectra- nuclear magnetic double resonance, chemical shift reagents, solvent effects on PMR Spectrum . Nuclear Overhauser Effect (NOE).

UNIT-II

13C-NMR spectroscopy:

Similarities and Difference between PMR and CMR-CMR recording techniques -BBC-BBD-SFORD-Gate pulse CMR spectrum.

General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonylcarbon), coupling constants.Typical examples of CMR spectroscopy – simple problems.

UNIT-III

ORD& CD Curves:

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

UNIT-IV

2D NMR spectroscopy:

Definitions and importance of COSY, DEPT, HOMCOR, HETCOR,INADEQUATE, INDOR, INEPT, NOESY, HOM2DJ, HET2DJ.

Study of COSY ,DEPT, HOMCOR, HETCOR, INADEQUATE INDOR INEPT ,NOESY HOM2DJ, HET2DJ, taking simple organic compounds as examples.

UNIT –V

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

References :

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

22CH4E1: GREEN CHEMISTRY

Course Code	22CH4E1	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

Course:GREEN CHEMISTRY		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the principles of green chemistry and concepts related to green organic synthesis.	2,7
2	Understand the role and significance of green organic synthesis.	1,2,7
3	Exercise the basic and advanced knowledge gained in green organic synthesis in chosen job role.	1, 6
4	Analyse how far green methods are environmentally benign over conventional methods of synthesis.	1, 7
5	Evaluate the principles of green chemistry in organic synthesis.	1, 7

CO-PO MATRIX								
COURSE CODE 22CH4E1	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		H					M
	CO2	M	M					L
	CO3	H					H	
	CO4	H						M
	CO5	H						M

Unit-I

Principles of Green Chemistry: Prevention of waste / by-products, atom economy, Hazardous products-Designing of safer chemicals-energy requirements Selection of appropriate solvents and starting materials-Use of protecting groups and catalysis-Designing of biodegradable products. green organic synthesis of paracetamol, catechol, adipic acid, urethane and ibuprofen.

Unit-II

Microwave assisted reactions: Theory ofMicrowave, advantages, disadvantages, applications-water as solvent: Hoffmann elimination, hydrolysis, oxidation of Toluene, oxidation of alcohols, hydrolysis of methyl benzoate to benzoic acid.

Organic solvents: Esterification reactions, Fries rearrangement, Ortho ester Claisen rearrangement, DielsAlder reactions, synthesis of chalcones, decarboxylation.

Solid state reactions (solvent free): De acetylation, deprotection, saponification of esters, synthesis of anhydrides from dicarboxylic acid, synthesis of nitriles from aldehydes.

Unit-III

Phase Transfer Catalysis: Definition, Mechanism, Types, advantages and applications of PTC – C-alkylation, N-alkylation, Darzen's reaction, Wittig reaction, Benzoyl cyanides from benzoyl chloride, alcohols from alkyl halides, Crown ethers – Introduction,synthetic applications: esterfication, saponification, Anhydride formation, $KMnO_4$ oxidation, aromatic substitution, elimination.

Unit-IV

Ultrasound assisted green synthesis: Introduction, instrumentation, types of sono chemical reactions – Homogeneous reactions – Curtius rearrangement of Benzoyl azide to phenyl isocyanate. Heterogeneous Liquid-Liquid reactions - Esterification, saponification, Hydrolysis, substitutions, additions. Heterogeneous Solid – Liquid Reactions–oxidation, reduction, hydroboration, coupling, Bouveault reaction, Strecker reaction.

Unit-V

Ionic liquids: Definition-Types of Ionic Liquids- properties- Application in organic synthesis-alkylation, allylation, oxidation, hydrogenation, hydroformylation, alkoxycarbonylation, carbon-carbon bond forming reactions-suzuki coupling, Heck reaction, stille coupling.

Textbooks/Referencebooks:

1. New Trends in Green Chemistry by V.K.Ahluwalia, M.Kidwai.

2. Green Chemistry: Environment Friendly Alternatives by RashmiSanghi, M.M.Srivastava

3. Green Solvents for Organic Synthesis by V.K.Ahluwalia, RajenderS.Varma.

4. Organic synthesis – special Techniques, V.K.Ahluwalia, RenuAggarwal.

5.Green Chemistry - V.K.Ahluwalia, Ane Books Pvt. Ltd.,

22CH4E2:TECHNIQUES FOR MODERN INDUSTRIAL APPLICATIONS

Course Code	22CH4E2	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1.	Memorise the concepts of purification and chromatographic methods.	2,7
2	Understand the concepts of purification methods and chromatographic methods.	1,2,7
3	Apply the knowledge gained in purification and chromatographic techniques in their chosen job role.	1, 6
4	Analyse that how far the purification and chromatographic techniques are useful in assessing the purity of the compound.	1, 7
5	Evaluate that how far a compound is purified / separated using purification and chromatographic techniques.	1, 7

CO-PO MATRIX								
COURSE CODE 22CH4E2	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		H					M
	CO2	M	M					L
	CO3	H					H	
	CO4	H						M
	CO5	H						M

UNIT-I

Classical Methods of purification

Recrystallization: Basic principles, choice of solvent, seeding, filtration and centrifugation and drying. Concepts of fractional crystallization.

Distillation: Basic principles. Distillation types- continuous distillation, batch distillation, fractional distillation, vacuum distillation and steam distillation.

UNIT-II

Thin Layer chromatography:

Basic Principles. Common stationary phases, Methods of preparing TLC plates, Selection of mobile phase, Development of TLC plates, Rf value. Application of TLC in monitoring organic reactions. identification and quantitative analysis.

UNIT-III

Paper chromatography:

Basic Principles. Ascending and descending types. Selection of mobile phase, Development of chromatograms, One and two dimensional paper chromatography, Applications of paper chromatography.

UNIT-IV

Gas chromatography:

BasicPrinciples. Different types of GC techniques. Selection of columns and carrier gases. Instrumentation.detectors; Rf values. Applications in the separation, identification and quantitative analysis of organic compounds.

UNIT-V

High Performance liquid chromatography (HPLC):

Basic Principles.Normal and reversed Phases.Selection of column and mobile phase.Instrumentation. Detectors; Rf values. Applications in the separation, identification and quantitative estimation of organic compounds.

SUGGESTED BOOKS:

1. Principles of Instrumental Analysis by D. A. Skoog, F. J. Holler and T. A. Nieman, Harcourt College Pub.
2. Separation Techniques by M. N. Sastri, Himalaya Publishing House (HPH), Mumbai.
3. Bio Physical Chemistry by A. Upadhyay, K. Upadhyay and N. Nath,(HPH) , Mumbai.
4. A Hand Book of Instrumental Techniques for Analytical Chemistry- Ed-F. A. Settle, PrearsonEdn, Delhi.27
5. Introduction to Organic Laboratory Techniques-D. L. Pavia, G. M. Lampman,G. S. Kriz and R. G. Engel, Saunders College Pub (NY).
6. Instrumental methods of Chemical Analysis by B. K. Sharma, Goel Publish House, Meerut.
7. Instrumental methods of Chemical Analysis by H. Kaur, PragatiPrakasan, Meerut.
8. Protein Purification-Principles and practice, III Edn- R. K. Scopes, Narosa Publishing House , Delhi.

22CH4E3: NANO CHEMISTRY

Course Code	22CH4E3	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

Course:NANO CHEMISTRY		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the basic concepts of nanochemistry and nano materials.	2,7
2	Understand the basic and advanced concepts of nanochemistry and nano materials	1,2,7
3	Apply the knowledge gained in the field of nanochemistry as and when required.	1, 6
4	Analyse the role of surface characterization methods in the study of nanomaterials and their properties.	1, 7
5	Evaluate the role and signifigance of nanochemistry in various interdisciplinary sciences.	1, 7

Course Learning Objective(S): The main objective of this paper is to give a basic and updated knowledge for the students on Nano Chemistry.

CO-PO MATRIX								
COURSE CODE 22CH4E3	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		H					M
	CO2	M	M					L
	CO3	H					M	
	CO4	H						M
	CO5	H						M

Unit-I

Introduction to Nano chemistry: Definition of terms-nanoscale, nanomaterials, nanoscience, nanotechnology-scale of materials natural and manmade-nanoscience practiced during ancient and modern periods-contributors to the field of Nanochemistry.

Unit-II

Synthesis of Nanomaterials: Top down and bottom- up approaches-synthesis of carbon nanotubes, quantumdots, gold and silver nanoparticles.

Unit-III

Characterization of Nano materials: Electron microscopy techniques-scanning electron microscopy, transmission electron microscopy and atomic force microscopy.

Unit-IV

Application of Nanomaterials: Solar cells-smart materials-molecular electronics-biosensors-drug delivery and therapy-detection of cancerous cells.

Unit-V

Nanochemistry in Nature: The science behind the nanotechnology in lotus effect-self-cleaning property of lotus-gecko foot climbing ability of geckos-water strider-anti wetting property of water striders-spider silk mechanical properties of the spider silk.

Textbooks/ Referencebooks:

1. Nano: The Essentials: Understanding Nanoscience and Nanotechnology, T.Pradeep, McGraw-Hill Professional Publishing,2008.
2. Introduction to Nanoscience, J.Dutta, H.F.Tibbals and G.L.Hornyak, CRCpress, BocaRaton, 2008.

22CH4E4: ORGANO METALLIC REAGENTS

Course Code	22CH4E4	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the synthetic roots and applications of organo metallic reagents.	2,7
2	Appreciate the methods of synthesis and reactivity of various organo metallic reagents	1,2,7
3	Investigate the conceptual knowledge in various organo metallic reagents in organic synthesis	1, 6
4	Interpret the role of organo metallic reagents in organic synthesis	1, 7
5	Assess the role of specific of organic metallic reagents as catalysts in organic synthesis	1, 7

Course Learning Objective(S): The main objective of this paper is to give a basic and updated knowledge for the students on Organometallic Reagents.

CO-PO MATRIX								
	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
COURSE CODE 22CH4E4	CO1		H					M
	CO2	M	M					L
	CO3	H					H	
	CO4	H						H
	CO5	H						M

UNIT-I

Organo Magnesium and Lithium compounds: Preparation of Grignard reagents with alkyl, allyl, and propargyl halides, alkylation reaction with carbonyl compounds, esters, imines and nitriles, epoxides, acids, acid chlorides, carbondioxide, carbondisulfide, sulfurdioxide. Preparation of alkyllithium reagents, Lithium Di isopropyl amide (LDA) and its synthetic applications.

Unit-II

Organo Copper and Nickel compounds: Organo copper reagents - preparation, reactions, organocuprates, lithium organocuprates (Gilmanreagents). Organonickel compounds: π-allylnickel complexes, preparation of 1,5 cyclic dienes, nickelcarbonyl.

Unit-III

Organo Palladium compounds: Preparation of palladium reagents, π-allyl palladium complexes – formations, reactions – prenylation, formation of conjugated dienes, synthesis of

macro cyclic nitrogen hetero cyclic. Heck reaction, Stille coupling reaction, Sonogashira coupling reaction, suzuki coupling reaction.

Unit-IV

Organoboranes: Preparation of Organobornaesviz hydroboration with BH_3-THF, dicylohexylboranes, disiamylborane, thexylborane, 9-BBN and catechol boranes .protonolysis, oxidation, isomerization and cyclization. Free radical reactions of organoboranes, reactions with α-bromoketones, α-bromoesters, carbonylation, the cyanoborate process and the reaction of alkenylboranes and trialkyltrialkynyl borates.

Unit-V

Organosilanes: Synthetic applications of organo silicon compounds, protection of functional groups, trimethylsilly ethers, sillylenolethers, trimethylsilyliodide, trimethylsilyltriflate, Peterson olefination. Synthetic applications of α-silylcarbanion and β-silylcarbonyl compounds, alkenylsilanes, Allylsilanes, the β-effect - control of rearrangement of carbonium ions by silicon.

Referencebooks:

1. Organometallic in Synthesis AManualbyMSchlosser, L.Hegedus, B.Lipshutzetal, JohnWily&sons.

2. Modern methods of organic synthesis by W.Carruthers (Cambridge).

3. Organic synthesis by H.O.House.

4. Organometallics: Aconcise introduction, ChristophElschenbroich, 3rdedition,Willey-VCH.

5. Advanced Organic Chemistry, F.ACareyand R.J.Sundberg.Plenum.

6. Transition metals in the synthesis of complex organic molecules, Hegedus, L.S,secondedition, University Science, Book ,CA,1999.

7. Organo metallic Chemistry and Catalysis, Astruc, D,SpringerVerlag, 2007.

8. Organo transition metal chemistry: Applications to organic synthesis, Davies, S.G,Pergamon Press, NewYork, 1986.

22CH4E5: ANTIBIOTICS, DRUGS, VITAMINS & STEROID HARMONES

Course Code	22CH4E5	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	Memorise the basic concepts of Antibiotics, drugs, vitamins, steroid harmones	2,7
2	Understand the role of Antibiotics, drugs, vitamins, harmones in human life.	1,2,7
3	Apply the knowledge gained about antibiotics, drugs, vitamins and steroids in their chosen fields..	1, 6
4	Analyse that how far antibiotics, drugs, vitamins, harmones are useful in enhancing the health of the humans.	1, 7.
5	Evaluate that how various compounds can function as antibiotics, drugs as anticancer agents	1, 7

CO-PO MATRIX

	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
COURSE CODE 22CH4E5	CO1		H					M
	CO2	M	M					L
	CO3	H					M	
	CO4	H						M
	CO5	H						M

UNIT-I

Antibiotics:

Cell wall biosynthesis, inhibitors, β-lactam rings, antibiotics inhibiting protein syntheis, structure elucidation of ampicillin, amoxicillin, chloramphenicol and gramidin.

UNIT-II

Drugs and Medicinal chemistry:

(I) Chemotherapy : Methodology for structure – activity relationship determination.

(II) Drugs: Structure synthesis & Activity of the following : Anticancer Agents: Taxol, Vinblastine,

Vincristine, Campothecin.

UNIT-III

Chemotherapy of Brain: Introduction – neurotransmitters

CNS stimulants : Strychnine, Picrotoxin (CNS activity only) nikethemide caffeine

CNS depressants: General anesthetics, mode of action of Sedatives & Hypnotics.

UNIT-IV

(I) Antimalarials: Paludrin – quinacrin – chloroquin – camoquin – pamaquin – sontoquine.
(II) Antiamoebicagents :Chiniofon – Resotren – Iodochlorohydroxyquin.
(III) Sulpha drugs: Sulphanilamide – Dihydrocurprine – Prontosil
(IV)Antiseptics: Diphenyl – Chlorophene-2,4,4-trichloro-2'-hydroxydiphenyl ether – aminocerine hydrochloride.

UNIT-V

Fat Soluble Vitamins: Chemistry, Synthesis of vitamin A1, and vitamin K
Water soluble Vitamins: Chemistry, Synthesis of B1 and C
Steroid Hormones:
Chemistry & synthesis of progestrone, testosterone.

Non steroid hormones: Chemistry & synthesis of thyroxin, epinephrine.

TEXT BOOKS:

1. Introduction to Medicinal Chemistry – Wiley VCH
2. Text Book of Organic Medicinal and Pharmaceutical Chemistry, Wilson and Gisvild, (ed Robert F. Dorge)
3. An introduction to drug design by SS Pandeya
4. Buger's Medicinal Chemistry and drug discovery Vol.I by (Ed) ME Wolff – John – Wileyby A. Burger
5. The Organic Chemistry of drug design and drug action by RB Silverman, Academic press
6. Principles of Medicinal Chemistry by William O. Foye, Lea &Febiger, Philadelphia/London,1989.

22CH4E6:SEPARATION TECHNIQUES AND ELECTRO ANALYTICAL TECHNIQUES

Course Code	22CH4E6	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	Memorize the theory and principles of separation techniques in chemical analysis	2,7
2	Understand the significance of chromatography in separation of components and quantitative determination	1,2,7
3	Exercise theconceptual knowledge of chromatography in chemical analysis	1,6
4	Analyze the role of the analytical techniquesin quantitative and qualitative analysis	1,7
5	Assess the data obtained in the instrumental analysis of chemical compounds.	1,7

CO-PO MATRIX								
COURSE CODE 22CH4E6	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		M					M
	CO2	H	M					M
	CO3	H					H	
	CO4	H						M
	CO5	H						M

UNIT-I

SEPARATION TECHNIQUES IN CHEMICAL ANALYSIS: SOLVENT EXTRACTION : Introduction,principle,techniques,factors affecting solvent extraction, quantitative treatment of solvent extraction equilibria-chelate and ion association systems-synergism., ION EXCHANGE : Introduction,action of ion exchange resins, separation of inorganic mixtures, applications.,

UNIT - II

CHROMATOGRAPHY: Introduction-Column, paper chromatography-Thin layer chromatography and HPLC and Gas chromatography: Introduction, equipment. Gas liquid chromatography. Exclusion chromatography.-Applications

UNIT III

Electrogravimetry: - Theory of electro analysis–Polarisation–Over voltage–Principles involved in electrogravimetric analysis–current – voltage curves – separation of metals by electrolysis – constant current – controlled potential electrolysis.

Unit IV

Coulometry: - Coulometry at controlled potential – separation of Nickel and Cobalt – coulometres – types of coulometric analysis – constant current coulometry of coulometric titrations.

UNIT –V

Voltametry, Polarography and Amperometric titrations: - Voltametry – Principle of Polarography – dropping mercury electrode; working; factors effecting the limiting current; residual current, migration current – diffusion current – kinetic current – polarographic maximum – Half wave potential – Organic Polarography, Rapid Scan polarography – cyclic voltametry – qualitative and quantitative polarographic analysis – Amperometric titrations – its advantages and disadvantages – Bi Amperometric titrations – Chronopotentiometry

SUGGESTED BOOKS:,

1. B.K.Sharma -- Instrumental methods of chemical analysis,Goel Publishers,
2 .G.Chatwal and S.Anand --Instrumental methods of chemical analysis,,
3. J.J.Lingane- Electroanalytical Chemistry- Inter Science,
4. A.I.Vogel -- A text Book of Quantitative Inorganic Analysis-ELBS,
5 .H.H.Willard,LLMerrit and JA Dean -- Instrumental Methods of Analysis.,
6. Peace-Instrumental Methods of Analysis,
7. J.W.Robbinson- Under graduate Instrumental Analysis,
8. R.A.Day and A.L.Underwood- Quantitative Analysis,
9. G.W Eving- Instrumental Methods of Chemical Analysis.,
10.D.A.Skoog,D.M.West and F.J.Holler--Fundamentals of Analytical Chemistry ,
11. H.Kaur-- Instrumental methods of chemical analysis,PragathiPrakasan,
12 .D.A.Skoog,F.J.Holler and Neman-- Instrumental Methods of Analysis.,
13.G.H.Morrison and H.Frieser- Solvent extraction in Analytical Chemistry,
14. Chemical Separation methods- JA Dean, D.Vannostrand Company, New York
15. Physical and Chemical Methods of Separation by E.W.Berg, MC Graw Hill Book Company,
New York

22CH4E7: ANALYTICAL CHEMISTRY

Course code	22CH4E7	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize basic concepts of analytical chemistry, chemical equilibrium, absorption spectrometry, thermal methods of analysis and potentiometry.	2,7
2	Understand the principle, theory and advanced aspects of analytical chemistry, chemical equilibrium, absorption spectrometry, thermal methods of analysis and potentiometry.	1,2,7
3	Display the knowledge gained in the areas of analytical chemistry, chemical equilibrium, absorption spectrometry, thermal methods of analysis and potentiometry in chosen job role.	1, 6
4	Analyse the role of analytical chemistry, chemical equilibrium, absorption spectrometry, thermal methods of analysis and potentiometry as and when required.	1, 7
5	Evaluate the role and significance of principles of analytical chemistry in other allied fields	1, 7

CO-PO MATRIX								
COURSE CODE 22CH4E7	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		H					M
	CO2	M	M					L
	CO3	H					M	
	CO4	H						M
	CO5	H						M

UNIT – 1

Basic introduction to nature of analytical chemistry Quantitative methods Qualitative methods , Flow diagrams ,Chemistry in toxicology ,Examples for quantitative and qualitative methods, real life examples ROLE : sample preparation basic techniques for analysis physical separation , separation in liquids ,micro analytical balance ,filtration techniques ,wet washing ,dry Ashing , crucibles, filter paper uses of crucibles and filter papers stereo chemical modes are applied [supra +supra] : supra-anta Antra, supra Antra- anta.

UNIT - 2

Chemical equilibria, Chemical equilibria in nature chemical equilibria in analytical chemistry, equilibria between strong and week acids , equilibrium state, different acids, types of equilibria as basis of chemical analysis, equilibria and equilibria constants , importance in analytical chemistry, salt hydrolysis, titration curves , common ion effect , formation constant for complex ions, Introduction from different titrimetric methods,

hendersonhesselbalch equation, spectro chemical methods , acid base titrations, acid base titration indicators.

UNIT- 3

Absorption Spectrometry , instruments , beers law, different transitions , chromophores , d-d , f-f, C-T transitions and applications, chromophoric reagents , analysis of mixture , applying beers law to mixtures , applications – photometric titrations, spectro photometric titrations, A) complexing agent B) complex ion in solution , infrared absorption spectroscopy A)theory B) principle C) instrumentation for IR, FTIR techniques A) theory B) principle, instrumentation of FTIR , uses and interterometer.

UNIT – 4

Thermal method of analysis, Introduction ,dynamic measurement, thermo gravimetric analysis, differential thermal analysis , differential scanning calorimerty, thermo balance, thermal techniques and uses , thermal analysis – solids , Standardisation, geometric estimation, water content, TG-plot , thermo gravimetry – example, mixture of solids in TG, introduction of DTG, samples , furnaces and crucibles, DT, uses of DTG data, food analysis, introduction to DTG, DTA , instruments, uses and applications, DSC, instruments uses and applications, Introduction, electron transfer reactions, electrodes, electrode potential, standard electrode potential, nernest equation, applications of nernest equation, precipitaion /complex ions in nernest equation, electro chemical method of analysis, potentiometry, reference electrode

UNIT 5

Potentiometers, cells, potentiometric titrations, Use of oxidising and reducing agents , redox potential, potentiometric titrations, uses of oxidising and reducing agents, electrode potentials, IR drop In electrochemical cells, ohmic potential electro gravimetric method , controlled potential coulrometry, Its uses in synthesis , colorimetric titrations Applications, electrochemical methods, volumetric methods, analytical method , voltametry, cyclic voltametry – waveforms , CV plot, CV and its application to identity, potential pulses, Differential pulses.

Reference Books:

1. Physical chemistry, G.K. Vemulapalli (Prentice Hall of India).

2. Physical chemistry, P.W. Atkins. ELBS**.**

3. Text book of Physical Chemistry, Samuel Glasstone, Macmillan pub.

4. Quantitative Analysis, A.I.Vogel, Addison Wesley Longmann Inc.

5. Fundamentals of Analytical Chemistry, Skoog& West

6. Quantitative Analysis, Day & Underwood.

7. Instrumental Methods of Analysis, H.H.WAILLARD, Merritt.Jr and J.A.D.Can

8. Instrumental Methods of Analysis, Ewing W.Wend&Pand

9. Instrumental Methods of Analysis, B.K.Sharma

10. Instrumental Methods of Analysis, Chatwel&Anand.

11. Analytical Chemistry, An introduction, D.A.Skoog, D.M.West&F.J.Holler, Sanders college Publishing,
Newyork.

22CH4E8:ENERGY, ENVIRONMENT AND SOIL CHEMISTRY

Course Code	22CH4E8	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the basic theory related to sources of energy,water resources ,air and soil pollution.	2,7
2	Comprehend the significance of sources of energy .water resources ,air and need for good quality of soil.	1,2,7
3	Apply the theoretical aspects of sources of energy . water resources ,air and soil quality parameters`	1, 6
4	Analyse the functioning of sources of energy water resources,pollutants in air and soil.	1,7
5	Evaluate the quality parameters of sources of energy, water ,air and soil	1, 7

CO-PO MATRIX								
COURSE CODE 22CH4E8	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		H					M
	CO2	M	M					L
	CO3	H					M	
	CO4	H						M
	CO5	H						M

UNIT-I

Sources of Energy :Fossil fuels- Nuclear fission and fusion- Solar energy-use of solar energy in space heating and waterheating- production of electricity using solar energy- solar trough collectors- power tower- solar pond- solarenergy for driving vehicles- power from indirect solar energy – Hydropower- wind power- Biomass energy-production of ethanol from biomass- production of methane from biomass- photosynthesis- photo electrochemistryGeothermal energy.

UNIT-II

Water Resources Hydrological cycle: physical and chemical properties of watercomplexation in natural and waste water, Anomalous properties-water pollutants-TypesSources- Heavy metals- metalloids- organic –Inorganic –Biological and Radioactive-Types of reactions in various water bodies including marine environment-Eutrophication-Ground waterPotable water standards. Treatment for portable water.

UNIT-III

Air: Chemical reactions in the atmosphere – Aerosols types- Production and distribution – Aerosols andRadiation – structure and composition of atmosphere- temperature inversion – Global warning- Ozone depletion– Green house effect, "CFC"s- Acid rain.

UNIT-IV

Soil : Composition of soil- lithosphere- inorganic and organic contaminants in the soil- Biodegradation-Nondegrdable waste and its effect on the environment- Bioremediation –of surface soils- Fate and transport of contaminants on soil system– Bioindicators- Soil parameterssoil destruction- Erosion- Soil conservation –Nitrogen pathways and NPK in soil

UNIT-V

Soil pollution: Introduction – soil pollution by industrial wastes. soil pollution byurban wastes, Radioactive pollutants andAgricultural waste- chemical and metallic pollutantsBiological agents – mining - Detrimental effects of soilpollutants – Effects of industrial pollutants- Effects of sewage and domestic wastes- Effects of heavy metals-Effects of radioactive pollutants- Effects of modern agro- technology – Diseases caused by soil pollution – solidwaste management – sources and classification -public Health Aspects – methods of collection- Disposalmethods – potential methods of disposal.

Reference Books:

1. Daniel D.Chiras (1994), Environmental Science, 4th Ed.
2. Environmental Chemistry by W. Moore and J.Moore
3. Environmental chemistry by J.O.M. Bockariss
4. Environmental by BK Sharma
5. Environmental chemistry by SS Dara
6. Environmental chemistry by Mahajan

22CH4E9: HETERO CYCLIC CHEMISTRY

Course Code	22CH4E9	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

Course:HETERO CYCLIC CHEMISTRY		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the synthetic routes and reactions related to three, four, five, six membered and fused heterocyclic compounds.	2,7
2	Understand the concepts of synthesis and reactions of three, four, five, six membered and fused heterocyclic compounds.	1,2,7
3	Apply the conceptual knowledge gained in the synthesis and reactions of organic synthesis three, four, five, six membered and fused heterocyclic compounds as and when required.	1,6,
4	Analyse and categorize the various reactions involved in the synthesis of three, four, five, six membered and fused heterocyclic compounds	1, 7
5	Evaluate the role of heterocyclic compounds in theraupetic and industrial usage	1, 7

Course Learning Objective(S): The main objective of this paper is to give a basic and updated knowledge for the students on Heterocyclic Chemistry.

CO-PO MATRIX								
COURSE CODE 22CH4E9	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		H					M
	CO2	M	M					L
	CO3	H					M	
	CO4	H						M
	CO5	H						M

UNIT-I

Definition, Classification and Nomenclature (HantzschWidman System) of hetero cycles.
Three membered Heterocyclic Compounds: Synthesis, reactivity, and importance of the following ring systems: Aziridines, Oxiranes, Thiiranes, azirine.

UNIT-II

Four membered Heterocyclic Compounds: Synthesis, reactivity, and importance of the following ring systems :Azitidines, oxetanes, Thietanes.
Fused systems: Synthesis and reactivity of Penicillins G and V.

UNIT-III

Five membered Heterocyclic Compounds with two hetero atoms: Synthesis, reactivity, aromatic character, and importance of the following heterocycles: Pyrazole, Imidazole, Oxazole, Isoxazole, Thiazole.
Fused systems: Synthesis and reactivity of Indoles and Benzimidazoles.

UNIT-IV

Six-membered Heterocyclic Compounds with two hetero atoms: Synthesis, reactivity, aromatic character and importance of the following heterocycles: Pyridazines, Pyrazine, Oxazine, Thiazine.
Fused systems: Acridines and Benzodiazines.

UNIT- V

Larger ring and other Heterocycles: Synthesis and reactivity of Azepines, Oxepines and Thiepines. Synthesis and reactivity of Benzodiazepines.

Reference books:

1. Some Modem Methods of Organic Synthesis W.Caruthers, Cambridge University Press, Cambridge.
2. Organic Synthesis vizBoranes, HerbetC. BrownGray, W.KramerAlanB.Levy and M.MarkMidland JohnWilly&Sons, NewYork.
3. Heterochemistry, T.L.Gilchrist, Longman science and tech.
4. Anintroduction to the Chemistry of Heterocyclic Compounds, R.M.Acheson, Interscience Publishers, NewYork
5. Principle of Organic Chemistry, RocNorman, J.M.Coxon, Nelson Throms
6. Advanced Organic Chemistry, F.ACarey and R.J.Sundberg. Plenum.
7. Heterocyclic chemistry by Jai JackLie, Springer publications.

22CH4M2: MOOCs – CHEMISTRY OF MAIN GROUP ELEMENTS

Course Code	22CH4M2	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	-	Exam Hours	03

S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the fundamental concepts of chemistry of main group elements.	2,7
2	Comprehend the basic and advanced Concepts of chemistry of main group elements.	1,2,7
3	Apply the Conceptual knowledge gained in the study of chemistry of main group elements as and when required.	1, 6
4	Analyze the role of chemistry of main group elements in establishing the structure and bonding, chemicalproperties, characteristics of group elements.	1, 7
5	Assess the scope and need of chemistry of main group elements in understanding the other concepts of chemistry in allied fields.	1, 7

CO-PO MATRIX								
COURSE CODE 22CH4M2	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		H					M
	CO2	M	M					L
	CO3	H					M	
	CO4	H						M
	CO5	H						M

Unit -1

Classification of Elements and Periodic Properties: periodic trends, classifications of main group elements, Effective Nuclear Charge, Structure and Bonding aspects, VSEPR theory, valency Bond theory, (Mo)Molecular orbital theory, Hybridization, Homonuclear diatomic molecules, heteronuclear diatomic molecules, Molecular orbital theory for poly atomic molecules.

Unit – 2

Chemistry of Hydrogen : Hydrides and Hydrogen Bonding, Hydrates and Clathrates, covalent hydrides, salane hydrides, transition metal hydrides, chemistry of Group-I elements (Li,Na,K,Ru,&Ce),Binary compounds, Hydroxides, Ionic salts, complexation of cations by crown and cryptates, Chemistry of Group –II elements, electro negativity, physical and chemical properties, Electronic configurations.

Unit – 3

Chemistry of Group 13 Elements :Occurance, isolation and properties of the elements, oxides, coordination compounds, lower valent compounds. Introduction to chemistry of Group-14 Elements,

physical properties of diamond, Graphite, Fullerenes and Carbides, carbon monoxide cyanides and related compounds, compounds with C-S bond, chemistry of group –I elements.(Al,Ga,Ta&Si,Ge,Sn,Pb)

Unit - 4

Chemistry of Group-15 Elements : Multiple bonding stereochemistry, Isolation and properties of the elements,complex compounds, Hydrides, Halides, oxohalides ,Oxides, Sulfides, Phosphorous-Nitrogen compounds, Compounds with Element-Element double bond, Nitrides, Nitrogen Hydrides, Nitrogen oxides,Hydrazine,Physical and chemical properties of 15^{th},16^{th} and 17^{th} group elements.

Unit - 5

Organo metallic compounds : Preparation of organometallic compounds, Lithium Alkyl and Aryls, Organo sodium and organo potassium compounds, Mercuration and oxomercuration, Alkyl and Arylsilicon Halides, Transition metals, Alkene complexes, Notation and electron counting in Alkene and relatedcomplexes, other pi-donar ligands, types of ligands, Cyclopentadienyls,Benzenoid – metal complexes, Alkyne complexes, Allyl Complexes.

Books & References

- Advanced Inorganic chemistry, 6th addition 1999, F. A Cotton G.wilkinson, C.A Murillo,
  M. Bochmann, John Wiley and Sons, NewYork.
- Inorganic Chemistry, 3rd addition, 1999, D.F. Shriver, P.W Atkins, oxford university press oxford.
- Inorganic Chemistry 2^{nd},3^{rd}& 4^{th} Edition, C. E HouseCroft and A.G Sharpe pearsonpentice Hall.
- Main group Chemistry, 2000 W. Henderson Royal Society of Chemistry, publication Cambridge.

22CH4L1: ORGANIC ESTIMATIONS

Course Code	22CH4L1	I A Marks	30
No. of Lecture Hours / Week	3	End Exam Marks	70
Total Number of Lecture Hours	-	Total Marks	100
Seminar	-	Exam Hours	03

Course: ORGANIC ESTIMATIONS (22CH4L1)		
S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	Memorize the basic principles involved in organic quantitative analysis.	2,7
2	Understand the importance of organic quantitative analysis and their use in research and industry.	1,2,7
3	Exercise the procedure of quantitative analysis in chosen job roles.	1,6,3
4	Analyse the similarities and differences of the principle involved in the estimation of organic functional groups.	1,5,7
5	Evaluate how far these methods are accurate in quantitative determinations.	1,3,4,7

CO-PO MATRIX								
COURSE CODE 22CH4L1	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		H					M
	CO2	M	M					L
	CO3	H			L		M	
	CO4	H				M		M
	CO5	H		M				M

Expt. 1: Estimation of phenol (bromination method)
Expt. 2: Estimation of aniline (Bromination method)
Expt.3: Estimation of sugars –glucose and sucrose by using Fehlings solution
Expt. 4: Determination of iodine value of oil or fat
Expt. 5: Determination of saponification value of oil or fat
Expt. 6: Estimation of vitamin 'C' in lime juice.
Expt. 7: Estimation of Nitro group
Expt. 8: Estimation of formaldehyde
Expt. 9: Isolation of caffeine from tea/coffee sample.

22CH4P1: PROJECT WORK

Project: PROJECT WORK (code 22CH4P1)		
S.No.	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the basic concepts related to chosen area of internship.	2,7
2	Understand the need of effective communication in drafting and presentation of project data.	1,2,3
3	Apply the knowledge of theoretical aspects to carry out project work	1,6,7
4	Interpret the data obtained in form of graphs and figures into verbal form	1,4,7
5	Evaluate the results obtained in the project work to provide valuable conclusions of the research	1,5,7

CO-PO MATRIX								
COURSE CODE 22CH4P1	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO1		H					M
	CO2	M	M					L
	CO3	H			M		M	
	CO4	H				H		M
	CO5	H		H				M

The project will be assigned in the final semester. The project will be performed at the established industry (or) in the department under the supervision of the faculty or research institutes. It may involve experimental and/or theoretical work as well as critical review of the literature. Each of the students has to carry out original research in a topic in accordance with the work chosen under the guidance and supervision of a teacher in the concerned Department of the college.

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

The final dissertation should have at least 40 – 60 pages typed in Times New Roman 12 font except Headings and side headings with 1.5 line spacing.