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DEPARTMENTOF CHEMISTRY

2nd Board of Studies Meeting

23rd June, 2018

Koneru Lakshmaiah Education Foundation
(Deemed to be University estd. u/s. 3 of the UGC Act, 1956)
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MEMBERS ATTENDED THE BOARD OF STUDIES, DEPARTMENT OF CHEMISTRY

Date of the meeting:
Venue: Room No: - F 008

Members present:

S. No.	Name	Designation	Position	Signature
1	Dr. Pranvir S Satvat	Professor	Patron	
2	Dr. J. V. Shanmukh Kumar	Professor	HOD-Chairperson	
3	Dr. K. R. S. Prasad	Professor	Secretary	
4	Dr. M. V. Basaveswara Rao	Professor, Krishna University	External Member	
5	Dr. A. Ramachandraiah	Professor, NIT Warangal	External Member	
6	Dr. K. Nageswara Rao	Manager, M/S Trimax Biosciences, Raichur, Karnataka	External Member	
7	Dr. Rajkumar Gangula	Principal Scientist, Aron Research Center, Banglore.	External Member	
8	Dr. Y. Anjaneyulu	Professor	Internal Member	
9	Dr. K. Ravindranath	Professor	Internal Member	
10	Dr. N. S. Kameswara Rao	Professor	Internal Member	
11	Dr. M. Sujatha	Associate Professor	Internal Member	
12	Dr. I. V. Kasiviswanath	Associate Professor	Internal Member	
13	Dr. T. Bhaskara Rao	Assistant Professor	Internal Member	
14	Dr. Pradeep Kumar Brahmin	Assistant Professor	Internal Member	
15	Dr. A. Venkateswara Rao	Assistant Professor	Internal Member	
16	Dr. S. Naresh Varma	Assistant Professor	Internal Member	
17	Dr. N. S. M. P. Latha Devi	Associate Professor, HOD, Dept. of Physics	Internal Member	
18	Dr. B. V. Appa Rao	Professor, I/C HOD, Dept. of Mathematics	Internal Member	

K L UNIVERSITY
DEPARTMENT OF CHEMISTRY
AGENDA OF THE 2nd BOARD OF STUDIES MEETING BOS – 2018

Contents

List of Members of the 2nd Board of Studies Meeting

Name	Designation
Dr. Pranvir S Satvat	Professor
Dr. J. V. Shanmukh Kumar	Professor
Dr. K. R. S. Prasad	Professor
Dr. M. V. Basaveswara Rao	Professor, Krishna University
Dr. A. Ramachandraiah	Professor, NIT Warangal
Dr. K. Nageswara Rao	Manager, M/S Trimax Biosciences, Raichur, Karnataka
Dr. Rajkumar Gangula	Principal Scientist, Aron Research Center, Banglore.
Dr. Y. Anjaneyulu	Professor
Dr. K. Ravindranath	Professor

Dr. N. S. Kameswara Rao	Professor
Dr. M. Sujatha	Associate Professor
Dr. I. V. Kasiviswanath	Associate Professor
Dr. T. Bhaskara Rao	Assistant Professor
Dr. Pradeep Kumar Brahmin	Assistant Professor
Dr. A. Venkateswara Rao	Assistant Professor
Dr. S. Naresh Varma	Assistant Professor
Dr. N. S. M. P. Latha Devi	Associate Professor, HOD, Dept. of Physics
Dr. B. V. Appa Rao	Professor, I/C HOD, Dept. of Mathematics

Item 2.1

Grant of Leave of absence, if any

Item 2.2

Welcoming the New Members

(Dr. J. V. Shanmukha Kumar will brief the meeting)

1. Dr. Pranvir S Satvat, Professor, Dean Academics - Patron.
2. Dr. A. Ramachandraiah , Professor, NIT Warangal - External expert
3. Dr. K. Nageswara Rao, Manager, M/S Trimax Biosciences, Raichur, Karnataka- External expert
4. Dr. Rajkumar Gangula, Principal Scientist, Aron Research Center, Banglore.
5. Dr. Y. Anjaneyulu, Professor, CES – Internal Member

Item 2.3
MINUTES OF THE MEETING OF THE 1st BOARD OF STUDIES OF CHEMISTRY DEPARTMENT, K L E F

Held at 11 a.m. on 5th July 2017 in Registrar Chamber

IN THE CHAIR

1. **Dr. J. V. Shanmukha Kumar,** Head, Department of Chemistry

MEMBERS PRESENT:

List of Members of the 1st Board of Studies Meeting

Name	Designation
Dr. J. V. Shanmukha Kumar	HOD-Chairperson
Dr. M. V. Basaveswara Rao	External expert
Dr. C. Venkat Rao	External expert
Dr. K. R. S. Prasad	Internal Member
Dr. K. Ravindranath	Internal Member
Dr. I. V. Kasiviswanath	Internal Member

The Head, Department of Chemistry formally welcomed all the members to the meeting of Board of Studies and thereafter the Agenda items are discussed and resolved as follows:

AGENDA ITEMS

1. Agenda Item

1.1 To resolve and recommend the syllabus of M. Sc Chemistry.

2. Resolution:

2.1 It is resolved and recommended the syllabus of M. Sc Chemistry based on DAC meeting held on 13-4-2016.

3.Agenda Item

3.1 To resolve and recommend the syllabus of integrated M. Sc with modular approach.

4. Resolution:

4.1 It is resolved and not recommended the syllabus of integrated M. Sc with modular approach.

Item 2.4

Follow-up actions on the Minutes of the previous meeting(s)

(Dr. J. V. Shanmukha Kumar will brief the meeting)

We are strictly following the resolutions passed in the previous minutes of the previous meetings.

Item 2.5

Proposed and revised M. Sc (Chemistry) COURSE STRUCTURE FOR Y18 REGULATION

COURSE STRUCTURE SEMESTER WISE Y-18 M Sc Chemistry K L UNIVERSITY DEPARTMENT OF CHEMISTRY												
Sl No			**Course Code**	**Course Title**	**Type**	**Uni/Sch/Dept**	**L**	**T**	**P**	**S**	**Cr**	**CH**
1	COMMON	SEM-I	18 CY 1101	General Chemistry-I	Core	DEPT CORE	4	0	0		4	4
2			18 CY 1102	Inorganic Chemistry- I	Core	DEPT CORE	4	0	6		7	10
3			18 CY 1103	Organic Chemistry-I	Core	DEPT CORE	4	0	6		7	10
4			18 CY 1104	Physical Chemistry-I	Core	DEPT CORE	4	0	6		7	10
5		SEM-II	18 CY 1201	General Chemistry-II	Core	DEPT CORE	4	0	0		4	4
6			18 CY 1202	Inorganic Chemistry-II	Core	DEPT CORE	4	0	6		7	10
7			18 CY 1203	Organic Chemistry-II	Core	DEPT CORE	4	0	6		7	10
8			18 CY 1204	Physical Chemistry-II	Core	DEPT CORE	4	0	6		7	10
9	ANALYTICAL CHEMISTRY	SEM-III	18 CY 2111	Separation Techniques -I	Core	DEPT CORE	4	0	6		7	10
10			18 CY 2112	Quality Control and Traditional Methods of Analysis-I	Core	DEPT CORE	4	0	6		7	10
11			18 CY 2113	Applied Analysis	Core	DEPT CORE	4	0	0		4	4
12				Elective-1	Elective-I	DEPT Elective	3	0	0		3	3
13				Elective-2	Elective-2	DEPT Elective	3	0	0		3	3
				Electives								
14			18 CY2114	Instrumental Methods of Analysis								
15			18 CY2115	Applications of Chemical								

				Spectroscopy								
16			18 CY2116	Bio analytical Chemistry								
17			18 CY2117	Environmental Chemistry								
18			18 CY2118	Surface Analytical Techniques								
19			18 CY2119	Analysis of Food and Drugs								
22			18 CY 2211	Separation Methods – II	Core	DEPT CORE	4	0	6		7	10
23			18 CY 2212	Traditional Methods of Analysis - II	Core	DEPT CORE	4	0	6		7	10
24				Elective-3	Core	Elective-I	3	0	0		3	3
25			18 CY2213	Dissertation with Research Publication	Core		0	0	12		6	12
26		SEM-IV		**Electives**								
27			18 CY2214	Advanced Applied Analysis								
28			18 CY2215	Advanced Instrumental Methods of Analysis								
29			18 CY2216	Classical Methods of Analysis								
31	ORGANIC CHEMISTRY		18 CY 2101	Photo Chemistry and pericyclic reactions	Core	DEPT CORE	4	0	0		4	4
32			18 CY 2102	Organic Synthesis-I	Core	DEPT CORE	4	0	6		7	10
33		SEM-III	18 CY 2103	Organic Spectroscopy	Core	DEPT CORE	4	0	6		7	10
34			Elective-I	Elective-I	Elective-I	DEPT Elective	3	0	0		3	3
35			Elective-2	Elective-2	Elective-2	DEPT Elective	3	0	0		3	3

36				**Electives**								
37			18 CY2104	Techniques for modern industrial applications								
38			18 CY2105	Advanced Heterocyclic chemistry								
39			18 CY2106	Bio Organic Chemistry								
40			18 CY2107	Green Chemistry								
41			18 CY2108	Food Chemistry								
42			18 CY2109	Medicinal chemistry								
43			18 CY2110	Nano Chemistry								
45		SEM-IV	18 CY 2201	Organic Reaction Mechanisms and Named Reactions	Core	DEPT CORE	4	0	6		7	10
46			18 CY 2202	Organic Synthesis-2	Core	DEPT CORE	4	0	6		7	10
47			Elective-3	Elective-3	Core	Elective-I	3	0	0		3	3
48			18 CY2203	Dissertation with Research Publication			0	0	12		6	12
49				**Electives**								
50			18 CY2204	Advanced Organic Spectroscopy								
51			18 CY2205	Natural Products and Biomolecules								
52			18 CY2206	Organometalic Chemistry								
53			18 CY2207	Chemistry of Drugs and Pharmaceuticals								
GRAND TOTAL							**61**	**0**	**72**	**0**	**97**	**133**

ITEM No. 2.6

PROPOSED SYLLABUS FOR M. Sc Chemistry

Sl No			Course Code	Course Title	K L Sylabus
1	COMMON	SEM-I	18 CY 1101	General Chemistry-I	**Treatment of analytical data:** Classification of errors - Determinate and indeterminate errors - Minimisation of errors - Accuracy and precision - Distribution of random errors - Gaussian distribution - Measures of central tendency - Measures of precision - Standard deviation - Standard error of mean - student's t test - Confidence interval of mean - Testing for significance - Comparison of two means - F-test - Criteria of rejection of an observation - propagation of errors - Significant figures and Computation rules - Control charts - Regression analysis - Linear least squares analysis. **Titrimetric Analysis:** Classification of reactions in titrimetric analysis- Primary and secondary standards-Neutralisation titrations-Theory of neutralisation indicators-Mixed indicators- Neutralisation curves-Displacement titrations-Precipitation titrations-Indicators for precipitation titrations-Volhard method-Mohr method-Theory of adsorption indicators-Oxidation redution titrations-Change of electrode potentials during titration of Fe(II) with Ce (IV)-Detection of end point in redox titrations-Complexometric titrations-Metal ion indicators-Applications of EDTA titrations-Titration of cyanide with silver ion. **Visible spectrophotometry and potentiometry** - Beer-Lambert's law - deviations from Beers law - Instrumentation - Applications - Photometric titrations - Spectrophotometric determination of pK value of an indicator - Simultaneous spectrophotometric determinations -Advantages of potentiometric methods - Reference electrode - Standard hydrogen electrode . Calomel electrode -Indicator electrodes:Metal-metal ion electrodes - Inert electrodes -Membrane electrodes - theory of glass membrane potential -Direct potentiometry , potentiometric titrations – Applications. **Programming in Chemistry**. Developing of small computer codes using any one of the languages FORTRAN/C/BASIC involving simple formulae in Chemistry, such as Van der Waals equation. Chemical kinetics (determination of Rate constant) Radioactive decay (Half Life and Average Life). Determination Normality, Molarity and Morality of solutions. Evaluation Electro negativity of atom and Lattice Energy from experimental determination of molecular weight and percentage of element organic compounds using data from experimental metal representation of molecules in terms of elementary structural features such as bond lengths, bond angles.
2			18 CY 1102	Inorganic	Structure & Bonding: Applications of VSEPR, Valence Bond and Molecular orbital theories in explaining

				Chemistry- I	the structures of simple molecules- role of p and d orbitals in pi bonding. Application of MO theory to square planar (PtCl42-) and Octahedral complexes (CoF63-, Co(NH3)63+). Walsh diagram for H2O molecule. Inorganic cage and ring compounds – preparation, structure and reactions of boranes, carboranes, metallocarboranes, boron–nitrogen (H3B3N3H3), phosphorus–nitrogen (N3P3Cl6) and sulphur-nitrogen (S4N4, (SN)x) cyclic compounds. Electron counting in boranes – Wades rules (Polyhedral skeletal electron pair theory). Isopoly and heteropoly acids. Coordination compounds: Crystal field theory - crystal field splitting patterns in octahedral, tetrahedral, tetragonal, square planar, square pyramidal and trigonal bipyramidal geometries. Calculation of crystal field stabilization energies. Factors affecting crystal field splitting energies – Spectrochemical series – Jahn – Teller effect, nephelauxetic effect – ligand field theory. Term symbols – Russell – Sanders coupling – derivation of term symbols for various configurations. Spectroscopic ground states. Electronic spectra of transition metal complexes: Selection rules, break down of selection rules – Orgel and Tanabe-Sugano diagrams for d1 –d9 octahedral and tetrahedral transition metal complexes of 3d series – Calculation of Dq, B and β parameters. Charge transfer spectra. Magnetic properties of transition and inner transition metal complexes – spin and orbital moments – quenching of orbital momentum by crystal fields in complexes.
3			18 CY 1103	Organic Chemistry-I	Structure and reactivity: Localized and delocalized covalent bond- Concept of resonance and aromaticity - Huckel's rule for aromaticity in benzenoid and non-benzenoid compounds, anti-aromaticity and homo-aromaticity. Nature of reaction energy and kinetic considerations - types of organic reactions - reagents - reactive intermediates. Their formation and stabilization - inductive and mesomeric effects. i) Aliphatic Nucleophilic substitutions: The SN2, SN1, mixed SN1 and SN2, SET mechanisms. Reactivity-effects of substrates, attacking nucleophiles, leaving groups and reaction medium. Common carbocation rearrangements – primary, secondary and tertiary. The neighbouring group participation (NGP) -anchimeric assistance, NGP by σ and π- bonds, phenonium ions, norbornyl and norbornenyl systems, Classical and nonclassical carbocations, NGP by halogens and heteroatoms (O,N,S) The SNi and SN2' mechanisms. Nucleophilic substitution at an allylic, and vinylic carbons. ii. Aromatic Nucleophilic Substitution: The SNAr, SN1, benzyne and SRN1mechanisms. Reactivity - effect of substrate, structure, leaving group and attacking nucleophile. The von Richter, Sommelet - Hauser and Smiles rearrangements. Sereoisomerism-Stereoisomers Classification – Configuration and conformation. Molecular Three dimensional representations: Wedge, Fischer, Newman and Saw-horse formulae, their description and interconversions. Molecular Symmetry & Chirality: Symmetry operations and symmetry elements (Cn & Sn). Criteria for

					Chirality. Dissymmetrization. Optical isomerism: Molecular Symmetry and Chirality-Cahn-Ingold-Prelog rules R, S-nomenclature, stereoisomerism resulting from more than one chiral center, meso and pseudoasymmetric compounds - Axial Chirality - Stereochemistry of allenes spiranes - biphenyl derivatives and atropisomerism - Planar chirality - Ansa compounds and trans - Cycloalkenes - Helicity. Helically chiral compounds Geometrical isomerism - E, Z - nomenclature - Physical and Chemical methods of determining the configuration of geometrical isomers-Stereoisomerism in 3, 4 and 5-membered cyclic compounds. Nano Chemistry & Green Chemistry Green Chemistry : Introduction , Basic principles of Green Chemistry, Atom economy, measuring and controlling Environmental performance, Green catalysis, Bio catalysis , Environmentally benign solutions, renewable resources, green reagents, Examples of Green reactions – Synthesis of ibuprofen, clean Fischer –Indole synthesis comparison of the above with conventional methods. Nano chemistry Introduction, Carbon Nano tubes : Structure of single and multiwalled carbon nano tubes, synthesis –solid and gaseous carbon based production technique , synthesis with Controlled orientation, Growth mechanism(catalyst free growth & catalyst activated growth) of carbon nano tubes, applications.
4			18 CY 1104	Physical Chemistry-I	Thermodynamics: Chemical equilibrium- effect of temperature on equilibrium constant-Van't Hoff equation. Partial molar quantity- different methods of determination of partial molar quantity. Chemical potential-Phase rule and its derivation, Gibbs-Duhem equation, Duhem-Margules equation, Classius-Clapeyron equation. Nernst heat theorem. Third law of thermodynamics- Determination of the absolute entropy-Apparent exceptions to Third law of thermodynamics. Micelles and Macromolecules: Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micelllar concentration (CMC), factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization- phase separation and mass action models, solubilization, micro emulsion, reverse micelles. Polymers- Definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of polymerization. Molecular mass- Number and mass average molecular mass, molecular mass determination- Osmometry, viscometry, diffusion and light scattering methods. Sedimentation, chain configuration of macromolecules, calculation of average dimensions of various structures. Chemical Kinetics: Theories of reaction rates- Collision theory- Limitations, Transition state theory. Effect of ionic strength- Debye Huckel theory-Primary and secondary salt effects. Effect of dielectric constant, effect of substituent, Hamett equation -limitations- Taft quation. Consecutive reactions, parallel reactions, opposing reactions (Uni molecular steps only, no

					derivation). Specific and general acid-base catalysis. Skrabal diagram. Fast reactions- ifferent methods of studying fast reactions- flow methods, relaxation methods- temperature jump and pressure jump methods. Photochemistry: Electronic transitions in molecules, Franck-Condon principle. Electronically excited molecules- singlet and triplet states, spin-orbit interaction. Quantum yield and its determination. Actinometry. Derivation of fluorescence and phosphorescence quantum yields. Quenching effect- Stern Volmer equation. Photochemical equilibrium and delayed fluorescence- E type and P type. Photochemical primary processes, types of photochemical reactions-photodissocoation, addition and isomerization reactions with examples.
5		SEM-II	18 CY 1201	General Chemistry-II	Symmetry and Group theory in Chemistry - Symmetry elements, symmetry operation, definition of group, suib group, relation between order of a finite group and its sub group. Point symmetry group. Schonfiles symbols, representation of groups by Matrices (representation for the Cn, Cnv, Cnh, Dn etc.groups to be worked out, explicitely). Character of a representation. The great orthogonality theorem(without proof) and its importance. Character tables and their use. Application of group theory in IR and Raman spectroscopy. Motion of molecules-Degrees of freedom –Energy associates with the degrees of freedom Type of spectra Microwave spectroscopy. Classification molecules, rigid rotator model, effect of isotopic substitution on the transition frequencies, Intensities non-rigid rotator-Microwave spectra of polyatomic molecules.Infared spectroscopy Harmonic oscillator, vibrational energies of diatomic molecules, zero point energy, force constant and bond strengths, anhoremonicity Morse potential energy diagram. Vibration – rotation spectroscopy. PQR braches, Born – oppenheimer approximation, Break down Born – openheimer approximation, selectionrules, normal modes of vibration group frequencies, overtones, hot bands, application of IR spectra topolyatomic molecules. Raman spectroscopy. Classical and quantum theories of Raman effects, pure rotational, vibrational and Vibrational – rotational Raman spectra, selection rules, mutual exclusion principle, Resonance Raman spectroscopy, coherent antistrakes Raman Spectroscopy (CARS) – Application.Visible and ultraviolet spectroscopy: - Electronic Spectra of diatomic molecules, vibrational structure ofan electronic transition, classification of bands, rotational fine structure of electronic vibrational transition. Electronic Spectra of Polyatomic Molecules – Instrumentation – Applications. Nuclear Magnetic Resonance Spectroscopy: - Nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors influencing chemical shift, desheilding, spin – spin interactions, factors influencing, coupling constant J. Classification (ABX, AMX, ABC, A2, B2 etc.) Basic ideas about instrument NMR studies of nuclei other than proton – 13C,19F, 31P. Use of NMR in medical diagnostics.
6			18 CY 1202	Inorganic Chemistry- II	Metal cluster compounds - definition – evidences for existence of M-M bonds - conditions favorable for formation of M-M bonds – preparation, structure and bonding of the following metal cluster compounds. Re2Cl82-, Mo2Cl84-, Re2(RCOO)4X2, Mo2(RCOO)4(H2O)2, Cr2(RCOO)4(H2O)2, Cu2(RCOO)4 (H2O)2,

					Cr2Cl93-, Mo2Cl93-, W2Cl93-, Re3Cl9, Re3Cl123-, Mo6Cl84+, Nb6X122+ and Ta6X122+. Polyatomic clusters – Zintle ions, Chevrel phases. Organometallic compounds - 16 and 18 electron rules. Isoelectronic relationship - Synthesis, structure, bonding and reactions of carbon monoxide, dinitrogen and nitric oxide complexes. Isolobal relationship – H, Cl, CH3, Mn(CO)5; S, CH2, Fe(CO)4; P, CH, Co(CO)3 Synthesis, structure, bonding and reactions of metallocenes with special reference to ferrocene Metal Ligand equilibria in solution: Step wise and overall formation constants and their interaction – trends in stepwise constants – factors affecting the stability of metal complexes – Pearson's theory of hard and soft acids and bases (HSAB), chelate effect and its thermodynamic origin, determination of stability constants of complexes – spectrophotometric method and pH –metric method. Reactivity of metal complexes – inert and labile complexes. Explanation of lability on the basis of valence bond and crystal field theories. Inorganic Reaction Mechanisms: Substitution reactions of metal complexes – D, Id, Ia and A mechanisms Ligand replacement reactions of metal complexes – Acid hydrolysis – factors affecting acid hydrolysis – Anation and Base hydrolysis of Cobalt(III) complexes. Ligand displacement reactions of square planar complexes of platinum (II). Factors affecting square planar substitution – trans effect (theories). Electron transfer reactions of complexes – concept of complementary and non-complementary reactions with examples. Inner and outer sphere mechanisms.
7			18 CY 1203	Organic Chemistry-II	Electrophilic addition to carbon carbon double bond: Stereoselective addition to carbon carbon double bond; anti addition- Bromination and epoxidation followed by ring opening. Syn addition of OsO4 and KMnO4. Elimination reactions Elimination reactions E2, E1, E1CB mechanisms. Orientation and stereoselectivity in E2 eliminations. Pyrolytic syn elimination and α-elimination, elimination Vs substitution. Facors influencing the elimination reactions Aromatic substitution reactions- electrophilic, nucleophilic and through benzynes - radical substitution of arenes - orientation of nucleophilic substitution at a saturated, carbon, SN1, SN2, SNi reactions-effect of structure, nucleophile, leaving group, solvent. Additions involving electrophiles, nucleophiles and free radicals. Elimination reactions - El, E1CB, E2 reactions – elimination versus substitution reactions. Mechanism of some name reactions: Aldol, Perkin, Benzoin, Cannizaro, Wittig, Grignard, Reformatsky - Meerwein, Hoffmann Claisen and Favorsky rearrangements. Hydroboration - Openauer oxidation, clemmensen reduction - Meerwein - Pondorf and verley and Birch reductions. Stork enamine reactions, Michael addition, Mannich Reaction, Diels -Alder reaction, Ene - reaction, Bayer - Villiger Reaction. Alkaloids& Terpenoids Alkaloids Occurrence, isolation, general methods of

					structure elucidation and physiological action, degradation, classification based on nitrogen heterocyclic ring, structure elucidation and synthesis of the following: Atropine, Papaverine and Quinine. Terpenoids Classification of terpenoids, occurrence, isolation, general methods of structure determination. Isoprene and special isoprene rule. Structure determination and synthesis of the following representative molecules: Farnesol, Zingeberine, Cadinene and Abietic acid.
8			18 CY 1204	Physical Chemistry-II	Physical methods of molecular structural elucidation: Magnetic properties of molecules- theories of magnetic susceptibility- measurement of magnetic susceptibility. Principle and theory of NMR spectroscopy- Nature of spinning particle and its interaction with magnetic field. Chemical shift and its origin. Spin-Spin interaction-experimental methods. Application of NMR to structural elucidation- Structure of ethanol, dimethylformamide, styrene and acetophenone. Electron Spin Resonance: Principle and experimental technique- g-factor, line shapes and line widths- hyperfine interactions- applications of ESR studies to the structure of free radicals, metal complexes and biological systems. Electrochemistry I: Electrochemical cell- Galvanic and electrolytic cell. Concentration cell with and without transference- effect of complexation on redox potential- ferricyanide/ ferrocyanide couple, Iron(III) phenonthroline/ Iron(II) phenonthroline couple. Determination of standard potential. Activity coefficient from EMF data. Primary and secondary cells, batteries examples. Fuel cells. Electrochemistry II: The electrode-electrolyte interface. The electrical double layer. The Helmholtz-Perrin parallel-plate model, the Gouy-Chapman diffuse-charge model and the Stern model. Electrodics: Charge transfer reactions at the electrode-electrolyte interface. Exchange current density and overpotential. Derivation of Butler-Volmer equation. High field approximation, Tafel equation, Low field equilibrium, Nernest equation. Voltametry- Concentration polarization, experimental techniques.
9	ANALYTICAL CHEMISTRY	SEM-III	18 CY 2111	Separation Techniques -I	Chromatography: classification of different chromatographic methods, methods of development-Elution development, Gradient elution development, displacement development, and frontal analysis. Principles of chromatography, different migration, adsorption phenomena, partition, adsorption coefficient, retardation factor, retention time and volume, column capacity, temperature effects, partition isotherm. Dynamics of chromatography-efficiency of chromatographic column, zone spreading, High Equivalent Theoretical Plate (HETP), Van Deempter equation, resolution, choice of column, length and flow velocity, qualitative and quantitative analysis. Chromatography–2: Column chromatography (adsorption chromatography): principles, general aspects, adsorption isotherms, chromatographic media, nature of forces between adsorbent and solutes, eluents (mobile phase), column chromatography without detectors and liquid chromatography with detectors and applications. Gel Exclusion chromatography or Gel filtration chromatography: principles, properties of xerogels, apparatus and detectors, resolution of gel type, applications to organic compounds.

					Capillary Electrophoresis: Principle, Details of the Instrument, Applications to Inorganic and Organic compounds. Gas chromatography: Theory, Instrument description of equipment and different parts, columns (packed and capillary columns), detector specifications-thermal conductivity detector, flame ionization detector, electron capture detector, nitrogen-phosphorus detector, photo ionization detector, programmed temperature gas chromatography; applications in the analysis of gases, petroleum products etc., other detectors used their Principles and Applications. Inorganic molecular sieves: structure of zeolites, crystals, types of sieves, application in the separation of gases including hydrocarbons, ion exclusion-principles and applications, Counter current chromatography – Principles and application, Affinity chromatography – principles and applications GC–MS–Introduction: Instrumentation –GC–MS interface–Mass spectrometer (MS) Instrument operation, processing GC – MS data – ion chromatogram Library searching–Quantitative measurement–sample preparation Selected ion monitoring – Application of GC–MS for Trace constituents. Drugs analysis, Environmental analysis and others. Liquid-liquid partition chromatography: Principle supports, partitioning liquids, eluents, reverse phase chromatography, apparatus, and applications High performance liquid chromatography: Theory, Instrument description of the different parts of the equipment, columns, detectors-UV detector, refractometric detector, Fluorescence detector, Diode Array detector, applications in the separation of organic compounds, names of other detectors used their Principles and Applications. LC-MS – Introduction – Instrumentation – liquid chromatograph – Mass spectrometer Interface – Instrumental details – Processing LC-MS data – ion chromatograms – Library searching – Quantitative measurements. Sample preparation – selected ion monitoring. Application of LC-MS for Drug analysis, Environmental samples and others.
10			18 CY 2112	Quality Control and Traditional Methods of Analysis-I	Characteristics of an analysis: quality of an analytical procedure, limit of detection, sensitivity, safety, cost measurability, selectivity and specificity, quality control-principles of Ruggedness test, control charts, Youden plot, and ranking test. Evaluation and reliability of analytical data: limitation of analytical methods, accuracy, precision, errors in chemical analysis, classification of errors, minimization of errors, significant figures, computations and propagation of errors. Statistical analysis: Mean deviation, Standard deviation, coefficient of variance, normal distribution, F test, T test, rejection of results, presentation of data. Quality assurance and management systems: elements of quality assurance, quality assurance in design,

					development, production and services, quality and quantity management system, ISO 9000 and ISO 14000 series-meaning of quality, quality process model, customer requirement of quality calibration and testing, statistical process control, process control tools, control chart, statistical quality control, acceptance sampling. Good laboratory practices (GLP) – need for GLP, GLP implementation and organization, GLP status in India. (e) Brief out line of ICH guide lines on drug substances and products. Decomposition techniques in analysis Principle of decomposition and Dissolution. Difference between dissolution / decom-position of Organic and Inorganic substances. Prinicples of Decomposition Techniques in Analysis. . Decomposition of samples with acids – H2O, HCl, HF, HNO3, H2SO4 and HClO4 Decomposition of samples by fusion, Alkali Fusion--- Na2CO3, NaOH, Acidic Fusion--- Sodium Hydro Sulphate, Sodium Pyro Sulphate Oxidation Fusion---Na2O2, Sodium Chlorate Reductive Fusion Na2CO3 + Na4BO4 Sintering process, Fusion with alkali carbonates, alkali hydroxides, Sodium Peroxide Decomposition of samples by sintering with sodium peroxide, sodium carbonate. Principles of decomposition at high temperatures, high pressures . Principles of Microwave and ultrasonic decomposition techniques. (b) Organic Compounds Principles of solubility of organic compounds, non polar, polar solvents. Recrystallisation methods and application of solubility and Recrystallisation. Oxidant systems – Principles and applications in analysis Applying the Analytical chemistry of some selected oxidant systems – formal, standard and normal potentials in various media, species responsible for the oxidation properties, stability of the solutions, standardization, requirement for the selections of the oxidants, selection of suitable indicators for Oxidant systems. a) Inorganic Systems Mn (III), Mn (VII), Ce (IV), Cr (VI), V (V), periodate, iodate, b) Organic Systems chloramine-T.

					Organic Functional group analysis Classification of functional groups with suitable examples. Determination of: Functional groups imparting acidic nature – thiol, enediol, phenolic hydroxyl. Functional groups imparting basic nature – Aliphatic and Aromatic primary, secondary and tertiary amines – hydrazine derivatives. Functional groups which impart neither acidic nor basic nature – Aldehydes, Ketones, Nitro, Methoxy, Olifinic.
11			18 CY 2113	Applied Analysis	Analysis of Ores General techniques of analysis applied to complex materials - Scope of metallurgical analysis - General methods of dissolution of complex materials - Various chemical methods for the effective separation of the constituents in the complex materials. Analysis of ores: Iron ore- Analysis of the Constituents – Moisture , loss of ignition, Total Iron, ferrous Iron ,Ferric Iron, alumina , silica, Titania, Lime, Magnesia, Sulphur, phosphrous, manganese, alkalies, combined water, Carbon in blast furnace, flue dust and sinter. Manganese Ore - Analysis of the Constituents – Total Manganese, MnO_2, SiO_2, BaO, Fe_2O_3, Al_2O_3, CaO, P and S Chromite Ore - Analysis of the Constituents – Chromium, SiO_2, FeO, Al_2O_3 CaO,& MgO. Phosphate rock Ore - Analysis of the Constituents - CaO,P_2O_5, F, SiO_2,CO_2,S, Na_2O, Al_2O_3, Fe_2O_3, Mgo,K_2O,Cl,MnO. Organic carbon, Moisture, Loss of ignition. Aluminium Ore (Bauxite) - Analysis of the Constituents – Silica, Alumina, Fe_2O_3,Titania, MnO, P_2O_5, CaO, MgO, vanadium, zirconium, and alkalies. Unit – II Analysis of Finished Products – I Analysis of steel for C, Si ,S, P, Mn, Ni, Cr; Mg and analysis of blast furnace slag . Analysis of refractory materials: fire clay, flour spar, and magnesite Analysis of fluxes - limestone and dolomite. Unit – III Analysis of Finished Products – II Chemical Analysis of cement-silica, NH_4OH group, ferric oxide, alumina, lime, magnesia, Sulphide Sulphur , K_2O,Na_2O, free CaO in Cement and Clinker,SO_3 and loss on ignition. Analysis of oils - saponification number, iodine number, and acid number.. (c) Analysis of soaps - moisture, volatile matter, total alkali, total fatty matter, free caustic alkali or free fatty acids, sodium silicate , chloride.

					(d) Analysis of paints-vehicle and pigment, BaSO4,total lead and lead chromate Assessment of water Quality Sources of water, classification of water for different uses, types of water pollutants and their effects, Analytical methods for the determination of the following ions in water: Anions: CO32-, HCO3-, F-, Cl-, SO42-, PO43-, NO3-, NO2-, CN-, S2- Cations: Fe2+, Fe3+, Ca2+, Mg2+, Cr3+, As5+, Pb2+, Hg2+, Cu2+, Zn2+, Cd2+, Co2+ Determination of Dissolved oxygen (D.O), Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD), standards for drinking water.
12				Elective-1	
13				Elective-2	
				Electives	
14			18 CY2114	Instrumental Methods of Analysis	(a) UV-Visible Spectroscopy: laws of absorption, deviation from Beer's law, single and double beam spectrophotometers-instrumentation, sources of radiation, detectors, qualitative analysis by absorption measurements, general precautions in colorimetric determinations, determination of certain metal ions by using ligands – Fe2+, Fe3+, Al3+, NH4+, Cr3+, Cr6+, Co3+, Cu2+, Ni2+ and anions – NO2-, PO43- using suitable reagents, simultaneous determinations of dichromate and permanganate in a mixture, spectrophotomeric titrations, principle of diode array spectrophotometers. (b) Spectrofluorimetry: Theory of fluorescence, phosphorescence, factors affecting the above, quenching, relation between intensity of fluorescence and concentration, instrumentation, application with reference to Al3+, chromium salts, fluorescence, thiamin (B1) and riboflavin (B2) in drug samples Spectroscopic Methods - 2 (a) Infrared spectroscopy: units of frequency, wavelength and wave number molecular vibrations, factors influencing vibrational frequencies, instrumentation, sampling techniques, detectors, characteristic frequencies of organic molecules, qualitative and quantitative analysis with reference to (petroleum refinery and polymer industry), selected molecules like CO, CO2, non-destructive IR method for the analysis of CO and other organic compounds, principles of Fourier transform IR. (b) Raman Spectroscopy: Raman effect and spectra, differences between Raman spectra and IR spectra, instrumentation, Raman spectra of CO, CO2, N2O, H2O. Spectroscopic Methods -3 ***(a)*** NMR Spectroscopy: resonance condition, origin of NMR spectra, instrumentation, chemical shift, factors affecting chemical shift, shielding, spin-spin splitting, mechanism for spin-spin coupling, interpretation of NMR spectra of typical organic compounds, factors influencing NMR spectra, fast chemical reactions, magnitude of I, nuclei with quadrupole moments, FT NMR, study of isotopes other than proton-13C, 15N, 19F, 31P, 11B, double resonance, spin tickling, shift reagents, applications.

					(b) ESR Spectroscopy: principle, g value, hyper fine splitting, qualitative analysis, Krammers degeneracy, fine splitting, instrumentation, introduction to double resonance technique, difference between ESR and NMR spectra, quantitative analysis, application to study of free radicals and other analytical applications. Spectroscopic Methods -4 (a) Mass Spectroscopy: Principle, basic instrumentation, energetics of ion formation, types of peaks observed, resolution, qualitative analysis, molecular weight determination, quantitative analysis, advantages (b) X-ray Spectroscopy (XRF): chemical analysis by X-ray spectrometers, energy dispersive and wavelength dispersive techniques, evaluation methods, instrumentation, matrix effects, applications.
15			18 CY2115	Applications of Chemical Spectroscopy	Infrared Spectroscopy: Fourier Transform infrared spectroscopy: Applications. Ultraviolet and visible spectroscopy: Applications of UV-Visible spectroscopy, Nuclear Magnetic Resonance Spectroscopy: Applications of AB, AX, ABC, AMX Systems; double resonance, Lanthanide shift reagents; Carbon-13 NMR spectroscopy; COSY, NOE, FT NMR, 2D NMR and CIDNP. Mass Spectrometry: Fragmentation: McLafferty rearrangement. Particle bombardment methods, PD, SIMS, FAB, Gas chromatography-mass spectrometry, MS data system. Combined Applications: UV, IR, NMR and Mass in the elucidation of molecular structure.
16			18 CY2116	Bio analytical Chemistry	Relevance of BioAssaying and Biochemical Analysis; Spectroscopic methods and fluorimetric methods; Quantitation of Enzymes and Optical Methods of Detection of Enzymes; Electroanalytical Methods of Enzyme Detection; Radiochemical, Manometric, Calorimetric and Other Miscellaneous Methods; Immobilization Methods; Methods; Mass Spectrometry of Biomolecules, Matrix-assisted laser desorption/ionization (MALDI); Chromatography of macromolecular biomolecules; Mass Transfer Methods; Centrifugation and Sedimentation Methods; Electrophoretic Methods; Electrochemical Sensors and BioSensors in Bioanalysis; Immunoassaying;
17			18 CY2117	Environmental Chemistry	Chemistry of Atmosphere: Composition and structure of atmosphere, Greenhouse effect, Ozone depletion, Photochemical smog, Air sampling techniques, Sources, effects and monitoring of air pollutants by Instrumental methods, Control of air pollution, Water Pollution, Different types of water pollutants, Sources, characteristics and effects of water pollutants, Monitoring of Water Pollutants, Treatment of Municipal Waste Water, Treatment of Industrial Waste Water, Environmental Impact Assessment process in India, Basic principles of Green Chemistry
18			18 CY2118	Surface Analytical Techniques	Electron Spectroscopy for Chemical Analysis (ESCA): Principles, Instrumentation, and Analytical Applications. Auger electron spectroscopy: Principles, Instrumentation, Applications. Secondary ion mass spectrometry (SIMS):Principles, Instrumentation, Applications. Surface enhanced Raman Spectroscopy (SERS):

					Principles, Instrumentation, Nanoparticulate SERS substrates, Surface enhanced resonance Raman scattering (SERRS), SERRS of Ag and Au metal colloids, Thin solid films, Langmuir-Blodgett Monolayers, SERRS Mapping and imaging, Applications. Electron Energy Loss Spectroscopy (EELS): Principles, Instrumentation, Applications. Electron Microprobe analysis: Principles, Instrumentation, Analysis of semiconductors and crystalline materials, Applications. Low Energy Ion Scattering Spectroscopy: Principle, Instrumentation, Surface structural analysis
19			18 CY2119	Analysis of Food and Drugs	Importance of food analysis, Determination of approximate composition: Moisture, fat, protein, fiber, carbohydrate, etc. Quantitative analysis for food quality and safety - Determination of minerals, vitamins, anti-oxidants, toxins and preservatives. General idea of the properties of drugs for their characterization and quantification. Quantitative methods of analysis - Gravimetric and volumetric analysis, potentiometry, coulometry and amperometry titrations, colorimetry, fluorimetry and polarimetry methods.
22		SEM-IV	18 CY 2211	Separation Methods – II	Paper chromatography: principle, papers as a chromatographic medium, modified papers, solvent systems, mechanism of paper chromatography, experimental technique, different development methods-ascending, descending, horizontal, circular spreading, multiple development, two dimensional development, reverse phase paper chromatographic technique-visualization and evaluation of chromatograms, applications. Thin layer chromatography: principle, chromatographic media-coating materials, applications, activation of adsorbent, sample development, solvent systems, development of chromatoplate, types of development, visualization methods, documentation, applications in the separation, HPTLC-principle, technique, applications. Ion Exchange: principles of ion-exchange systems, synthetic ion-exchange resins, properties of anion and cation exchange resins, ion-exchange mechanism, ion-exchange equilibria, selectivity, ion-exchange capacity, applications of ion-exchangers in different fields. Ion exchange chromatography: Principle, Equipment, Application Specifically Separations of Lanthanides, Actinides, amino acids. Ion chromatography: principles of separation, instrumentation, detectors, separation of cations and anions, applications in the analysis of water and air pollutants. SAMPLING OF SOLIDS, LIQUIDS AND GASES Sampling: Basis of sampling, purpose of sampling, homogeneous and heterogeneous samples, statistical criteria for good sampling, sample size, sampling unit, gross sample, laboratory sample. Sampling of Solids: Cone and Quartering method, Long pile and alternative shovel method, precautions in preservation of solid samples, sampling of metals and other solids rods, wires, sheets, plates, especially

					Gold, Silver, Iron and other metals. Sampling of different types of liquids: different sampling techniques, sampling of drinking water, industrial effluents, precautions in sampling and preservation of collected liquid samples. Sampling of gases: sampling and Preconcentration by adsorption or absorption method, instantaneous monitoring, sampling in samplers and subsequent monitoring, different types of gas samplers, precautions in preservation of samples, systematic sampling and random sampling. IMPORTANCE OF ANLYTICAL CHEMISTRY AND SOLVENT EXTRACTION Importance of Analytical Chemistry to Industrial Research: Importance of Qualitative and Quantitative analysis in research and development, industries and other branches of science. Development and validation of an analytical method, units, concentrations, calculations, standards, chemical reactions, expressions of concentrations, importance of separation methods with examples. Solvent Extraction: principles and processes of solvent extraction, Distribution Law and Partition coefficient, nature of partition forces, different types of solvent extraction systems – Batch extraction, Continuous extraction, Counter current extraction, solvent extraction systems, applications in metallurgy, general applications in analysis and pre-concentration, special extraction systems like crown ethers, super fluid and surfactant extractions-examples.
23			18 CY 2212	Traditional Methods of Analysis - II	Precipitation methods - 1 ***(a)*** Crystal habit and super saturation, nucleation and crystal growth, homogeneous and heterogeneous nucleation, solubility and particle size, colloids, completeness of precipitation , effect of excess precipitant, pH, complex formation, temperature, purity of precipitates, aging. ***(b)*** Co-precipitation and post precipitation : theory of adsorption of salts having an ion in common with the main precipitate, co-precipitation in colloidal precipitates, adsorption of solvents, mixed crystal formation by occlusion and entrapment, re-precipitation with examples, Post-precipitation – theory of post-precipitation, examples of post-precipitation, conditions for obtaining pure and quantitative precipitates. ***(c)*** Precipitation Titrations: Principle, Indicators for precipitation titrations, determination of halides. Unit – II Precipitation methods - 2 (a) Precipitation from Homogeneous Solution (PFHS): theory of PFHS, methods of PFHS – increase in pH, decrease in pH, cation release, anion release, reagent synthesis, change in oxidation state, photochemical reactions, precipitation from mixed solvents. Applications of PFHS methods.

					(b) Gravimetric determinations: nature of species, preparation of solutions, limitations, interferences, inorganic precipitants-chloride and sulphate, organic precipitants dimethyl glyoxime (DMG), oxine, benzidine, salicylaldoxime, benzoin oxime, sodium tetraphenyl boron, tetraphenyl arsonium chloride. ***(a)*** Electro-gravimetric analysis: principle, important terms in electrogravimetry, decomposition voltage or decomposition potential, over voltage and their importance, instrumentation, electrolysis at constant current, determination of Cu2+ by constant current electrolysis, electrolysis at controlled potentials, determination of Cu, Pb, Sn in brass and bronze by controlled potential electrolysis. Reductant system – Principles and applications in analysis Analytical chemistry of some selected reductant systems – formal, standard and normal potentials in various media, stability of the solutions, species responsible for the reduction properties, standardization, requirement for the selection of the reductants, selection of suitable indicators for various reductant systems, Inorganic Systems – Cr (II), V (II), Ti (III), Sn (II), Fe (II) in H3PO4 and hydrazine, Organic Systems – hydroquinone and Ascorbic acid. Analysis of some selected Drugs: Basic considerations of drugs – Classification Determination of the following Drugs: Actyl salicylic acid (Antipyretic – Analgesic) Testosterone, progesterone and cortisone (Steroids and corticoids) Sulphadiazine (sulphadrugs) Phenobarbitone (Barbituric acid derivatives) Chloramphenicol, Benzyl penicillin and Tetracycline (Antibiotics) Thiamine (B1), Riboflavin (B2) and ascorbic acid (c) [Vitamins] Isoniazid (Antimicrobacterial agents) Methlydopa (Antihypertensive agents) Metronidazole (Antiamoebic agents).
24					
25			18 CY2213	Dissertation with Research Publication	
26				**Electives**	
27			18 CY2214	Advanced Applied Analysis	Analysis of non-ferrous alloys: Brass – Analysis of the constituents – Cu, Zn, Sn, Pb and Fe. Bronze - Analysis of the constituents – Cu, Sn, Zn, Pb and Fe. Solder - Analysis of the constituents – Sn, Pb and Sb.

					Analysis of Ferro alloys : Ferro silicon - Analysis of the constituents – Si, C, P,S Ferro vanadium - Analysis of the constituents – V, C, P, S. Si, Al. Ferro manganese - Analysis of the constituents – Mn, S, C, P, Si Silico manganese -Analysis of the constituents – Mn, S, C, P, Si Ferro chromium - Analysis of the constituents – Cr, C, Si. Analysis of Soil, Fertilizer and Fuel Analysis of soils: sampling, determination of moisture, total N, P, Si, lime, humus nitrogen, alkali salts, soil absorption ratio. Analysis of fertilizers: ammonical fertilizers, Phosphate fertilizers, Nitrate fertilizers. Analysis of fuels: solid fuels-coal, proximate analysis, ultimate analysis, heating value, grading of coal based on Ultimate Heat Value(UHV). Assessment of Air Quality Composition of pure air, classification of air pollutants, toxic elements present in dust and their sources – collection of air samples. Sources, effects, control of pollution and chemical analysis for the following. (a) Primary pollutants: (i) Carbon compounds - Carbon monoxide(CO) and Carbon dioxide(CO2). (ii) Sulphur compounds- sulphur dioxide (SO2), Sulphur trioxide (SO3) and Hydrogen Sulphide (H2S). (iii) Nitrogen compounds - nitric oxide (NO),and nitrogen dioxide (NO2), (iv) Hydrocarbons - Aliphatic hydrocarbons and polycyclic aromatic hydrocarbons (PAH). (v) Particulate matter - Repairable and Suspended particulate matter, Inorganic and Organic particulates. (b) Secondary pollutants - ozone (O3), peroxy acetyl nitrate (PAN), peroxy benzyl nitrate (PBN) (c) Standards for ambient air quality.

					Kinetic Methods of Analysis & Non aqueous Titrimetry (a) Kinetic methods of analysis: introduction, slow reactions, catalyzed reactions, methods of determination of catalyst concentration, extrapolation method for the determination of catalyst, variable time method, fixed time method, examples for the determination of toxic metals and anions using some typical kinetic reactions. (b) Non aqueous titrimetry : Classification of solvents and titrations for non aqueous titrmetry- Types of reactions - Indicators . (i) Determination of acids (ii) Determination of bases (iii) Karl-Fisher reagent for the determination of moisture content in drugs and other samples.
28			18 CY2215	Advanced Instrumental Methods of Analysis	SPECTRO-ANALYTICAL METHODS OF ANALYSIS:(a)Flame photometry: theory, instrumentation, combustion flames, detectors, and analysis of Na, K, Ca, Mg(b)Atomic Absorption Spectrometer: theory, instrumentation, flame and non-flame techniques, resonance line sources, hollow cathode lamp, instrumentation, chemical and spectral interferences, applications with special reference to analysis of trace metals in oils, alloys and toxic metals in drinking water and effluents (c)Inductively coupled plasma spectrometer(ICP-AES, ICP-MS): principles, instrumentation, plasma, AES detectors, quadrupole mass spectrometers, difference between the two detectors, analysis methods for liquids and solids, applications in the analysis of trace and toxic metals in water, geological and industrial samples. (d) Arc and Spark spectrographic Direct analysis of solid for metals. Thermal methods of Analysis (a) Thermo gravimetry-theory, instrumentation, applications with special reference to CuSO4.5H2O, CaC2O4.2H2O, CaCO3, (COOH)2.2H2O (b) Differential thermal analysis-principle, instrumentation, difference between TG and DTA - applications with special reference to the clays and minerals, coals (fuels) (c)Differential scanning calorimetry-principle, instrumentation, applications to inorganic materials like chlorates and per chlorates, ammonium nitrate, organic compounds and Drugs. Electro analytical Methods of Analysis - 1 (a) Voltametry and polarographic analysis : principle of polarography, residual current, migration current, diffusion current, half-wave potential, Ilkovic equation, instrumentation, Dropping mercury electrode (DME), advantages and disadvantages of DME, qualitative and quantitative analysis of inorganic ions-

					Cu, Bi, Pb, Cd, Zn, AC polarography, pulse polarography (b) Anode stripping voltametry: principle, instrumentation, Hanging mercury drop electrode, application in the analysis of Pb and Cd in environmental samples, principle of cathode stripping voltametry. (c) Coulometric analysis: principles of coulometric analysis with constant current, coulometric analysis with controlled potential, applications of coulometric methods for the analysis of cations-As (III), Fe (II) and I- and S2- by using I2 liberations and Ce4+ liberation in solutions ELECTRO ANALYTICAL AND RADIO CHEMICAL METHODS OF ANALYSIS - 2 (a) Ion Selective Electrodes: reference electrodes - hydrogen electrode, calomel electrode, silver chloride electrode; indicator electrodes – hydrogen and glass electrodes, theory of membrane potentials and liquid junction potentials, types of ion selective electrodes, basic properties, potentials and construction, calibration of ion selective electrodes, ion selective electrodes with fixed membrane sites, silver, lead, cadmium, sulfide, fluoride, cyanide and glass electrodes, applications in the analysis of air and water pollutants, principles of liquid membrane, gas sensing and enzyme based electrode (b) Radio chemical methods of analysis: detection and measurement of radioactivity, introduction to radioactive tracers, applications of tracer technique, isotope dilution analysis - applications, activation analysis – application, advantages and disadvantages, radio carbon dating technique
29			18 CY2216	Classical Methods of Analysis	Water analysis (i) analysis of water for total hardness (Ca2+ and Mg2+) (ii) analysis of water for chloride (Cl-) (iii) analysis of water for alkalinity (CO32-, HCO3-) (iv) analysis of dissolved oxygen (DO) in drinking water and sewage water (v) analysis of chemical oxygen demand (COD) in drinking water and sewage water 2. Fertilizer analysis (i) analysis of fertilizer for ammonia, nitrate and phosphate 3. Analysis of iron ore (i) complete analysis of iron ore (ii) analysis of iron ore (with special reference to percentages of Fe (II) and Fe (III) present in the sample) INSTRUMENTAL METHODS OF ANALYSIS-I ***1.*** pH metry (i) Determination of alkalinity in a colored effluent using pH metric end point (ii) Determination of purity of commercial HCl, H2SO4, H3PO4 and CH3COOH using pH metric end point ***2.*** Conductometry

					(i) Determination of a mixture of strong acid and weak acid present in a colored effluent ***3.*** Potentiometry (i) Determination of Cr (VI) with Fe (II) using potentiometric end point (ii) Determination of a mixture of Ce (IV) and V (V) with Fe (II) using potentiometric end point (iii) Determination of a mixture of Mn (VII) and V (V) with Fe (II) using potentiometric end point (iv) Determination of a mixture of bromide and chloride with AgNO3 using potentiometric end point (v) Determination of KSCN with AgNO3 using potentiometric end point
31	ORGANIC CHEMISTRY	SEM-III	18 CY 2101	Photo Chemistry and pericyclic reactions	Rearrangements: Classification and general mechanistic treatment of nucleophilic, freeradical and electrophilic rearrangements, Wangner- Meerwein and realated reactions, Tiffeman Demzanov rearrangement, α-Ketol rearrangement, Neber, Hofmann, BayerVilliger, Stevens ,Wittig rearrangements. Advanced organic named reactions with mechanisms: Baylis- Hillman reaction, Mitsunobu reaction, Pechmann condensation,Roush coupling, Shapiro reaction, Suzuki coupling. Organic Photochemistry – Fundamental concepts – Jablonski diagram – Energy transfer, characteristics of photoreactions, photoreduction and photoxidation, photoreactions of ketones and enones, Norrish Type I and II reactions. Photochemistry of alkenes, dienes and aromatic compounds, reactions of unactivated centres – Photolytic cycloadditions and photolytic rearrangements –Photosenstitisation –Photoadditions – Barton reaction – Parterno Buchi reaction. Concerted reactions – stereochemistry-orbital symmetry and concerted symmetry and correlation diagram –Frontier molecular orbital approach – Woodward and Hoffmann rules – Electrocyclic reactions – cycloaddition reactions – sigmatropic rearrangements – selection rules and examples with simple molecules – 1,3 and 1,5 hydrogen shifts –Cope and Claisen rearrangements.
32			18 CY 2102	Organic Synthesis-I	Various electronic transitions - Effect of solvent on electronic transitions - Ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes and conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds - Ultraviolet spectra of aromatic and heterocyclic compounds - Steric effect in biphenyls. Charecteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines - Detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance. Nuclear spin - Nuclear resonance - Saturation, shielding of magnetic nuclei - Chemical shifts and its measurements - Factors influencing chemical shift - Deshielding - Spin-spin interactions - Factors influencing coupling constant 'J' – Classificati on (ABX, AMX, ABC, A2B2etc.) - Spin decoupling - Basic ideas about instrument - FT-NMR - Advantages of FT-NMR. Shielding

					mechanism - Mechanism of measurement - Chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, en ols, carboxylic acids, amines and amides) - Chemical exchange - Effect of deuteration - Complex spin-spin interaction between two, three, four and five nuclei (First order spectra) - Virtual coupling. Stereochemistry - Hindered rotation - Karplus curve variation of coupling constant with dihedral angle. Simplification of complex spectra: nuclear magnetic double resonance - Contact shift reagents - Nuclear overhauser effect (NOE). 13C-NMR Spectroscopy: General considerations - Chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon) - Coupling constants. Mass Spectrometry Introduction - Ion production - Types of ionization; EI, CI, FD, and FAB - Factors affecting fragmentation - Ion analysis - Ion abundance. Mass spectral fragmentation of organic compounds - Common functional groups - Molecular-ion peak - Metastable peak - Mc. Lafferty rearrangement. Nitrogen rule - Isotope labeling - High resolution mass spectrometry. Examples of mass spectral fragmentation of organic compounds with respect to their structure determination.
33			18 CY 2103	Organic Spectroscopy	Various electronic transitions - Effect of solvent on electronic transitions - Ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes and conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds - Ultraviolet spectra of aromatic and heterocyclic compounds - Steric effect in biphenyls. Charecteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines - Detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance. Nuclear spin - Nuclear resonance - Saturation, shielding of magnetic nuclei - Chemical shifts and its measurements - Factors influencing chemical shift - Deshielding - Spin-spin interactions - Factors influencing coupling constant 'J' – Classificati on (ABX, AMX, ABC, A2B2etc.) - Spin decoupling - Basic ideas about instrument - FT-NMR - Advantages of FT-NMR. H1 NMR Spectroscopy: Shielding mechanism - Mechanism of measurement - Chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, en ols, carboxylic acids, amines and amides) - Chemical exchange - Effect of deuteration - Complex spin-spin interaction between two, three, four and five nuclei (First order spectra) - Virtual coupling. Stereochemistry - Hindered rotation - Karplus curve variation of coupling constant with dihedral angle. Simplification of complex spectra: nuclear magnetic double resonance - Contact shift reagents - Nuclear overhauser effect (NOE). 13C-NMR Spectroscopy: General considerations - Chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon) - Coupling constants.

					Mass Spectrometry Introduction - Ion production - Types of ionization; EI, CI, FD, and FAB - Factors affecting fragmentation - Ion analysis - Ion abundance. Mass spectral fragmentation of organic compounds - Common functional groups - Molecular-ion peak - Metastable peak - Mc. Lafferty rearrangement. Nitrogen rule - Isotope labeling - High resolution mass spectrometry. Examples of mass spectral fragmentation of organic compounds with respect to their structure determination.
34					
35					
36				**Electives**	
37			18 CY2104	Techniques for modern industrial applications	X-ray Absorption Spectroscopy: Principles, Rotating single crystal method, Powder crystal method, Interpretation of diffraction patterns, Small angle X-ray diffraction analysis, Electron diffraction methods, Neutron diffraction methods: Small angle neutron diffraction (SANS) analysis. Scanning electron microscopy: Scanning Electron Microscope, Energy Dispersive X-ray spectrometry (EDX), Field-emission SEM (FESEM) analysis. Transmission electron microscopy: Instrumentation, Imaging surface structures. Scanning tunneling microscopy: Instrumentation, Surface imaging by STM, STM Lithography. Atomic force microscopy: Chemical force microscopy, AFM Lithography.
38			18 CY2105	Advanced Heterocyclic chemistry	I ntroduction to Heterocycles: 06P Nomenclature (Hantzsch Widman System), spectral characteristics, reactivity and aromaticity of monocyclic, fused and bridged heterocycles. HC-2: Nonaromatic heterocycles: 10P Different types of strains, interactions and conformational aspects on nonaromatic heterocycles. Synthesis, reactivity, and importance of the following ring systems. Azirines, Oxaranes, Thiiranes, Diazirenes, Diaziridines, Azetidines. HC-3: Five and six-membered heterocycles with two hetero atoms: 10P Synthesis, reactivity, aromatic character and importance of the following heterocycles: Pyrazole, Imidazole, Oxazole, Thiazole, Pyrimidine, Pyrazine, Oxazine, and Thiazine. HC-4: Heterocycles with more than two hetero atoms: 10P Synthesis, reactivity, aromatic character and importance of the following heterocycles: Triazoles, Oxadiazoles, Thiadiazoles, Triazines. HC-5: Larger ring and other heterocycles: 12P Synthesis and reactivity of Azepines, Oxepines and Thiepines. Synthesis and

					rearrangement of Diazepines. Synthesis of Benzoazepines, Benzodiazepines, Benzooxepines, Benzothiepines, Azocines, and Azonines. HC-6: Banzanellated azoles and dipolar structures: 12P Banzanellated azoles: Synthesis and reactivity of Benzimidazoles, Benzoxazoles and Benzothiazoles. Heterocyles with Ring-Junction nitrogen: Synthesis and reactivity of Quinolizines, Indolizines and Imidazopyridines. Heterocycles with Dipolar structures: Betaines: Formation, aromaticity and reactivity of pyridine-N-oxides and pyridinium imides. Mesoionic heterocycles: Synthesis and aromaticity of sydnones and 1,3-dipolar addition reaction of mesoionic heterocycles.
39			18 CY2106	Bio Organic Chemistry	Introduction, bond considerations, Proximity effects in organic chemistry, hydrolysis of glycoside bond, complementary bifunctional catalysis, Carbohydrates, Lipids and Fatty acids, Aminoacids, Peptides and Proteins, DNA and RNA, Receptors, Molecular recognition, Enzymes.
40			18 CY2107	Green Chemistry	Basic principles of Green Chemistry, Atom Economy, Selection of starting materials, Designing biodegradable products, Green reaction conditions, Green catalysis, Ionic liquids, Supercritical fluids, Flourous phase reactions, Microwave and Ultrasound assisted reactions, Heterogeneous catalysis: Biocatalysis: Green analytical methods
41			18 CY2108	Food Chemistry	Importance of Proteins, Lipids, and Carbohydrates, Aroma substances, Vitamins, Minerals, Food Additives, Food Contamination, Milk and Dairy Products, Chemical composition and nutritional value of common food stuffs, properties of foods Food preservation and processing, Food additives and their role, Pigments and colouring agents.
42			18 CY2109	Medicinal chemistry	Concepts of Medicinal Chemistry, Classification and Nomenclature of Drugs. 06P A) Concepts of Medicinal chemistry: Important terminology in medicinal chemistry: Drugs, Pharmacy, Pharmaceutics, Toxicology; Pharmacodynamic agents, Pharmacophore, Pharmacodynamics, metabolite and antimetabolites, chemotherapy. Mechanism of chemotherapeutic actions: 1) Biological defences 2) Chemical defences. a) Surface active agent, b) Metabolic antagonism. Assay of Drugs: Chemical assay, Biological assay, Immunological assay, LD-50 and ED-50. B) Classification and Nomenclature of Drugs: i) Classification of drugs on the basis of therapeutic action. a) Chemotherapeutic agents, b) Pharamacodynamic agents. ii) Nomenclature of drugs: Naming of drugs according to IUPAC system a) Naming of organic groups, b) Naming of heterocyclic nuclei. iii) Differentiate medicine and drugs. MC-2: Drug Design: 18P A] Drug Discovery. i) Introduction ii) Procedure followed in drug design. a) Drug discovery without a lead, b) Lead discovery. iii) Lead modification: Drug design and development a) Identification of the active part: The pharamcophore, b) Functional group modification, c) Structure-activity relationship, d) Structure modification to increase potency and the therapeutic index; 1) Homologation, 2) Chain branching, 3) Ring-chain transformation., 4) Bioisosterism, 5) Combinatorial chemistry. iv) Structural modification to increase oral bioactivity. 1) Electronic effect, 2) The Hammet equation, 3) Lipophilicity effect. B] Concept of prodrugs and soft drugs. a) Prodrugs: i) Prodrugs designing, types of prodrugs, ii) Prodrug formation of compounds containing various chemical groups, Prodrugs and drug delivery system b) Soft drugs: i) Soft drug concept, ii) Properties of soft drug. 10 C] Theories of drug activity. i) Occupancy theory, ii) Rate theory, iii) Induced

					theory. D] QSAR method: Introduction, Methods used in QSAR studies, Hansch method, Free-Wilson method, Advantages and disadvantages of free approach, Computer based methods of QSAR related to receptor binding, Physico-Chemical properties, Lipophilicity, Electronic parameters, Steric substituent constants, Experimental determination of partition coefficients. E] Structure based drug design. i) Process of structure based drug design, ii) Deactivation of certain drug, iii) Determination of the structure of the protein, iv) Design of inhibitors. F] Molecular modelling using computers. i) Introduction ii) Uses of molecular modelling: a) Manual use, b) Further-computer programming, c) X-ray crystallography. G] Design of Enzyme inhibitors. i) Introduction, ii) Competitive inhibitors, iii) Active-site directed irreversible inhibition of enzymes, iv) Suicide enzyme inactivation. H] New developments Gene therapy and drug resistance. MC-3: Pharmacokinetics and Pharamodynamics. 09P A] Pharmacokinetics: a) Drug absorption, b) Distribution, c) Elimination., d) Disposition B] Pharmacodynamics. a) Introduction, Elementary treatment of enzyme inhibition, b) Membrane active drug, c) Sulphonamides Mechanism of action of following drugs: Action of CNS disorder, inflammation, cardiac dysfunction. MC-4: Drug metabolism. 05P I] Introduction, II] Oxidation, III] Reduction, IV] Hydrolysis, V] Conjugation. MC-5: Antimicobacterial drugs. 08P A] Antitubercular drugs: Introduction. a) First-line agents (Primary tubercular drugs): Structure and activity of streptomycin and dihydro-streptomycin, Synthesis and SAR of 4-amino salicylic acid and isoniazid. b) Second line agents (Secondary antitubercular agents): Structure and activity of Rifampicin, Cycloserine, Viomycin, Enthionamide, Ethambutol, Thioacetazone. (Synthesis of Cycloserine and Ethambutol expected) B] Antileprotic drugs. Chaulmoogra and hydnocarpus oil, Multidrug therapy, SAR of sulphones, Dapsone (DDS), Acedapsone, Solapsone, Diaminodipheyl thiourea, Rifampicin. (Synthesis of Acedapsone expected) MC-6: Antibiotics. 08P 1. Introduction, classification of antibiotics, 2. Cell wall synthesis, 3. Mechanism of action of antibiotics, a) Inhibition of cell-wall synthesis, b) Inhibition of bacterial protein synthesis, c) Disorganization of the cytoplasmic membrane, d) Interference in the bacterial nucleic acid synthesis, e) Inhibition of the tetrahydro-folate biosynthesis
43			18 CY2110	Nano Chemistry	Introduction: Scope and importance of nanoscience and nanotechnology. Synthetic Methods: Chemical Routes : Physical methods, Techniques for characterization:, BET method for surface area analysis, dynamic light scattering for particle size determination. Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials, fullerenes, carbon nanotubes, core-shell nanoparticles, self- assembled monolayers, nanocrystalline materials, magnetic nanoparticles thermoelectric materials, non-linear optical materials, liquid crystals.
45		SEM-IV	18 CY 2201	Organic Reaction Mechanisms and Named Reactions	Rearrangements: Classification and general mechanistic treatment of nucleophilic, freeradical and electrophilic rearrangements, Wangner- Meerwein and realated reactions, Tiffeman Demzanov rearrangement, α-Ketol rearrangement, Neber, Hofmann, BayerVilliger, Stevens ,Wittig rearrangements. Advanced organic named reactions with mechanisms : Baylis- Hillman reaction, Mitsunobu reaction, Pechmann condensation,Roush coupling, Shapiro reaction, Suzuki coupling. Organic Photochemistry – Fundamental concepts – Jablonski diagram – Energy transfer,

					characteristics of photoreactions, photoreduction and photoxidation, photoreactions of ketones and enones, Norrish Type I and II reactions. Photochemistry of alkenes, dienes and aromatic compounds, reactions of unactivated centres – Photolytic cycloadditions and photolytic rearrangements –Photosenstitisation –Photoadditions – Barton reaction – Parterno Buchi reaction. Concerted reactions – stereochemistry-orbital symmetry and concerted symmetry and correlation diagram –Frontier molecular orbital approach – Woodward and Hoffmann rules – Electrocyclic reactions – cycloaddition reactions – sigmatropic rearrangements – selection rules and examples with simple molecules – 1,3 and 1,5 hydrogen shifts –Cope and Claisen Rearrangements.
46			18 CY 2202	Organic Synthesis-2	Formation of Carbon-Carbon single bounds: alkylations via enolate the enamine and related reactions, umplong (dipole inversion) reactions – the aldol reaction – applications of organo palladium, organo nickel and organo copper reagents ,applications of α-thiocarbonions, selenocarbonions and sulphur ylides, synthetic applications of carbenes and carbenoids. : Formation of carbon-carbon double bonds: Elimination reactions Pyrolytic, syneliminations, sulphoxide-sulphonate rearrangement the witting reaction-alkenes from arylsulphonyl hydrazones, claisen rearrangement of allyl vinylethers. Methods of polymerization (a) addition polymerization (b) Condensation polymerization (c) Radical polymerizations (two examples of each method) Reactions of unactivated carbon-hydrogen bonds: The HoffmannLieffier- Freytag rection-the Barton reaction-Photolysis of organic hypothalites. :Synthetic applications of organoboranes Organoboranes: Preparation of Organobornaes viz hydroboration with BH3-THF, dicyclohexyl borane, disiamyl borane, thexyl borane, 9-BBN and diisopino camphenyl borane, functional group transformations of Organo boranes-Oxidation, protonolysis and rearrangements. Formation, of carbon of carbon-bonds viz organo boranes carbonylation, the cyanoborate process and reaction of alkenyl boranes and trialkenyl borates.
47					
48			18 CY2203	Dissertation with Research Publication	
49				**Electives**	
50			18 CY2204	Advanced Organic Spectroscopy	Optical Rotatory dispersion and circular dichrosim : phenomenon ORD and CD. Classification of ORD and CD curves; cotton effect curves and their application to stereochemical problems ; the octant rule and its application to alicyclic ketones. Improving the NMR spectrum : the mean,pulse experiment, new techniques in FTNMR spectroscopy: The

					separation of Chemical shift and coupling on to two different axes (2D-NMR, Cosy), spin decoupling, the nuclear over hauser effect associating the signal from directly bonded 13 C and 1H. ESR derivative curves: Values and hyperfine splitting. Fragmentation processes; fragmentation associated with functional groups; rearrangement and mass spectra of some chemical classes. Structural elucidation of Organic Compounds by a combined application of the special method of Units I-III.(UV,IR,NMR and Mass)
51			18 CY2205	Natural Products and Biomolecules	Study of isolation, structure, stereochemistry, synthesis, biogenesis and biological properties of the following classes of natural products from plant, animal, and microbial sources and biopolymers. Acetogenins and shikimates: Microbial metabolites: Pencillin G, Cephalosphorin-Ö and streptomycin. Terpenes: Forskolin, taxol and azadirachtin. Alkaloids: Morphine, reserpine and vincristine Biopolymers: Peptides: a.-Aminoacids, their general properties and synthesis, Synthesis of peptides by Merrifield solid phase synthesis. Chemistry of oxytocin and dolastain-10.
52			18 CY2206	Organometalic Chemistry	Classification of Organometallic compounds, Metal alkyl-metal aryl complexes, Metal carbenes and metal carbines, Oxidative addition, reductive elimination, Migratory insertion reactions, Ligand substitution reactions and Fluxoinality in Organometallic compounds, Metal clusters, Capping rule, Mingos rule, Carbide clustersclusters having interstitial main group elements, Applications of organometallics as catalysts, C-C and C-N cross coupling reactions
53			18 CY2207	Chemistry of Drugs and Pharmaceuticals	Chemical and Biological assay of the following compounds: Vitamins: A, B, C, D, E and K; Hormones: Sex hormones, Steroidal and Non-steroidal hormones, Adrenaline, Thyroxine and Cardiac glycosides, Antibiotics: Penicillin, Streptomycin, Chloromycetin, Tetracyclins, Novobiocin and Cephalosporins. Chemistry of Drugs: Pharmalogical activity, uses and limitations of Antipyretics, Analgesics, Sedatives, Hypnotics, Barbiturates, Sulphadrugs, Anaesthetics, Antiseptics, Antibacterials, Diuertics, Anthelmentics, Anticoagulants, Anticonvulsants, Antihistamines, Psychotherupeutics

Item No. 2.7

Propose to evaluate the courses of study and make changes, if necessary.

Some amount of changes incorporated in some of the subjects to meet the present requirements.

Item No.2.8

Academic Calendar for the academic year 2018-19

Academic Calendar for M. Sc Chemistry Program

Academic year 2018-2019

Academic Calendar for Academic year 2018-2019

BBA/ Bs.HM /B.Com / MBA /B.Pharma / BBA-LLB / BCA / B.Sc VC / BFA / BA –IAS Academy / B.Arch / M.Sc

SEMESTER – I & III	PERIOD / DATE
• Induction Classes 1st year BBA/ BsHM /B.Com / MBA B.Pharma / BBA-LLB / BCA / B.Sc VC / BFA / BA –IAS Academy / B.Arch & ********** • Commencement of class work 2nd / 3rd / 4th B.Pharma / BBA-LLB / BCA / B.Sc VC / BFA / B.Arch	19th July 2018
Registration -ODD semester (2nd & 3rd year BBA/BsHM/B.Com/2nd year MBA	6th August 2018
Commencement of class work for Internship based programs BBA/BsHM /B.Com/MBA	7th August 2018
I Internal Assessment Examinations	19th to22nd September, 2018
II Internal Assessment Examinations	14th to 17th November , 2018
Last Instructions day for MBA and BBA	17th November,2018
• **SAP** training Module for MBA II • **Practical Examinations** / Lab assessment / Make up test for BBA/ BsHM /B.Com / MBA B.Pharma / BBA-LLB / BCA / B.Sc VC / BFA / BA –IAS Academy / B.Arch	19th November to 1st December 2018
Commencement of **comprehensive exams**	3rd December, 2018

SEMESTER – II &IV	PERIOD / DATE
Registration – Even Semester - BBA/ Bs.HM /B.Com / MBA B.Pharma / BBA-LLB / BCA / B.Sc VC / BFA / BA –IAS Academy / B.Arch	27th December, 2018
Commencement of class work - BBA/ Bs.HM /B.Com / MBA B.Pharma / BBA-LLB / BCA / B.Sc VC / BFA / BA –IAS Academy / B.Arch	27th December, 2018
I Internal Assessment Examinations	11thFebruary to 14thFebruary , 2019
II Internal Assessment Examinations	01st April to 04th April,2019
Last Instructions day	04th April, 2019
• **SAP training Module** for MBA I&II, BBA 3rd yr • **Practical Examinations** / Lab assessment / Make up test for BBA/ BsHM /B.Com / MBA B.Pharma / BBA-LLB / BCA / B.Sc VC / BFA / BA –IAS Academy / B.Arch	05th to 18th April,2019
Commencement of **comprehensive exams**	22nd April,2019
Commencement of **SIP (Internship)** for Bs.HM (45 days)/ BBA, B.Com (Two Months) /MBA (3 months) /BBA –LLB (45 days) / B.Pharma	14th May 2019

Event	Commencement of Class	Internal Test I	Internal Test II	Comprehensive Exam	No of Working days
ODD	07.08.2018	19.09.2018 (35)	14.11.2018 (39)	03.12.2018 (15)	89
EVEN	27.12.2019	11.02.2019 (34)	01.04.2019 (38)	22.04.2018 (18)	90

ACADEMIC CALENDAR FOR M. Sc 2018-19

2018-19 ODD SEMESTER

MON	TUE	WED	THU	FRI	SAT	SUN
			Jul-19	20	21	22
23	24	25	26	27	28	29
30	31	**AUG** 1	2	3	4	5
6-ODD	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	**SEP** 1	2
3	4	5	6	7	8	9
10	**11**	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
OCT 1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	**NOV** 1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	**DEC** 1	2

2018-19 EVEN SEMESTER

MON	TUE	WED	THU	FRI	SAT	SUN
DEC 3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20 - EVEN	21	22	23
24	25	26	27	28	29	30
31	**JAN** 1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	**FEB** 1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	**MAR** 1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
APR 1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21

MON	TUE	WED	THU	FRI	SAT	SUN
22	23	24	25	26	27	28
29	30	**MAY** 1	2	3	4	5
6	7	8	9	10	11	12
13 SIP						

Legend to use the calender

	Academic Registrations
	Classwork as per timetable
	Public & University holidays
	University Level Festival
	Internal Tests
	External lab/theory exams
	Semester Break
	Preparatory Classes

Item No.2.9

ACADEMIC REGULATIONS
FOR THE AWARD OF 2 YEARS M. Sc Chemistry

(WITH EFFECT FROM THE ACADEMIC YEAR 2018-19)

The KLEF shall confer two years M. Sc (Chemistry) degree to the candidates who passed the Bachelor of Science with Chemistry Programs and fulfill all the requirements for the award of the degree.

1.0 ELIGIBILITY FOR ADMISSIONS:

Admission to the above program shall be made subject to the eligibility, qualifications and specialization prescribed by the University for each Program, from time to time.

1.1. Input qualification required for admission in the two years full time M. Sc (Chemistry) Program is a pass in the three years of B.Sc education with Chemistry and a minimum of 50% in aggregate.

1.2. A student should have been declared passed in the previous academic year by the recognized university or its equivalent for seeking admission in the KL University in the current academic year.

2.0 COURSE WORK:

2.1 A Candidate after securing admission must pursue the M. Sc (Chemistry) course of study for four semester's duration.

2.2 Normally a semester consists of 90 instructional days.

2.3 The registration of a candidate is valid for a period equal to twice the prescribed duration of the Program from the date of registration.

3.0 ATTENDANCE

3.1 A candidate shall be deemed to have eligibility to write comprehensive examination in a course if he has put in at least 85% of attendance in the semester for the named course.

3.2 Condonation of shortage of attendance up to 10% i.e., from 75% and above and less than 85% may be given by the University based on the recommendations of the Dean (Academics).

3.3 Condonation of shortage of attendance may be granted only on genuine and valid reasons on representation by the candidate with supporting evidence only on medical grounds.

3.4 If the candidate does not satisfy the attendance requirement, he is detained for want of attendance and shall re-register again for that semester. He/she shall not be promoted to the next semester.

4.0 EVALUATION:

The performance of a candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks per subject, on the basis of formative and summative Evaluation.

4.1 Summative evaluation shall be carried out at the end of the semester by conducting a Comprehensive Examination which carries 40% weightage in the aggregate marks.

4.2 Formative evaluation shall be carried out on a continuous basis by the Course Instructor. This carries a weightage of 60% of aggregate marks.

4.3 The pattern of the comprehensive examination and various components of continuous evaluation are provided in the foregoing paragraphs.

4.4 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he/she secures a minimum of 40% of marks in the Internal Evaluation and a minimum of 40% in the Comprehensive Examination for M.Sc (Chemistry) courses.

4.5 In case a candidate does not secure the minimum academic requirement in any of the subjects (as specified in 4.4 above) he has to re-appear for the Comprehensive Examination when that examination is conducted next in that subject.

4.6 In case a candidate is detained for want of attendance or other reasons, he should repeat the course when offered next on the campus or do any other specified course as may be prescribed.

5.0 Evaluation Scheme:

5.1 A comprehensive examination of **three hour-duration** is held at the end of the semester for 100 marks. Entire curriculum is covered in the comprehensive examination. General Structure of the Question Paper for the Comprehensive Examinations is provided below:

S. No.	Pattern	Marks
1.	**Section A**: *Questions must be based on fundamentals and their applications of CO1 to CO4*	40
2.	**Section B**: *Practical/Application Oriented Questions with Higher BTL Covering all CO's/BTL*	40
3	**Section C** *Question must be based on comprehensive knowledge of course and interconnection of courses*	20
	Total	**100**

5.2 Continuous Assessment: Continuous assessment carries 50% weightage in aggregate marks. Various components which are included in the continuous assessment are furnished below:

Evaluation plan (Pure Theory)

Evaluation Type	Evaluation Component	Weightage/Marks		Assessment Dates	Duration (Hours)	CO1	CO2	CO3	CO4
Blooms Taxonomy Level									
In-Semester Summative Evaluation Total=60 %	**In-Sem Exam-I**	Weightage	17.5	In-Sem Exam-I Dates	2	8.75	8.75		
		Max Marks	50M			25	25		
	In-Sem Exam -II	Weightage	17.5	In-Sem Exam-II Dates	2			8.75	8.75
		Max Marks	50M					25	25
	Surprise Quiz	Weightage	3		20 Min	0.75	0.75	0.75	0.75
		Max Marks	40M			10	10	10	10
	ALMs	Weightage	10	Continuous Evaluation		2.5	2.5	2.5	2.5
		Max Marks	100M			25	25	25	25
End-Semester Summative Evaluation Total = 40 %	**Home Assignment + Book**	Weightage	5+2	Continuous Evaluation		1.75	1.75	1.75	1.75
		Max Marks	40M			10	10	10	10
	Attendance	Weightage	5	Continuous evaluation					
		Max Marks	5M						
	Semester End Exam	Weightage	40	**End Sem Exam Dates**	**3 hrs**	10	10	10	10
		Max Marks	100M	Dates		25	25	25	25

Evaluation plan (Lab & Theory based Course)

Evaluation Type	Evaluation Component	Weightage/Marks		Assessment Dates	Duration (Hours)	CO1	CO2	CO3	CO4	CO5
Blooms Taxonomy Level										
In-Semester Summative Evaluation Total =60 %	**In-Sem Exam-I**	Weightage	10M	21-9-2018	2	4.5	4.5			1
		Max Marks	50M			21	21			8
	In-Sem Exam -II	Weightage	10M	16-11-2018	2			4.5	4.5	1
		Max Marks	50M					21	21	8
	Lab In-Sem Exam	Weightage	8M	Lab In-Sem Exam Dates	1 ½					8
		Max Marks	40M							40
	ALMs	Weightage	8M	Continuous Evaluation		2	2	2	2	
		Max Marks	100 M			25	25	25	25	
	Home Assignment + Textbook	Weightage	3+2	Continuous Evaluation		0.75	0.75	0.75	0.75	
		Max Marks	40M			10	10	10	10	
	Lab Continuous Evaluation	Weightage	14M	Continuous evaluation						14
		Max Marks	100 M							100
	Attendance	Weightage	5M	Continuous evaluation						
		Max Marks	5M							
End-Semester Summative Evaluation Total = 40 %	**SE Lab Expt.**	Weightage	8	Lab External	1 ½					8(expt +viva)
		Max Marks	40M	Dates						25
	SE Lab Proj.	Weightage	8	Lab External	1 ½					8(Review+ viva)
		Max Marks	40M	Dates						25
	Semester End Exam	Weightage	24	**End Sem Exam Dates**	**3 hrs**	6	6	6	6	
		Max Marks	100 M			25	25	25	25	

a) Two internal tests will be conducted for all courses during the semester. The internal tests will be conducted for 50 marks which in turn will be scaled down to15 marks. The schedule of tests will be notified by the Examinations Coordinator in consultation with the Head Department of Chemistry.

b) Written home assignments are given in a course by the faculty member concerned. Students have to submit the home assignment before the specified date. Course Coordinators shall take precautions to ensure that there is no scope for copying in the home assignments.

c) Student's attitude means, the student's inclination, openness and fervor to learning and honoring the instructions of the faculty member concerned. Participation means, the student's involvement in the class activities including answering the specific and overhead questions the faculty member puts from time to time during a session under interactive style of delivery in the class room or lab or an activity hall. Good behavior on and off the premises, punctuality and regularity in attending classes are the issues coming under discipline.

d) Class attendance is monitored by each faculty member and based on the percentage of attendance marks are awarded by the faculty member concerned.

e) In order to maintain transparency in evaluation, the answer sheets of all components should be shown to the students within one week of conducting the tests and quiz. If a student is not convinced with the marks awarded he/she can apply for re-check. However, the student can apply for re-check on the day of returning the answer sheet within the classroom only.

f) It shall be the responsibility of the Course Coordinator to display solution key on the notice board immediately after the evaluation component with evaluation scheme. The Instructor should stick to the evaluation scheme announced while checking the answer sheets.

g) Computation of aggregate marks, submission of final grades duly approved by the Dean, Academics to the Examination Department is the sole responsibility of the Course Coordinator.

6.0 GRADING:

At the end of all evaluation components based on the performance of the student in courses, each student is awarded with a **letter grade**. The list of letter grades and their connotation are given below:

Grade	Qualitative Meaning	Grade Point attached
O	Out Standing	10
X	Excellent	9
A	Very Good	8
B	Good	7
C	Fair	6
D	Satisfactory	5
F	Fail	0

The grades 'X'and 'F' will be earned and remaining grades will be awarded.

A student getting less than 40% in comprehensive examination or less than 40% marks in the internal assessment will be considered to have earned 'F'grade.

In the combined theory and lab courses along with overall 40% score the student should get independently 40% in both theory and lab components else treated as failed and has to take the examination again in total in both theory and practical.

7.0 AWARD OF DEGREE:

A candidate shall be eligible for the award of **M. Sc (Chemistry) Specialization with Organic/Analytical Chemistry** if he/she satisfies the minimum academic requirements in each and all subjects. **For the award of M. Sc (Chemistry) degree a student must have obtained a minimum CGPA of 5.50.**

8.0 WITHHOLDING OF RESULTS:

If the candidate has not paid dues to the University or if any case of indiscipline is pending against him, the result of the candidate shall be withheld and he will not be allowed/ promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

9.0 TRANSITORY REGULATIONS:

Candidates who have discontinued or have been detained for want of attendance or who have failed after having undergone the course in earlier regulations and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered. Whereas he continues to be in the academic regulations he was first admitted.

10. PROGRAM STRUCTURE FOR TWO YEAR FULL TIME M. Sc (chemistry)

11. The program structure for the two year full time M. Sc (Program approved by the Board of Studies and the Academic Council will be applicable/implemented.

12.0 GENERAL:

i. The academic regulations should be read as a whole for purpose of any interpretation.

ii. The academic regulations mentioned herein have to be read with the other relevant regulations of the University that are in vogue.

iii. Malpractices rules: Shall be governed as per the University norms.

iii. Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final and binding.

v. The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the University.