

M.Sc. CHEMISTRY SECOND SEMESTER**COURSE CODE: MSC 201****COURSE TYPE: CCC****COURSE TITLE:****INORGANIC CHEMISTRY-2****CREDIT:****HOURS:****THEORY:****PRACTICAL:****THEORY:****PRACTICAL:****6****90****00****MARKS:****MARKS****THEORY:****PRACTICAL:****THEORY:****PRACTICAL:****70+30****OBJECTIVE:**

To study about the theories of coordination complexes, Chemistry of lanthanides, to learn about Nanotechnology and use of Inorganic Compounds in Biological Chemistry.

UNIT-1/ 24**Hours****ELECTRONIC SPECTRA AND MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEXES**

Spectroscopic ground states, correlation, Orgel and Taube-Sugano diagrams for transition metal complexes (d1 to d9 states), calculation of Dq, B and P parameters, charge transfer spectra, spectroscopic method of assignment of absolute configuration in optically active metal chelates and their stereochemical information, anomalous magnetic moments, magnetic exchange coupling and spin crossover.

UNIT-2/ 15**Hours****METAL CLUSTERS**

Higher Boranes, Carboranes, Metalloboranes and Metallocarboranes, Metal Carbonyl and halide clusters, compounds with metal-metal multiple bonds.

UNIT-3/ 18 Hours	<p>THE CHEMISTRY OF LANTHANIDES,ACTINIDES AND NANOTECHNOLOGY</p> <p>The Chemistry of solid state, lanthanides and actinides, oxidation state spectral, magnetic characteristics, coordination numbers, stereochemistry, nuclear and non-nuclear applications.</p> <p>Nanotechnology - introduction - preparatory methods, characterization, application as sensors, biomedical applications, application in optics and electronics.</p>
UNIT-4/ 15 Hours	<p>BIOINORGANIC CHEMISTRY</p> <p>Transport proteins: Oxygen carriers, metalloenzymes, carboxy peptidase, carbonic anhydrase, redox process, iron-sulphur proteins, chlorophyll, salient features of the photo synthetic process, vitamin B₁₂ role of sodium, potassium, calcium, zinc and copper; fixation of nitrogen, nitrogen cycle.</p> <p>Anti-cancer drugs and their mechanism of action, Natural and man made radio isotopes and their application.</p>
UNIT-5/ 18 Hours	<p>COORDINATION CHEMISTRY</p> <p>Stability of complexes, thermodynamic aspects of complex formation, factors affecting stability. HSAB APPROACH. Determination of stability constant by spectrometric, polarographic, potentiometric methods.</p> <p>Stereochemical aspects – Stereoisomerism in inorganic complexes, isomerism arising out of ligand and ligand confirmation, chirality and nomenclature of chiral complexes, optical rotator dispersion and circular dichroism.</p>
RECOMENDE READINGS:	<ol style="list-style-type: none"> 1. A.R. West, Basic solid state chemistry, John Wiley, (1991). 2. S. Glasstone, Source Book on Atomic Energy, Van Nostrand Co., (1969). 3. G. Frielander, J.w. Kennedy and J.M. Miller, Nuclear and Radiochemistry, John Wiley and Sons, (1981). 4. Hari JeevanArnikar , Essentials of nuclear chemistry, New Age International (P) Ltd., (2005). 5. Hari JeevanArnikar,Nuclear Chemistry Through Problems, New Age International (P) Ltd., (2007). 6. G.T. Seaborg, Transuranium elements, Dowden Hitchinson and Ross, (1978). 7. NishitMathur, Nanochemistry, RBSA publishers (2010). 8. Patric Salomon, A hand book on Nano Chemistry, Dominant publishers and distributors (2008). 9. G.B. Sergeev ,Nanochemistry ,Elsevier Science and Technology (2007). 10. U. Saityanarayana, Essentials of Biochemistry, Books and Allied (P) Ltd.,

M.Sc. CHEMISTRY SECOND SEMESTER**COURSE CODE: MSC 202****COURSE TYPE: CCC****COURSE TITLE:****ORGANIC CHEMISTRY-2****CREDIT:****HOURS:****THEORY:****PRACTICAL:****THEORY:****PRACTICAL:****6****90****00****MARKS:****MARKS****THEORY:****PRACTICAL:****THEORY:****PRACTICAL:****70+30****OBJECTIVE:**

To learn the various types of reactions, rearrangements and their synthetic utility.

UNIT-1/19 Hours**ADDITION TO CARBON - CARBON AND CARBON – HETERO MULTIPLE BONDS**

Electrophilic, nucleophilic and neighbouring group participation mechanisms - addition of halogen and nitrosyl chloride to olefins. Hydration of olefins and acetylenes. Hydroboration, hydroxylation, Michael addition, 1, 3 - dipolar additions, Carbenes and their additions to double bonds - Simon - Smith reaction. Mannich, Stobbe, Darzen, Wittig, Wittig - Horner and Benzoin reactions. Stereochemical aspects to be studied wherever applicable. Carbenes and nitrenes : Methods of generation , structure, addition reactions with alkenes - insertion reactions.

UNIT-2/ 19 Hours**OXIDATIONS AND REDUCTIONS**

Mechanism - study of the following oxidation reactions - oxidation of alcohols - use of DMSO in combination with DCC or acetic anhydride in oxidising alcohols - oxidation of methylene to carbonyl, oxidation of aryl methenes - allylic oxidation of olefins. Ozonolysis - oxidation of Olefinic double bonds and unsaturated carbonyl compounds - oxidative cleavage of C-C bond. Reduction: Selectivity in reduction of 4-t-butylcyclohexanone using selecterides. Hydride reductions - reduction with LiAlH₄, NaBH₄, tritertiarybutyloxyaluminium hydride, sodium Cyanoborohydride, trialkyltin hydride, hydrazines.

UNIT-3/16 Hours	<p>MOLECULAR REARRANGEMENTS</p> <p>A detailed study with suitable examples of the mechanism of the following rearrangements: Pinacol - Pinacolone (examples other than tetramethylethylene glycol) - Wagner - Meerwein, Demjanov, Dienone - phenol, Favorski, Baeyer - Villiger, Wolf, Stevens (in cyclic systems) and Von Richter rearrangements.</p>
UNIT-4/ 20 Hours	<p>NATURE OF BONDING AND REACTION MECHANISM</p> <p>Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, Huckel's rule, energy level of molecular orbitals, annulenes, antiaromaticity and aromaticity, homoaromaticity. PMO approach</p> <p>Types of mechanisms, types of reactions, Thermodynamic and kinetic requirements, kinetic and thermodynamic control, Hammond's postulate, Curtin Hammet Principle, Potential energy diagram, transition energy states and intermediates, methods of determining mechanism, isotope effects. Effect of structure on reactivity- resonance and field effects, steric effects, Hammett equation, substitution and reaction constants.</p>
UNIT-5/ 16 Hours	<p>HETEROCYCLES, VITAMINS AND STEROIDS</p> <p>Imidazole, oxazole, thiazole, flavones, isoflavones, anthocyanins, pyrimidines (cytosine and Uracil only) and purines (adenine, guanine only). Syntheses of parent and simple alkyl or aryl substitution - derivatives are expected. Synthesis of vitamin A1 (Reformatsky and Wittig reaction methods only). Conversion of cholesterol to progesterone, estrone and testosterone.</p>
RECOMENDE READINGS:	<ol style="list-style-type: none"> 1. E.S. Gould, Structure and Mechanism, 2. Francis A. Carey and Richard J. Sundberg, Advanced Organic Chemistry - Part B, 3rd Edition (1990). 3. H.O. House, Modern Synthetic Reactions, The Benjamin Cummings Publishing Company, London (1972). 4. I.L. Finar, Organic chemistry, Vol. I and II, 5th Edition, ELBS Publication. 5. J. March, Advanced organic reaction mechanism and structure, Tata McGraw Hill. 6. Mc Murry, Advanced organic chemistry, Thomas Pvt. Ltd., 7. Michael B. Smith, Organic Synthesis, McGraw Hill, International Edition (1994). 8. Michael Smith, Organic synthesis. 9. Michael Smith, Organic synthesis. 10. Parmer and Chawla, Organic reaction mechanisms, S. Chand and Co., 11. Paul de Mayo, Molecular Rearrangements, Vol. I and II. 12. R.E. Ireland, Organic synthesis, Prentice Hall of India 13. R.O.C. Norman, Principles of organic synthesis, Chapman and Hall, London. 1980. 14. Raymond K. Mackie and David M. Smith, Guide book to Organic synthesis, ELBS Publication. 15. S.M. Mukherji and S.P. Singh, Organic Reaction Mechanism, MacMillan India Ltd., Chennai (1990). 16. Stuart Warren, Work book for organic synthesis, The Disconnection Approach, John Wiley & Sons (Asia) Pvt. Ltd., 17. W. Carruther, Jain Coldham, Modern Methods of organic synthesis, IV Edition. 18. W. Carruthers, Some Modern Methods of Organic Synthesis, III Edition, Cambridge University Press, (1993).

M.Sc. CHEMISTRY SECOND SEMESTER			
COURSE CODE: MSC 203		COURSE TYPE: CCC	
COURSE TITLE:			
PHYSICAL CHEMISTRY			
CREDIT:		HOURS:	
THEORY:	PRACTICAL:	THEORY:	PRACTICAL:
6		90	00
MARKS:		MARKS	
THEORY:	PRACTICAL:	THEORY:	PRACTICAL:
70+30			
OBJECTIVE:			
To learn the various types of spectroscopy and radio chemistry.			
UNIT-1/ 16 Hours	Recapitulation : Width and intensity of spectral transitions, Forier transform, microwave spectroscopy, rotation spectra of di – and poly- atomic molecules, Stark effect. Infra red spectroscopy : Harmonic and an harmonic oscillator, vibrational spectra of di – and poly- atomic molecules, coarse and fine structure, Nuclear spin effect, application		
UNIT-2/ 18 Hours	RAMAN SPECTROSCOPY: Introduction, Rotational Raman spectra, Vibrational Raman Spectra, polarization of light and Raman effect, structure elucidation from combined Raman and IR spectroscopy, applications in structure elucidation. ELECTRONIC SPECTROSCOPY OF MOLECULES: Born – Oppenheimer approximation, electronic spectra of diatomic molecules, vibrational coarse structure, rotational fine structure dissociation energy and dissociation products, electronic structure of Diatomic molecules, molecular photoelectron spectroscopy, application.		

UNIT-3/ 16 Hours	<p>(A) ESR AND MOSSBAUR SPECTROSCOPY AND ITS APPLICATIONS</p> <p>(B) PRINCIPLES OF NMR – CHEMICAL APPLICATIONS OF PMR IN STRUCTURE ELUCIDATION.</p>
UNIT-4/ 18 Hours	<p>RADIO CHEMISTRY : type of radioactive decay, Decay Kinetics, Detection & measurement of radiation (G.M. & Scintillation counter). Elements of radiation chemistry – Radiation chemistry, interaction of radiation with matter, passage of nucleus through matter, interaction of radiation with matter, Units. for measuring radiation absorption, Radiation dosimetry, Radiolysis of water, free radiation in water Radiolysis, Radiolysis of some aqueous solution.</p>
UNIT-5/ 22 Hours	<p>NUCLEAR REACTOR :- The fission energy, The Natural uranium reactor, the four factor formula- The reproduction factor K, the classification of reactor. Reactor power, Critical size of thermal reactor, excess reactivity & control, the Breeder reactor, The Indian nuclear energy programme, Reprocessing of spent fuel : Recovery of Uranium & Plutonium, Nuclear waste management, Natural nuclear reactor. Isotopes for nuclear reactors. Isotope separation, separation of selected isotopes, Plutonium.</p> <p>APPLICATIONS OF RADIOACTIVITY :- Typical reaction involved in preparation of radioisotopes: ^3H, ^{14}C, ^{22}Na, ^{32}P, ^{35}S, and ^{137}I General principles of using radioisotopes.- Physical constants – Diffusion coefficients, surface area, solubility.- Analytical applications- neutron activation analysis, dilution analysis, radiometric titration.- Industrial applications – radiography, friction and wear out, gamma radiography.</p>
RECOMMENDED READINGS:	<p>19. Fundamentals of molecular spectroscopy : C.N. Banerjee and E.Mc. Cash (Fourth edition).</p> <p>20. Elements of Nuclear chemistry – H.J. Arnikar, fourth edition Wiley Eastern Ltd.</p> <p>21. Source book of atomic energy – S. Glasstone, D. Van Norton company.</p> <p>22. Chemical applications of radioisotopes – H.J. M. Brown Buffer & Janner Ltd.</p>

M.Sc. CHEMISTRY SECOND SEMESTER			
COURSE CODE: MSC B02		COURSE TYPE: ECC/CB	
COURSE TITLE:			
POLYMER CHEMISTRY			
CREDIT:		HOURS:	
THEORY:	PRACTICAL:	THEORY:	PRACTICAL:
6		90	00
MARKS:		MARKS	
THEORY:	PRACTICAL:	THEORY:	PRACTICAL:
70+30			
OBJECTIVE:			
To gain the knowledge in the preparation, properties, characterization and Uses of polymers.			
UNIT-1/ 16 Hours	Basic Concepts Classification – Nomenclature and isomerism – functionality – Molecular forces and chemical bonding in polymers – Molecular weight – Linear, branched and cross linked polymers. Thermoplastic and thermosetting polymers – Elastomers, Fibers and resins. Techniques of polymerization–emulsion, bulk, solution and suspension.		
UNIT-2/ 16 Hours	Kinetics and Mechanism Kinetics and Mechanism of polymerization – free radical, cationic, anionic and co-ordination polymerization (Ziegler - Natta Catalyst). Copolymerisation – Kinetics (Detailed Study). General characterization–Kinetic chain length–degree of polymerization, chain transfer - initiators – inhibitors – retarders.		

UNIT-3/ 22 Hours	<p>Structure and Properties</p> <p>Structure - property relationship – Mechanical properties, Thermal properties – Glass transition temperature – Factors affecting Glass transition temperature – crystallinity and melting point – related to structure.</p> <p>Nitrogenase enzyme : Introduction, Types of nitrogen fixing microorganism, metal clusters in nitrogenase. Nitrogen fixation pathway. Transition metal complexes : Dinitrogen complexes. Biological redox reactions. Photosynthesis and chlorophyll.</p> <p>Polymer characterization and analysis</p> <p>Crystalline nature – X-Ray diffraction – Differential Scanning Calorimetry (DSC) – Thermo Gravimetric Analysis – molecular weight determination – Osmometry (membrane), Viscosity, Ultra centrifuge and Gel Permeation Chromatography.</p>
UNIT -4/ 18 Hours	<p>INDUSTRIAL NATURAL POLYMERS</p> <p>Important industrial polymers – preparation and application of polyethylene, poly vinyl chloride, poly urethanes, polytetrafluoro ethylene (TEFLON), Nafion and ion – exchange resins.</p> <p>Importance of natural polymers – application and structures of starch, cellulose and chitosin derivatives.</p>
UNIT-5/ 18 Hours	<p>SPECIALITY POLYMERS</p> <p>Bio polymers – biodegradable polymers – biomedical polymers – poly electrolytes - conducting polymers – high temperature and fire retardant polymers - polymer blend – polymer composites – polymer nanocomposites – IPN inter penetrating network polymers – Electroluminescent polymers.</p>
RECOMENDE READINGS:	<p>F. W. Bill Meyer. Text book of polymer science, III Edition, John Wiley and sons, New York.</p> <p>P. J. Flory. Principles of Polymer Chemistry, Cornell Press (recent edition).</p> <p>V. R. Gowarikar, B. Viswanathan, J. Sridhar, Polymer Science – Wiley Eastern, 1986.</p> <p>G. S. Misra – Introduction to Polymer Chemistry, Wiley Eastern Ltd.,</p> <p>P. Bahadur, N. V. Sastry, Principles of Polymer Science, Narosa Publishing House.</p> <p>G. Odian, Principles of Polymerization, McGraw Hill Book Company, New York, 1973.</p> <p>A. Rudin, The Elements of Polymer Science and Engineering. Academic Press, New York, 1973.</p>

I. C. E. H. Brawn, The Chemistry of High Polymers, Butter worth & Co., London, 1948.

G. S. Krishenbaum, Polymer Science Study Guide, Gordon Breach Science publishing, New York,1973.

E. A. Coolins, J. Bares and E. W. Billmeyer, Experiments in Polymer Science, Wiley Interscience,New York, 1973.

M.Sc. CHEMISTRY SECOND SEMESTER			
COURSE CODE: MSC B03		COURSE TYPE: ECC/CB	
COURSE TITLE:			
ORGANIC SYNTHESIS - I			
CREDIT:		HOURS:	
THEORY:	PRACTICAL:	THEORY:	PRACTICAL:
6		90	00
MARKS:		MARKS	
THEORY:	PRACTICAL:	THEORY:	PRACTICAL:
70+30			
OBJECTIVE:			
To study about reagents in organic synthesis, reaction and mechanism.			
UNIT-1/ 18 Hours	MODERN SYNTHETIC METHODS, REACTIONS AND REAGENTS Synthesis of simple organic molecules using standard reaction like acetylation alkylation of enamines and active methylene compounds, Grignard reaction, Phosphorus and sulphurylides Robinson annulations, Diels Alder reactions, protection and deprotection of functional groups (R-OH, R-CHO, RCO, R-NH ₂ and R-COOH).		
UNIT-2/ 18 Hours	Nucleophilic C-C bond formation: Henry reaction, Wittig reaction and Horner-WordwothEmmons reaction and their selectivities; Chemistry of enolates – E, Z geometry of enolates, kinetic vs thermodynamic control of enolates, stereoselective enolate reactions, alkylation, aldol condensation (Zimmerman and Evans models), Mukaiyama reaction.		
UNIT-3/ 18 Hours	Electrophilic C-C bond formation: Prins reaction, Vilsmeier-Hack reaction, Pictet-Sprengler reaction, Heck reaction, Stille coupling, Suzuki coupling, Negishi reaction, reactions of allylsilane, Acylation of carbonyl carbon; Carbonyl cyclizations and cleavages.		
UNIT-4/ 18 Hours	Miscellaneous reactions: Biginelli reaction, Hantzsch reaction, Passerini reaction, Ugi reaction, McMurry olefination, Ring closing metathesis (RCM) - Grubb's reaction, Mitsunobu reaction, Nef reaction, Sharpless asymmetric epoxidation and asymmetric dihydroxylation. Carboxylic acids and derivatives, decarboxylation reactions, 1,3-dithiane reactivity: Umpolung effect, Peterson's synthesis.		

UNIT-5/18 Hours	Reagents in organic synthesis: K-selecteride and L-selecteride, sodium cyanoborohydride, super hydrides, 9-BBN, IBX, Dess-Martin periodinane, manganese dioxide, Fetizon reagent, dioxiranes, ceric ammonium nitrate, Gilman's reagent, lithium disopropylamide, dicyclohexylcarbodiimide, trimethylsilyl iodide, tri-n-butyltin hydride, Tebbe reagent, CoreyNicolaou reagent, baker's yeast, lipase, Mosher's reagent, use of Os, Ru, and Tl reagents and DDQ.
RECOMEND E READINGS:	1. F. A. Carey & R. J. Sundberg. Advanced Organic Chemistry Part B, Plenum Press (2007). 2. M. B Smith. Organic Synthesis (2 nd end.), McGraw-Hill, Inc. (2001). 3. J. March. Advanced Organic Chemistry: Reactions, Mechanism and Structure (4th edn.), John Wiley & Sons (2005).

M.Sc. CHEMISTRY SECOND SEMESTER			
COURSE CODE: MSC B04		COURSE TYPE: ECC/CB	
COURSE TITLE:			
APPLIED CHEMISTRY			
CREDIT:		HOURS:	
THEORY:	PRACTICAL:	THEORY:	PRACTICAL:
6		90	00
MARKS:		MARKS	
THEORY:	PRACTICAL:	THEORY:	PRACTICAL:
70+30			
OBJECTIVE:			
To gain the knowledge in the preparation, properties, characterization and Uses of polymers.			
UNIT-1/ 18 Hours	CHEMISTRY OF WATER: Water quality parameters - Total dissolved solids - hardness - dissolved oxygen - Physical, Chemical, Biological contaminants in water - Municipal water treatment - sterilization - Chlorination - Ozonisation - Conversion of sea water into drinking water - Reverse Osmosis - Deionization.		
UNIT-2/ 18 Hours	CHEMISTRY OF DRUGS: Classification of drugs - Administration of Drug - Absorption of drugs - Elimination of drug by Kidney - Some important drugs - Antibiotics, Anti malarials, anti asthmatic drugs - Anti bacterial drugs, anti septics, anesthetics, analgesics and anti pyretic drugs. (Role and examples in each type) - Misuse of drugs.		
UNIT-3/ 18 Hours	CHEMISTRY OF POLYMERS Classification of polymers - Addition and condensation polymers - Polymerisation reaction - co-polymers - homopolymers - Thermoplastics and thermosets - Molecular weight of polymers - Rubbers - Inorganic polymers - Biopolymers - Domestic and industrial application of polymers.		

UNIT-4/ 18 Hours	<p>CHEMISTRY OF MATERIALS: Cement - Manufacture of cement - Setting of cement - Paint - Varnishes - Enamel and Lacquers - Refractories - Properties - Manufacturing methods - adhesives - types - Adhesive action - Preparation of adhesives - Soaps and Detergents.</p>
UNIT-5/ 18 Hours	<p>CHEMISTRY OF ENVIRONMENTAL POLLUTANTS: Gaseous pollutants - Effect of gaseous pollutants on human health - Method of Control - Water pollutants - types - Removal methods - Soil pollutants - types - Control methods - nuclear wastes - Adverse effects - Control methods.</p>
RECOMENDE READINGS:	<ol style="list-style-type: none"> 1. Engineering chemistry, Jain and Jain, Dhanpat Rai Publishing company. 2. Fundamental concepts of applied chemistry by Jayashree Ghosh, S. Chand & Company Ltd. 3. Introductory polymer chemistry, G.S. Mistra - New age international Pvt. Ltd. 4. Environmental science - Koushik and AmbauKoushik. New age international Publishers.

M.Sc. CHEMISTRY SECOND SEMESTER**COURSE CODE: MSC211****COURSE TYPE: CCC****COURSE TITLE:****PHYSICAL AND ORGANIC CHEMISTRY LAB****CREDIT:****HOURS:****THEORY: PRACTICAL: 06****THEORY: PRACTICAL:135****MARKS:****MARKS****THEORY: PRACTICAL:****THEORY: PRACTICAL:**

PHYSICAL CHEMISTRY

SURFACE TENSION

1. To find out the composition of mixture of two liquids A and B.
2. To find out the surface tension of liquids at room temperature and hence calculate the atomic parachor of C, H, O.
3. To determine the parachor of a mixture of two liquids.

SOLUTION

1. Determination of molecular weight of non volatile substance cryoscopically using water as solvent.
2. Determination of solubility product of sparingly soluble electrolyte.
3. Determination of molecular weight of a given solute by boiling point elevation method.

PARTITION COEFFICIENT

1. Determination of distribution coefficient of Iodine between water and CCl_4 , Succinic acid between ether and water, or Benzoic acid between benzene and water.
2. Determination of equilibrium constant of the reaction between KI and I_2 .

REFRACTOMETRY

1. Determination of refractive index of a liquid by Abbe refractometer and hence specific and molar refraction.
2. Determination of molar refractivity of CH_3COOH , CH_3OH , $\text{CH}_3\text{COOC}_2\text{H}_5$ and CCl_4 and calculate the refraction equivalent of C, H and Cl.

CHEMICAL KINETICS

1. Determination of Rate constant of hydrolysis of methyl acetate catalysed by acid and also energy of activation.
2. Determination of Rate constant of hydrolysis of ethyl acetate by NaOH.
3. Study of kinetics of decomposition of H_2O_2 and HI.
4. To study the inversion of cane sugar in presence of HCl and H_2SO_4 and hence determine the relative strength of acids.

5. To determine the relative strength of acids by studying the hydrolysis of an ester.

CONDUCTIVITYMETRY

1. Determination of dissociation constant of electrolytes.
2. Determination of equivalent conductance of electrolytes.
3. Determination of solubility and solubility product of sparingly soluble salts.
4. Determination of strength of strong and weak acids in given mixture.
5. Determination of degree of hydrolysis and hydrolysis constant of CH_3COONa and NH_4Cl
6. Determination of relative strength of two acids.

PH METRY/POTENTIOMETRY

1. Titrate ferrous ammonium sulphate against $\text{K}_2\text{Cr}_2\text{O}_7$ potentiometrically and determine the redox potential of ferrous ferric system.
2. Titrate mixture of HCl and CH_3COOH potentiometrically/pHmetrically.
3. Potentiometric precipitation titration using silver electrode.
4. Determination of strength of acids by pH meter.
5. Determination of dissociation constant of acids by Albert Serjean method.

COLORIMETRY/SPECTROMETRY

1. To verify Lambert Beer's law using a colorimeter
2. Determination of composition of binary mixture containing $\text{K}_2\text{Cr}_2\text{O}_7$ and KMnO_4 using spectrophotometer
3. Determination of the wavelength of maximum absorption of a compound using spectrophotometer.
4. Titration of a solution of Ferrous ammonium sulphate and KMnO_4 spectrometrically/colorimeter.
5. To determine the concentration of Ni in solution by spectrophotometric titration.

ORGANIC CHEMISTRY

QUALITATIVE ANALYSIS: Separation, Purification and Identification of Binary mixture (solid-solid, solid-liquid).

ORGANIC SYNTHESIS: Two and three step synthesis of organic compounds including Acylation, Oxidation, Grignard's reaction, Aldol reaction, Sandmeyer reaction, Friedle Craft's reaction, Aromatic electrophilic substitution.

QUANTITATIVE ANALYSIS:

1. Determination of the percentages number of hydroxyl group.
2. Estimation of amine/phenols.
3. Estimation of Carbonyl group.
4. Estimation of Glycine.
5. Determination of equivalent weight of carboxylic compound.
6. Estimation of carboxylic group.

Recommended Reading:

Arthur I. Vogel, A text book of Practical Organic Chemistry, ELBS Raj K. Bansal, Laboratory Manual of Organic Chemistry, Wiley Eastern limited. N.N. Greenwood and A. Earnshaw, Chemistry of the Elements, Vol.II, Pergamon Press (1997).

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M.Sc. CHEMISTRY SECOND SEMESTER	
COURSE CODE: MSCB01	COURSE TYPE : ECC/CB
COURSE TITLE: ENVIRONMENTAL AND FOREST LAWS	
CREDIT: 06	HOURS : 90
THEORY: 06	THEORY: 90
MARKS : 100	
THEORY: 70	CCA : 30
OBJECTIVE:	
<ul style="list-style-type: none"> - Understands the concept and place of research in concerned subject - Gets acquainted with various resources for research - Becomes familiar with various tools of research - Gets conversant with sampling techniques, methods of research and techniques of analysis of data - Achieves skills in various research writings - Gets acquainted with computer Fundamentals and Office Software Package . 	
UNIT - 1 18 Hrs	<p style="text-align: center;">EVOLUTION OF FOREST AND WILD LIFE LAWS</p> <p>a) Importance of Forest and Wildlife</p> <p>b) Evolution of Forest and Wild Life Laws</p> <p>c) Forest Policy during British Regime</p> <p>d) Forest Policies after Independence.</p> <p>e) Methods of Forest and Wildlife Conservation.</p>
UNIT - 2 18 Hrs	<p style="text-align: center;">FOREST PROTECTION AND LAW</p> <p>a) Indian Forest Act, 1927</p> <p>b) Forest Conservation Act, 1980 & Rules therein</p> <p>c) Rights of Forest Dwellers and Tribal</p> <p>c) The Forest Rights Act, 2006</p> <p>d) National Forest Policy 1988</p>

UNIT - 3**18 Hrs****WILDLIFE PROTECTION AND LAW**

- a) Wild Life Protection Act, 1972
- b) Wild Life Conservation strategy and Projects
- c) The National Zoo Policy

UNIT - 4**18 Hrs****CHAPTER – BASIC CONCEPTS**

- a. Meaning and definition of environment.
- b. Multidisciplinary nature of environment
- c. Concept of ecology and ecosystem
- d. Importance of environment
- e. Meaning and types of environmental pollution.
- f. Factors responsible for environmental degradation.

CHAPTER– INTRODUCTION TO LEGAL SYSTEM

- a. Acts, Rules, Policies, Notification, circulars etc
- b. Constitutional provisions on Environment Protection
- c. Judicial review, precedents
- d. Writ petitions, PIL and Judicial Activism

CHAPTER – LEGISLATIVE FRAMEWORK FOR POLLUTION CONTROL LAWS

- a) Air Pollution and Law.
- b) Water Pollution and Law.
- c) Noise Pollution and Law.

CHAPTER- LEGISLATIVE FRAMEWORK FOR ENVIRONMENT PROTECTION

- a) Environment Protection Act & rules there under
- b) Hazardous Waste and Law
- c) Principles of Strict and absolute Liability.
- d) Public Liability Insurance Act
- e) Environment Impact Assessment Regulations in India

CHAPTER – ENVIRONMENTAL CONSTITUTIONALISM

- a. Fundamental Rights and Environment
 - i) Right to EqualityArticle 14
 - ii) Right to InformationArticle 19
 - iii) Right to LifeArticle 21
 - iv) Freedom of Trade vis-à-vis Environment Protection
- b. The Forty-Second Amendment Act
- c. Directive Principles of State Policy & Fundamental Duties
- d. Judicial Activism and PIL

Bharucha, Erach. Text Book of Environmental Studies. Hyderabad : University Press (India) Private limited, 2005.

Doabia, T. S. Environmental and Pollution Laws in India. New Delhi: Wadhwa and Company, 2005.

Joseph, Benny. Environmental Studies, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2006.

Khan. I. A, Text Book of Environmental Laws. Allahabad: Central Law Agency, 2002.

Leelakrishnan, P. Environmental Law Case Book. 2nd Edition. New Delhi: LexisNexis Butterworths, 2006.

Leelakrishnan, P. Environmental Law in India. 2nd Edition. New Delhi: LexisNexis Butterworths, 2005.

Shastri, S. C (ed). Human Rights, Development and Environmental Law, An Anthology. Jaipur: Bharat law Publications, 2006.

Environmental Pollution by Asthana and Asthana, S, Chand Publication

Environmental Science by Dr. S.R.Myneni, Asia law House

Gurdip Singh, Environmental Law in India (2005) Macmillan.

Shyam Diwan and Armin Rosencranz, Environmental Law and Policy in India –

Cases, Materials and Statutes (2nd ed., 2001) Oxford University Press.

JOURNALS :-

Journal of Indian Law Institute, ILI New Delhi.

Journal of Environmental Law, NLSIU, Bangalore.

MAGAZINES :-

Economical and Political Weekly

Down to Earth.