SEMESTER – I

CORE COURSE - I

INORGANIC CHEMISTRY I

Theory Hours :5	**Course code : P21CHC101**
Exam Hours : 3	**Credits :5**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES:

To learn about the inorganic polymers. To study the concept of coordination chemistry, stability of the complexes and stereochemistry of complexes. To know about the structure and bonding of inorganic compounds.

UNIT-I: STRUCTURE AND BONDING - I

Polyacids: Isopolyacids and heteropolyacids of vanadium, chromium, molybdenum and tungsten.

Inorganic Polymers: Silicates, structure - properties - correlation and applications - molecular sieves, polysulphur - nitrogen compounds and poly – organophosphazenes

.

UNIT-II: STRUCTURE AND BONDING - II

Boron hydrides: Polyhedral boranes, hydroboration, carboranes and metallocarboranes. Metal clusters : Chemistry of low molecularity metal clusters (upto) trinuclear metal clusters, multiple metal-metal bonds. Cubane clusters and Zintl clusters.

UNIT-III: COORDINATION CHEMISTRY - I

Stability of complexes; thermodynamic aspects of complex formation; factors affecting stability, HSAB approach. Determination of stability constants by spectrophotometric, polarographic and potentiomteric methods.

UNIT-IV: COORDINATION CHEMISTRY - II

Stereochemical aspects; stereoisomerism in inorganic complexes; isomerism arising out of ligand distribution and ligand conformation; chirality and nomenclature of chiral complexes; optical rotatory dispersion and circular dichroism. Macrocyclic ligands; types; porphyrins; corrins, Schiff bases; crown ethers and cryptates.

UNIT-V: COORDINATION CHEMISTRY - III

Evidences for metal-ligand orbital overlap, molecular orbital theory and energy level diagrams, concept of weak and strong field ligands, Jahn-Teller distortion, charge - transfer spectra. Term states for "d"-ions, energy diagrams, d-d transitions, Orgel and Tanabe - Sugano diagrams, spin orbit coupling, nephelauxetic effect, spectral and magnetic characteristics of transition metal complexes.

TEXT BOOKS

1. F. A. Cotton and G.W. Wilkinson, Advanced Inorganic Chemistry– A comprehensive Text, John Wiley and Sons (1988).
2. J. E. Huheey, Inorganic Chemistry, Harper and Collins, NY, IV Edition, (1993).
3. K. F. Purcell and J. C. Kotz, Inorganic Chemistry WB Saunders Co., USA, (1977).
4. M. C. Shrivers, P.W Atkins, CH. Langford, Inorganic Chemistry, OUP, (1990).
5. N. N. Greenwood and Earnshaw, Chemistry of the Elements, Pergamon Press, New York (1984).
6. N. H Ray, Inorganic Polymers, Academic Press, (1978)
7. S. F. A. Kettle, Coordination Chemistry, ELBS, (1973).

Suggested References

8. A. B. P. Lever, Inorganic Electronic Spectroscopy, II Edn., Elsevier, New York, (1984).
9. B.E. Dogulas DH McDaniel's and Alexander, Concepts and Models of Inorganic Chemistry, Oxford IBH, (1983).
10. B.N. Figgis, Introduction to Ligand Fields, Interscience, (1966).
11. E.L. Mutterties, Polyhedral Boranes, Academic Press, New York (1975).
12. M.C. Day and J. Selbin, Theoretical Inorganic Chemistry, Van Nostrand Co., NY (1974).
13. W.U. Mallik, G.D. Tuli, R.D. Madan, Selected topics in Inorganic Chemistry, S. Chand and Co., New Delhi, (1992).
14. D. M.P.Mingos and D. J. Wales, Introduction to Cluster Chemistry, Prentice Hall, 1990.
15. R. Gopalan, Text book of Inorganic Chemistry, University press (India) private Ltd.

COURSE OUTCOMES

After completing the course students will be able to

CO 1: Explain the principles of inorganic polymer synthesis and assess appropriate methods of synthesis.

CO2: Construct a plan for further research in inorganic polymers.

CO 3: Illustrate the bonding system of inorganic compounds

CO 4: Understand the key features of Co-ordination chemistry

CO 5: Apply the concepts of Co-ordination chemistry for further research.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1						✓	✓					
CO 2	✓							✓			✓	✓
CO 3		✓					✓				✓	
CO 4	✓			✓								
CO 5	✓				✓							✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER – I
CORE COURSE –II
PHYSICAL CHEMISTRY I

Theory Hours :6	**Course code : P21CHC102**
Exam Hours : 3	**Credits :5**
	Marks : Max marks -100
	Ext - 75
	Int- 25

OBJECTIVE:

To study the partial molar property, fugacity and its significance. Theories and basic concepts of chemical kinetics - mechanism of acid, base and enzyme catalysis reaction.

To acquire knowledge on phase equilibria of three component system. To study the basics of colloids.

UNIT-I: THERMODYNAMICS

Partial molar properties -Partial molar free energy (chemical potential), Partial molar volume and Partial molar heat content - Their significance and determination of these quantities. Variation of chemical potential with temperature and pressure.

Definition of fugacity - determination of fugacity by graphical method - variation of fugacity with temperature and pressure - the concept of activity and activity coefficients – determination of activity and activity coefficient by emf method - determination of activity and activity coefficients for non-electrolytes - determination of standard free energies - choice of standard states.

UNIT-II: PHASE EQUILIBRIA

Physical equilibria involving phase transition: Two component system - Congruent system (phenol-aniline) and Incongruent system (sodium chloride- water) - Peritectic reactions. Three component system: Solid - Liquid equilibria - hydrate formation (sodium chloride - sodium sulphate - water); Liquid - Liquid equilibria - one pair of partially miscible liquids (acetic acid - chloroform - water and alcohol - benzene - water); two pairs of partially miscible liquids (water - ethyl alcohol - succinic nitrile).

UNIT-III: COLLOIDS

Surface phenomena - surfactants, micellization, critical micelle concentration (CMC), factors affecting CMC of surfactants, micro emulsions, reverse micelles and surface films (electro kinetic phenomena).Structure and stability of colloids - Zeta potential (derivation), electro osmosis, protective colloids, gold number, sedimentation potential, streaming potential and Donnan membrane equilibrium.

UNIT-IV: CHEMICAL KINETICS

Absolute Reaction Rate Theory (ARRT) - Potential energy surfaces - partition function and activated complex- Eyring equation - estimation of free energy, enthalpy and entropy of activation and their significance.

Reactions in solutions - effect of pressure, dielectric constant and ionic strength on reactions in solutions - kinetic isotope effects - linear free energy relationships. Hammett and Taft equation.

UNIT-V: CATALYSIS

Acid - Base catalysis - mechanism of acid - base catalyzed reactions - Bronsted catalysis law. Catalysis by enzymes - Kinetics of enzyme catalyzed reaction - Michaelis - Menten equation and its interpretation. Effect of substrate concentration, pH and temperature on enzyme catalyzed reactions - inhibition of enzyme catalyzed reactions - Competitive, Non-competitive and Uncompetitive inhibition.

TEXT BOOKS

1. S. Glasstone, Thermodynamics for Chemists, Affiliated East West Press, New Delhi (1950).
2. J. Rajaram and J. C. Kuriacose, Thermodynamics for Students of Chemistry, Lal Nagin Chand, New Delhi (1986).
3. Samuel Glasstone, Textbook of Physical Chemistry, Macmillan India Limited, 2nd Edition
4. Terence Cosgrove – Colloid Science - Principles, methods and applications
5. Robert J. Hunter - Foundations of Colloid Science, 2nd Edition
6. J. Rajaram and J.C. Kuriacose, Kinetics and Mechanism of Chemical Transformations. Mac Millan India Ltd (1993).
7. K. J. Laidler, Chemical Kinetics, Harper and Row, New York (1987).

Suggested References

1. W. J. Moore, Physical Chemistry, Orient Longman, London (1972).
2. K. G. Denbiegh, Thermodynamics of Steady State, Methien and Co. Ltd, London (1951).
3. K. Nash, Elements of Chemical Thermodynamics, Addision Wesley (1962).
4. Alexander and Johnson- "Colloid science"- Oxford University Press
5. R. G. Frost and Pearson, Kinetics and Mechanism, Wisely, New York (1961).
6. Amdur and G. G. Hammes, Chemical Kinetics, Principles and Selected Topics, McGraw Hill, New York (1968).
7. M.V. Sangaranarayanan and V. Mahadevan, Text book of Physical Chemistry, University press (2011).

COURSE OUTCOMES

After completing the course students will be able to

CO 1: Understand the basic concepts of Chemical kinetics and thermodynamics

CO2: Understand the energy equation and its application.

CO 3: Describe the fundamental concepts such as enthalpy, entropy , fugacity, etc.,

CO4 : Explain the concept of catalytic system in chemical reactions.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓			✓	✓		✓	✓			✓	
CO 2							✓					
CO 3			✓	✓			✓				✓	
CO 4			✓		✓							

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)
SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)
SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER – I

CORE PRACTICAL – III

INORGANIC CHEMISTRY PRACTICAL - I

Practical Hours : 6	**Course code : P21CHC103P**
Exam Hours : 6	**Credits : 5**
	Marks : Max marks -100
	Ext - 60
	Int - 40

OBJECTIVES

- To learn the basic principle of volumetric and gravimetric analysis
- To know the preparation of complexes.

1. TITRIMETRY AND GRAVIMETRY

A mixture of solution(s) should be given for estimation

Cu (V) and Ni (G)

Cu (V) and Zn (G)

Fe (V) and Zn (G)

Fe (V) and Ni (G)

2. PREPARATION OF COMPLEXES

1. Tris(thiourea)copper(I) chloride
2. Tetramminecopper (II) sulphate
3. Potassium trioxalatoferrate
4. Potassium trioxalatoaluminate(III)
5. Potassium trioxalatochromate(III)
6. Hexamminecobalt(III) chloride

REFERENCE

1. A. I. Vogel, Text Book of Quantitative Inorganic Analysis; 6th Ed., Longman, New Delhi, 2000.

COURSE OUTCOMES

The students will acquire knowledge of

CO 1: Estimation of different cations by volumetric as well as gravimetric methods.

CO 2 : Preparation of various complex.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓	✓	✓	✓	✓	✓		✓			✓	✓
CO 2		✓		✓	✓						✓	

QUESTION PATTERN

Experiments - 60 MARKS

Internal - 40 MARKS

SEMESTER - I

CORE PRACTICAL - IV

ORGANIC CHEMISTRY PRACTICAL –I

Practical Hours : 6	**Course code : P21CHC104P**
Exam Hours : 6	**Credits : 3**
	Marks : Max marks -100
	Ext - 60
	Int - 40

OBJECTIVES

- To impart knowledge of laboratory techniques for analysis of organic substances and synthesis of organic compounds.

1. Qualitative analysis of an organic mixture containing two components

Mixtures containing two components are to be separated (pilot separation) and purified (bulk separation) – The physical constants are to be reported (analysis).

2. Preparation of organic compounds (single stage)

1. Methyl-*m*-nitrobenzoate from methylbenzoate (nitration)
2. Glucose pentaacetate from glucose (acetylation)
3. Resacetophenone from resorcinol (acetylation)
4. Benzophenoneoxime from benzophenone (addition)
5. *o*-Chlorobenzoic acid from anthranilic acid (Sandmayer reaction)
6. *p*-Benzoquinone from hydroquinone (oxidation)
7. Phenylazo-2-naphthol from aniline (diazotization)

REFERENCES:

1. J. Mohan, Organic Analytical Chemistry: Theory and Practice; Narosa, 2003.
2. V.K.Ahluwalia, P. Bhagat, and R. Agarwal, Laboratory Techniques in Organic Chemistry; I. K. International, 2005.
3. N. S. Gnanaprakasam and G. Ramamurthy, Organic Chemistry Lab Manual; S.V. Printers, 1987.
4. A. I. Vogel, A. R. Tatchell, B. S. Furniss, A. J. Hannaford and P. W. G. Smith, Vogel's Textbook of Practical Organic Chemistry; 5th Ed., Prentice Hall, 1989.

Course Out come

Students can be able

CO 1: To find out the nature of organic substances .

CO 2: To synthesize various organic compounds.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓		✓			✓			✓		✓	✓
CO 2	✓								✓		✓	✓

QUESTION PATTERN

Expeiments - 60 MARKS

Internal - 40 MARKS

SEMESTER I
MAJOR BASED ELECTIVE COURSE – I (A)
ORGANIC CHEMISTRY I

Theory Hours :5	**Course code : P21CH1MBE1:1**
Exam Hours : 3	**Credits :4**
	Marks : Max marks -100
	Ext - 75
	Int- 25

OBJECTIVES:

To make the students learn and understand the concept of stereochemistry, conformational analysis and their application in the determination of reaction mechanism. To understand the mechanism of nucleophilic and electrophilic substitution reactions.

UNIT-I: STEREOCHEMISTRY

Optical activity and chirality, classification of chiral molecules as asymmetric and dissymmetric. A brief study of dissymmetry of allenes, biphenyls, spiro compounds, trans-cyclooctene, cyclononene and molecules with helical structures. Absolute configuration - R, S notation of biphenyls and allenes. Fischer projection. Inter conversion of Sawhorse, Newman and Fischer projections. Erythro and threo nomenclature, E and Z nomenclature - Asymmetric synthesis - Cram's rule.

UNIT-II: CONFORMATIONAL ANALYSIS

Conformational analysis of disubstituted cyclohexane and their stereochemical features (geometrical and optical isomerism (if shown) by these derivatives). Conformation and reactivity of substituted cyclohexanol (oxidation and acylation), cyclohexanone (reduction) and cyclohexane carboxylic acid derivatives (esterification and hydrolysis). Conformation and stereochemistry of cis and trans-decalin and 9 - methyldecalin.

UNIT-III: ALIPHATIC SUBSTITUTION REACTIONS

Nucleophilic substitution reactions: SN1, SN2 and SNi mechanisms - Neighboring group participation – Reactivity - structural and solvent effects - substitution in norbornyl and bridgehead systems - substitution at allylic and vinylic carbons - substitution by ambident nucleophiles - substitution at carbon doubly bonded to oxygen and nitrogen - alkylation and acylation of amines, halogen exchange, Von-Braun reaction, alkylation and acylation of active methylene carbon compounds, hydrolysis of esters, Claisen and Dieckmann condensation.

Electrophilic substitution reactions: SE1, SE2 and SEi mechanism, double bond shift - Reactivity. Migration of double bond, keto-enol interconversion, Stark- Enamine reaction, halogenation of aldehydes and ketones and decarboxylation of aliphatic acids.

UNIT-IV: ELIMINATION REACTIONS

E1, E2 and E1CB mechanism - E1, E2 and E1cB spectrum - Orientation of the double bond - Hoffman and Saytzeff rules - Competition between elimination and substitution. Typical elimination reactions-dehydration, dehydrohalogenation and dehalogenation. Stereochemistry of E2 eliminations in cyclohexane systems. Mechanism of pyrolytic eliminations. Chugaev and Cope eliminations.

UNIT-V: AROMATIC SUBSTITUTION REACTIONS

Electrophilic substitution reactions: The arenium ion mechanism. Orientation and reactivity (ortho, meta and para directing groups). Typical reactions including Reimer - Tieman reaction, Vilsmeier - Haack, Gattermann, Gattermann - Koch reaction and Kolbe reaction. Synthesis of di and tri substituted benzene (symmetrical tribromo benzene, 2-amino-5-methyl phenol, 3-nitro-4-bromobenzoic acid, 3, 4-dibromonitrobenzene and 1, 2, 3 - trimethylbenzene) starting from benzene or any monosubstituted benzene.

Nucleophilic substitution reactions: Mechanisms: SN1, SNAr and Benzyne mechanisms. Methods for the generation of benzyne intermediate and reactions of aryne intermediate. Nucleophilic substitution involving diazonium ions. Aromatic nucleophilic substitution of activated halides, Ziegler alkylation and Chichibabin reaction.

Recommended Books

1. C. Wentrup, Reactive Molecules, John Wiley and Sons, New York (1984).
2. C.K. Ingold,Structure and mechanism in organic chemistry, Cornell Universitypress.
3. E. S. Gould, Mechanism and Structures in Organic Chemistry, Holt, New York (1959).
4. Ernest Eliel, Stereochemistry of carbon compounds, McGraw Hill, New York (1962).
5. Francis A. Carey and Richard J. Sundberg, Advanced Organic Chemistry, Part A and B, III Edition, Plenum Press (1990).
6. Graham Solomons, Organic Chemistry.
7. J. March, Advanced organic reaction mechanism and structure, Tata McGraw Hill.
8. J. Miller, Advanced Organic Chemistry, III Edition.
9. J. Miller, Aromatic Nucleophilic Substitution
10. Longman, A Guide book to mechanism in organic chemistry
11. Marc London,Organic Chemistry.
12. Nasipuri, Stereochemistry, Alhed Publishers, 2003.
13. Mc Murry, Organic Chemistry, V Edition, Asian Books Pvt Ltd (2000).
14. Niel Isaacs, Physical Organic Chemistry, ELBS Publications (1987).
15. P. Ramesh, Basic principles of Organic Stereochemistry, Madurai Kamaraj University.
16. P. S. Kalsi, Stereochemistry and mechanism through solved problems, WileyEastern Ltd., (1994).
17. P. S. Kalsi, Stereochemistry, Conformation analysis and Mechanism, II Edition, Wiley Eastern Limited, Chennai (1993).
18. R. K. Bansal, Organic Reaction Mechanism.
19. R.O.C. Norman, Organic Synthesis, Chapman and Hall, New York (1980).
20. S. M. Mukherji and S.P. Singh, Organic Reaction Mechanism, MacMillan India Ltd., Chennai (1990).

21. Stanley. H. Pines, Organic Chemistry, 5th Edn, McGraw Hill International Edition. 1987.
22. T. L. Gilchrist and C.W. Rees, Carbenes, Nitrenes and Arynes, Thomas Nelson and Sons Ltd., London.
23. Peter Sykes, A Guide book to mechanism in organic chemistry, Pearson Edition (2006).
24. C. N. Pillai, Textbook of Organic Chemistry, University press (India) private Ltd (2009).

COURSE OUTCOMES

CO1 To make the students learn and understand the concept of stereochemistry,

CO2 conformational analysis and their application in the determination of reaction mechanism.

CO3 To understand the mechanism of nucleophilic and electrophilic substitution reactions.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓		✓			✓			✓		✓	✓
CO 2	✓								✓		✓	✓
CO 3	✓			✓		✓			✓		✓	✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)
SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)
SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER - I
MAJOR BASED ELECTIVE COURSE – I (B)
CHEMISTRY OF NANOSCIENCE

Theory Hours : 5	**Course code : P21CH1MBE1:2**
Exam Hours : 3	**Credits :4**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES:

- To impart the knowledge of Nano chemistry.
- To know about Nano materials and how it is differs from bulk materials.

UNIT I

Synthetic Methods: Definition of nano dimensional materials – historical milestones – unique properties due to nanosize, quantum dots, classification of nano materials. General methods of synthesis of nanomaterials – hydrothermal synthesis, solvothermal synthesis – microwave irradiation– sol-gel and precipitation technologies– combustion flame – chemical vapour condensation process – gas-phase condensation synthesis – reverse micelle synthesis – polymer-mediated synthesis –protein microtubule-mediated synthesis – synthesis of nano materials using microorganisms and other biological agents – sono chemical synthesis – hydrodynamic avitation. Inorganic nano materials – typical examples – nanoTiO_2 /ZnO/CdO/CdS, organic nanomaterials – examples – rotaxanes and catenanes

UNIT II

Characterisation of Nanoscale Materials: Principles of Atomic Force Microscopy (AFM) – Transmission Electron Microscopy (TEM) Resolution and Scanning Transmission Electron Microscopy (STEM) – Scanning Tunneling Microscopy (STM) – Scanning Near field Optical Microscopy (SNOM).Scanning ion conductance microscope, scanning thermal microscope, scanning probe microscopes and surface plasmon spectroscopy.

UNIT III

Reactions in Nanoparticles: Reactions in nano space – nano confinement – nanocapsules Cavitands, cucurbiturils, zeolites, M.O.Fs, porous silicon, nano catalysis.

Applications of nano materials : Ferro electro material, coating, molecular electronics and nano electronics, biological and environmental membrane based application, polymer application.

UNIT IV

Carbon Clusters and Nanostructures: Nature of carbon bond − new carbon structures − carbon clusters – discovery of C60−alkali doped C60−superconductivity in C60−larger and smaller fullerenes. Carbon nano tubes – synthesis − single walled carbon nano tubes − structure and characterization − mechanism of formation − chemically modified carbon nano tubes −doping − functionalizing nano tubes − applications

of carbon nano tubes. Nano wires −synthetic strategies − gas phase and solution phase growth – growth control− properties.

UNIT V

Nanotechnology and Nanodevices: DNA as a nano material – DNA – knots and junctions, DNA – nano mechanical device designed by Seeman. Force measurements in simple protein molecules and polymerase – DNA complexes–molecular recognition and DNA based sensor. Protein nanoarray, nano pipettes, molecular diodes, self-assembled nano transistors, nanoparticle mediated transfection.

REFERENCES

1. C. N. R. Rao, A. Muller and A. K. Cheetham (Eds), The Chemistry of Nanomaterials: Vol. 1 and 2; Wiley-VCH;Germany, Weinheim, 2004.
2. C. P. Poole, Jr: and F. J. Owens, Introduction to Nanotechnology; Wiley Interscience, New Jersey, 2003.
3. K. J. Klabunde (Ed), Nanoscale Materials in Chemistry; 2nd Ed., Wiley- Interscience, New York, 2009.
4. T. Pradeep, Nano: The Essentials in Understanding Nanoscience and Nanotechnology; 1st Ed., Tata McGraw Hill, New York, 2007.
5. H. Fujita (Ed.), Micro machines as Tools in Nanotechnology; Springer-Verlag, Berlin, 2003.
6. BengtNolting, Methods in Modern Biophysics; 3rd Ed., Springer-Verlarg, Berlin, 2009.
7. H. Gleiter, Nanostructured Materials: Basic Concepts, Microstructure and Properties, Elsevier, Chennai, 2000.
8. W. Kain and B. Schwederski, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life; 2nd Ed., John-Wiley R Sons, New York, 2013.
9. T. Tang and P. Sheng (Eds), Nanoscience and Technology, Novel Structures and Phenomena; Taylor andFrancis, New York, 2003.
10. A. Nabok, Organic and Inorganic Nanostructures; Artech House, Boston, 2005.
11. E. A. Rietman, Molecular Engineering of Nanosystems; Springer-Verlag, New York, 2001.
12. Home page of Prof. Ned Seeman - http://seemanlab4.chem.nyu.edu/
13. Nanoletters - http://pubs.acs.org/journals/nalefd/index.html
14. Nanotation - http://www.acsnanotation.org/

Course outcomes:

CO 1: Able to understand available method of synthesis of nanomaterial

CO 2: Characterize the nano materials by knowing the principles of AFM, TEM, SEM etc.

CO 3: Familiar with the reaction in nano particles,

CO 4: Familiar with fictionalization and their realization.

CO 5: Able to apply the concepts of physics, chemistry, biology and engineering to the field of nano technology.

CO6 : Motivates to research.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓	✓		✓	✓		✓	✓	✓		✓	✓
CO 2	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓
CO 3				✓	✓						✓	✓
CO 4				✓							✓	✓
CO 5			✓	✓	✓		✓		✓		✓	✓
CO 6				✓	✓	✓		✓	✓		✓	✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER - I
MAJOR BASED ELECTIVE COURSE –I(C)
SUPRAMOLECULAR CHEMISTRY

Theory Hours : 5	**Course code : P21CH1MBE1:3**
Exam Hours : 3	**Credits :4**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES

1. To know the fundamentals of supramolecules.
2. To learn co-receptor molecules and multiple recognition
3. To study the supramolecular reactivity and catalysis.

UNIT I: Concepts of Supramolecular Chemistry

Concepts and languages of supramolecular chemistry – various types of non- covalent interactions – hydrogen bonds, C-H…X interactions, halogen bonds – π-π interactions, non–bonded interactions – various types of molecular recognition.

Crystal engineering of organic solids – hydrogen bonded supramolecular patterns involving water / carboxyl / halide motifs – concepts of different types of synthons based on non-covalent interactions – principles of crystal engineering and non-covalent synthesis – polymorphism and pseudopolymorphism – supramolecular isomorphism / polymorphism – crystal engineering of pharmaceutical phases.

UNIT II: Metallo Organic Frameworks

M.O.F (Metallo Organic Frameworks) – organometallic systems – combinations of different interactions to design molecular rods, triangles, ladders, networks, etc. – design of nanoporous solids – interligand hydrogen bonds in metal complexes – implications for drug design – crystal engineering of NLO materials, OLED.

UNIT III: Co-receptor Molecules and Multiple Recognition

Dinuclear and polynulclear metal ion cryptates – linear recognition of molecular length by ditopic co-receptors – heterotopic co-receptors – cyclophane receptors, amphiphilic receptors and large molecular cages – multiple recognition in metalloreceptors – supramolecular dynamics.

UNIT IV: Supramolecular Reactivity and Catalysis

Catalysis by reactive macrocyclic cation receptor molecules – catalysis by reactive anion receptor molecules – catalysis with cyclophane type receptors – supramolecular metallocatalysis – cocatalysis – catalysis of synthetic reactions– biomolecular and abiotic catalysis.

Supramolecular chemistry in solution – cyclodextrin, micelles, dendrimers, gelators – classification and typical reactions – applications.

UNIT V: Supramolecular Devices

Supramolecular devices and sensors – various types of supramolecular devices – an overview – supramolecular photochemistry – molecular and supramolecular photonic devices – light conversion and energy transfer devices – molecular and supramolecular electronic devices – electronic conducting devices – molecular wires, modified and switchable molecular wires – molecular and supramolecular ionic devices – tubular mesophases, molecular protonics – switching devices – electro-photo switch – ion and molecule sensors – role of supramolecular chemistry in the development of nanoscience and technology.

REFERENCES

1. J. M. Lehn, Supramolecular Chemistry; VCH, Weinheim, Germany, 1995.
2. G. R. Desiraju, Crystal Engineering: The Design of Organic Solids; Elsevier, United States, 1989.
3. G. R. Desiraju, and T. Steiner, The Weak Hydrogen Bond in Structural Chemistry and Biology; Oxford University Press, Oxford, 1999.
4. G. A Jeffrey, Introduction to Hydrogen Bonding; Oxford University Press: UK, 1997.
5. J. M. Lehn, Transition Metals in Supramolecular Chemistry; John Wiley and Sons: New York, 1999.
6. G. R. Desiraju, Current Science; 2001, 81, 1038.
7. Web source:

(i) Crystal Growth and Design, http://www.pubs.acs.org/journals/cgdefu/index.html (ii) Crystal Engineering Communicationhttp://www.rsc.org/Publishing/Journals/ce/index.asp

COURSE OUTCOMES

After the completion of the course, Students will be able to

CO 1:Have a good overview of the core concepts in supramolecular chemistry and explain non covalent interactions, molecular recognition and self-assembly.

CO 2. Be able to describe some of the applications of supramolecular chemistry including industrial applications and supramolecular catalysis.

CO 3 Understand fundamentals of photochemistry and laws governing it such as BeerLambert law.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1							✓	✓				
CO 2	✓							✓			✓	
CO 3						✓				✓		✓
CO 4						✓				✓		✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SKILL ENHANCEMENT COURSE –I THEORY
TEXTILE CHEMISTRY (2Hours)

Theory Hours :2	**Course code : P21CH1SE1**
Exam Hours : 2	**Credits :2**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES

- This course aims at facilitating the students to understand the various techniques in textile industry and various processes in dying.

UNIT – I

Textile fiber and pretreatment: Classification of textile fibers – concept and techniques of Ginning, Sizing, Desizing, Scouring, Bleaching, and Mercerization- fiber identification tests (Flame test – microscopical & solubility test)

UNIT –II

Dye chemistry: Colour and sensation - theories of colour and chemical constitution – Witt's theory - chromospheres - auxochrome – chromogen - classification of dye based on application .

Unit-III

Technical terms in dyeing: M.L.ratio – % of shade– % of exhaustion – equilibrium absorption.

Non textile uses of dyes: Leather dyeing, paper dyeing, solvent dyes, food colours, hair colours and fluorescent brightening agents

Unit-IV

Dye bath assistants: Explanation and mechanism of exhausting agent, wetting agent, leveling agent, dispersing agent and carrier.

Fastness properties – Light, Washing Rubbings ,sublimation and perspiration fastness.

Unit-V

Textile proofing – Water proofs, moth proofing, mildew proofing & fire proofing.

Dyeing machineries: Padding mangle, Jigger, and Winch.

References:

1.Chemical Technology of fibrous Materials – F.sadov, M.Horchagin and A.Matetshy, MirPublishers.
2.The Identification of Textile Fibres – Bruno Nuntak.
3.Introduction to Textile Science -3rd edition, MaryoryL.Joseph.
4.Textile Chemistry –Vol.IIR.H.Peters, Elserier, Avesterdam.
5.Dyeing and chemical Technology of Textile fibres-5th Edition, E.R.Trotman,Charles Griffin &Co Ltd
6.Chemistry of dyes & Principles of Dyeing -V.A.Shenai, Sevak Publications.
7.Scouring and Bleaching E.R.Trotman, Charles Griffin & Co Ltd.
8.Text Book of Applied Chemistry- K.Kapur.
9.A Students Text Book of Textile Science- A.J.Hall.

Course outcome:

Students are

CO 1: Able to understand fiber techniques.

CO 2: Improving their knowledge is proposed to dye Chemistry.

CO 3: Empower their ideas in applying techniques in dying.

CO 4: Enrich in knowing about textile proofing and dying machineries.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1							✓	✓				
CO 2	✓							✓			✓	
CO 3						✓				✓		✓
CO 4						✓				✓		✓

QUESTION PATTERN – 75 MARKS

SECTION-A- Answer all questions- 15x5=75 (2 questions from each unit, Essay type either or question)

SEMESTER – II

CORE COURSE -V

INORGANIC CHEMISTRY II

Theory Hours : 5	**Course code : P21CHC205**
Exam Hours : 3	**Credits :5**
	Marks : Max marks -100
	Ext - 75
	Int- 25

OBJECTIVES:

To make the students knowledgeable in solid state chemistry. To equip the students for their future career in nuclear industry. To learn the chemistry of lanthanides, to learn about nanotechnology and use of inorganic compounds in biological chemistry.

UNIT-I: THE CHEMISTRY OF SOLID STATE

Structure of solids; Comparison of X-ray and Neutron Diffraction; structure of pyrovoskite, cadmium iodide and nickel arsenide; spinels and antispinels, defects in solids, non-stoichometeric compounds. Electrical, magnetic and optical properties of solids, band theory. Semiconductors, superconductors, solid state electrolytes. Types of magnetic behaviour, dia, para, ferro, antiferro and ferrimagnetism, hysterisis.

Solid state lasers, inorganic phosphors and ferrites.

UNIT- II: NUCLEAR CHEMISTRY-I

Nuclear properties: Nuclear spin and moments, origin of nuclear forces, Nuclear models: liquid drop model and nuclear shell model. Modes of radioactive decay: Orbital electron capture, nuclear isomerism, internal conversion. Detection and determination of activity by cloud chamber, nuclear emulsion, bubble chamber, Geiger-Muller, scintillation and Cherenkov counters.

Nuclear reactions: Types, cross section, compound nucleus theory, high energy nuclear, direct nuclear, photonuclear and thermonuclear reactions.

UNIT- III: NUCLEAR CHEMISTRY-II

Stellar energy: synthesis of elements, hydrogen burning, carbon burning. Nuclear reactors: fast breeder reactors, particle accelerators, linear accelerators, cyclotron and synchrotron. Radio analytical methods: Isotope dilution analysis, radiometric titrations, radio immuno assay. Neutronactivationanalysis

UNIT-IV: THE CHEMISTRY OF LANTHANIDES, ACTINIDES AND NANOTECHNOLOGY

The chemistry of solid state, lanthanides and actinides, oxidation state, spectral, magnetic characteristics, coordination numbers, stereochemistry, nuclear and non-nuclear applications.

Nanotechnology: Introduction - preparatory methods, characterization, application as sensors, biomedical applications, application in optics and electronics.

UNIT-V: BIOINORGANIC CHEMISTRY

Transport proteins: Oxygen carriers, metalloenzymes, carboxy peptidase, carbonic anhydrase, redox process, iron-sulphur proteins, chlorophyll, salient features of the photo synthetic process, vitamin-B_{12}, role of sodium, potassium, calcium, zinc and copper; fixation of nitrogen, nitrogen cycle.

Text Books

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 Jeevan Arnikar , Essentials of nuclear chemistry, New Age International (P) Ltd., (2005).
5. Hari Jeevan Arnikar,Nuclear Chemistry Through Problems, New Age International (P) Ltd., (2007).
6. G. T. Seaborg, Transuranium elements, Dowden Hitchinson and Ross, (1978).
7. Nishit Mathur, 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.,
11. T. Pradeep, Nano: The essentials., McGrew Hill Education.(2007)

Suggested References

11. W. E. Addison, Structural principle in inorganic chemistry, Longman (1961).
12. D. M. Adams, Inorganic solids, John Wiley Sons (1974).
13. Azaroff, Solid State Chemistry, John Wiley.
14. B. E. Dogulas DH McDaniel's and Alexander, Concepts and Models of Inorganic Chemistry, Oxford IBH, (1983)
15. M. C. Day and J. Selbin, Theoretical Inorganic Chemistry, Van Nostrand Co., New York (1974).
16. J.E. Huheey, Inorganic Chemistry - Principles, Structure and Reactivity, Harper Collins, New York, IV Edition (1993).
17. N. Greenwood and A. Earnshaw, Chemistry of Elements, Pergamon, NY, (1984).
18. F.A. Cotton and G. Wilkinson Advanced Inorganic Chemistry - A Comprehensive Text, John Wiley and Sons, V Edition (1988).
19. K.F. Purcell and J.C. Kotz, Inorganic Chemistry - WB Saunders Co., USA (1977)
20. W. U. Mallik, G.D. Tuli, R.D. Madan, Selected topics in Inorganic Chemistry, S. Chand and Co., New Delhi, (1992).
21. M.N. Hughes, The Inorganic Chemistry of Biological processes, Wiley London, II Edition (1982).
22. Jonathan W. Stead, David R. Turner and Karl. J. Wallace., Core concepts in Supramolecular Chemistry and Nanochemistry, John Wiley sons Ltd (2007).
23. Beoffry A.Ozin, Andre Arsenault, Ludovico &Cademartiri. Nano chemistry - A chemical approach to nano materials, Royal Society of chemistry (2009).
24. Kenneth J. Klabunde, Nano scale materials in Chemistry A. John Wiley & Sons Publishers (2001).
25. L. Stryer, Biochemistry, V Edition, Freeman & Co., New York (2002) .
26. D. L. Nelson and M. M. Cox, Lehninger, Principles of Biochemistry, III edition, McMillan North Publication (2002).
27. W. Kaim and B. Schwederski, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life, an Introduction and Guide, Wiley, New York (1995).
28. S. J. Lippard and J. M. Berg, Principles of Bioinorganic Chemistry, University Science Books (1994).
29. I. Bertini, H. B. Grey, S. J. Lippard and J. S. Valentine, Bioinorganic Chemistry, Viva Books Pvt. Ltd., New Delhi (1998).
30. R. Gopalan, Text book of Inorganic Chemistry, University press (India) private Ltd.

Course outcome:

Students will be able to

CO 1: Describe the relationship between structure and chemical bonding and draw conclusions about the physical properties of materials such as macroscopic magnetic, electrical and optical behaviour, describe structure, physical properties of semiconductors and operation principles of semiconductor devices.

CO 2: Describe the basic principles of solid-state NMR, X-rays diffraction and electron microscopy, describe and exercise selected methods of solid state synthesis.

CO 3: Apply the chemistry of lanthanides and actinides for future use in the field of nano technology

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1		✓		✓				✓		✓	✓	✓
CO 2	✓	✓		✓	✓					✓	✓	✓
CO 3					✓			✓		✓	✓	✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)
SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)
SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER – II
CORE COURSE VI
ORGANIC CHEMISTRY II

Theory Hours :5 **Exam Hours : 3**	**Course code : P21CHC206** **Credits :5** **Marks : Max marks -100** **Ext - 75** **Int - 25**

OBJECTIVES:

To understand the nature of carbon-hetero atom multiple bond additions and the mechanism of a chemical reactions. To understand the techniques involved in the rearrangements and their synthetic utility. To know the methods of synthetic strategies and applications. To apply the knowledge of chemical reactions in organic synthesis.

UNIT-I: 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, Simon - Smith reaction. Mannich, Stobbe, Darzen, Wittig, Wittig - Horner and Benzoin reactions. Carbenes and nitrenes: Methods of generation, structure, addition reactions with alkenes and insertion reactions.

UNIT-II OXIDATIONS AND REDUCTIONS

Mechanism - study of the following oxidation reactions - oxidation of alcohols - use of DMSO in combination with DCC and acetic anhydride in oxidising alcohols - oxidation of methylene to carbonyl, oxidation of aryl methane - 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 $LiAlH_4$, $NaBH_4$, tritertiarybutyloxyaluminium hydride, sodium cyanoborohydride, trialkyltin hydride and hydrazines.

UNIT-III: MOLECULAR REARRANGEMENTS

A detailed study with suitable examples of the mechanism of the following rearrangements: Wagner - Meerwein, Pinacol - Pinacolone, Demjanov, Dienone - phenol, Favorski, Baeyer - Villiger, Wolf, Stevens and Von Richter rearrangements.

UNIT-IV: MODERN SYNTHETIC METHODS, REACTIONS AND REAGENTS

Synthesis of simple organic molecules using acetylation and alkylation of enamines, Grignard reactions, Diels - Alder reaction, phosphorus and sulphur ylides, Robinson annulations. Retrosynthetic Analysis: Basic principles and terminology of retrosynthesis, one group and two group C-X disconnections, one group C-C and two group C-C disconnections, amine and alkene synthesis. Protection and deprotection of functional groups (R-OH, R-CHO, RCO-R, R-NH_2 and R-COOH). Uses of the following reagents: DCC, Trimethylsilyliodide, 1, 3-Dithiane (umpolung), and diisobutylaluminiumhydride (DIBAL).

UNIT-V: HETEROCYCLES, VITAMINS AND STEROIDS

Synthesis of imidazole, oxazole, thiazole, flavones, isoflavones, anthocyanins, pyrimidines (cytocine, uaracil only) and purines (adenine, guanine only). Synthesis of vitamin-A_1 using Wittig method. Conversion of cholesterol to progesterone, estrone and testosterone.

Recommended Books

1. E. S. Gould, Mechanism and Structure in Organic Chemistry Holt, Rinehart and Winston Inc., 1959.
2. Francis A. Carey and Richard J, Sundberg, Advanced Organic Chemistry - Part B, 3rd Edition (1990).
3. H. O. House, Modern Synthetic Reactions, 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. L.F. Fieser and M. Fieser, Organic Chemistry, Asia Publishing House, Bombay, 2000.
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).
19. C. N. Pillai, Textbook of Organic Chemistry, University press (India) private Ltd (2009).

Course outcomes:

After completion of the course students will be able to

CO 1: Understand the nature carbon when tied –up with hetero atom and its reactions

CO 2: Understand the concept of Molecular rearrangements

CO 3: Describe different naming reactions.

CO 4: To apply the knowledge of chemical reactions in organic synthesis.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓						✓	✓	✓		✓	✓
CO 2		✓										
CO 3			✓						✓		✓	✓
CO 4						✓			✓		✓	✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER – II
CORE PRACTICAL - VII
INORGANIC CHEMISTRY PRACTICAL – II

Practical Hours : 5	**Course code : P21CHC207P**
Exam Hours : 3	**Credits : 5**
	Marks : Max marks -100
	Ext - 60
	Int - 40

OBJEVTIVES

- To know the principles and techniques involved in qualitative analysis of inorganic mixture and colorimetric estimation of cations.

I. **Semi micro qualitative analysis of a mixture containing two common and two rare cations.**

2.Common cations

Lead, bismuth, copper, cadmium, antimony, Tin, Iron, Aluminium, Chromium, Manganese, Nickel, Cobalt, Zinc, Calcium, Barium, Strontium, Magnesium and Ammonium.

Less common cations

Tungsten, Thalium, Selenium, Tellurium, Molybdenum, Cerium, Zirconium, Beryllium and lithium.

II. Colorimetric estimation

Estimation of Copper, Iron , Nickel, Chromiun and Manganese by using photoelectric colorimeter.

Reference :

1. Vogel's text book for qualitative & quantitative analysis

Course outcomes:

Students can able to

CO 1: Identify and separate the ions from inorganic salt mixture .

CO 2 : Estimate Copper, Iron , Nickel, Chromium and Manganese by using photoelectric colorimeter.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓		✓		✓	✓			✓		✓	
CO 2	✓		✓		✓				✓			✓

QUESTION PATTERN

Experiments - 60 MARKS

Internal - 40 MARKS

SEMESTER – II
CORE PRACTICAL - VIII

ORGANIC CHEMISTRY PRACTICAL- II

Practical Hours : 6	**Course code : P21CHC208P**
Exam Hours : 6	**Credits : 3**
	Marks : Max marks -100
	Ext - 60
	Int - 40

OBJECTIVES

To estimate the organic compounds, saponification value of an oil and iodine value of an oil.

- To learn about double stage preparation of organic compounds.

I.Quantitative analysis of organic compounds

Estimation of Phenol, aniline, ketone, glucose, saponification value of an oil and iodine value of an oil.

II. Preparation of organic compounds : (Double stage)

1. Para – bromoaniline from acetanailide (bromination and hydrolysis)
2. Para – nitroaniline from acetanilide (Nitration and Hydrolysis)
3. Acetyl salicylic acid from methyl salicylate (hydrolysis and acetylation)
4. 1,3,5 – tribromo benzene from aniline (bromination and diazotization &hydrolysis)
5. Benzanilide from benzophenone (BeckmannRearrangement)

References :

1N. S. Gnanaprakasam and G. Ramamurthy, Organic Chemistry Lab Manual; S.V. Printers, 1987.

- A. I. Vogel, A. R. Tatchell, B. S. Furniss, A. J. Hannaford and P. W. G. Smith, Vogel's Textbook of Practical Organic Chemistry; 5th Ed., Prentice Hall, 1989.

Course outcome

Students can able to

CO 1: Estimate the organic compounds like phenol, aniline, ketone, glucose.

CO 2: Able to determine saponification value of an oil and iodine value of an oil.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓		✓					✓			✓	
CO 2			✓								✓	

QUESTION PATTERN

Experiments - 60 MARKS

Internal - 40 MARKS

SEMESTER - II
MAJOR BASEDELECTIVE COURSE – II (A)
ANALYTICAL CHEMISTRY

Theory Hours : 5	**Course code : P21CH2MBE2:1**
Exam Hours : 3	**Credits :5**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES

- To introduce concepts of various analytical techniques

UNIT - I **(15 hours)**

Instrumental Methods of Analysis: Principles and applications of extended X-ray absorption fine structure (EXAFS) – surface extended X-ray absorption (SEXAFS) – atomic absorption spectroscopy (AAS) – flame emission spectroscopy (FES) – turbidimetry – theory and applications.

UNIT -II **(15 hours)**

Data and Error Analysis: Various types of error – accuracy, precision, significant figures – frequency distributions, the binomial distribution, the Poisson distribution,n and normal distribution – describing data, population and sample, mean, variance, standard deviation,

Hypothesis testing, levels of confidence and significance, test for an outlier, testing variances, means t-Test, paired t-Test – analysis of variance (ANOVA) – correlation and regression.

Curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals – general polynomial equation fitting, linearizing transformations, exponential function fit – r and its abuse – multiple linear regression analysis, elementary aspects.

UNIT – III **(15 hours)**

Chromatography : Solvent extraction – principles of ion exchange, paper, thin-layer and column chromatography techniques – columns, adsorbents, methods, R_f values, McReynold's constants and their uses – HPTLC, HPLC techniques – adsorbents, columns, detection methods, estimations, preparative column – GC-MS techniques – methods, principles and uses.

UNIT – IV **(15 hours)**

Thermo Analytical Methods and Fluorescence Spectroscopy

Principles – instrumentations and applications of thermogravimetry analysis (TGA), Differential Thermal Analysis (DTA) and Differential Scanning Colorimetry (DSC) –thermometric titrations – types – advantages.

Basic aspects of synchronous fluorescence spectroscopy – spectral hole burning – flow cytometry – fluorometers (quantization) – instrumentation – applications.

UNIT- V **(15 hours)**

Electroanalytical Techniques: Electrochemical sensors, ion-sensitive electrodes, glass – membrane electrodes, solid-liquid membrane electrodes – ion-selective field effect transistors (ISFETs) – sensors for the analysis of gases in solution.

Polarography – principles and instrumentation – dropping mercury electrode – advantages – Ilkovic equation – applications of polarography – polarographic maxima – oscillographic polarography, AC polarography – cyclic voltammetry –advantages over polarographic techniques – chronopotentiometry – advantages – controlled potential coulometry.

Amperometric titrations: principles – techniques – applications – estimation of lead.

REFERENCES

1. D. B. Hibbert and J. J. Gooding, Data Analysis for Chemistry; Oxford University Press, UK, 2006.
2. J. Topping, Errors of Observation and Their Treatment; 4th Ed., Chapman Hall, London, 1984.
3. A. Braithwaite and J. F. Smith, Chromatographic Methods; 5th Ed., Springer, Germany; 1995.
4. V. K. Srivastava and K. K. Srivastava, Introduction to Chromatography; 2nd Ed., Holden Day, New York, 1985.
5. H. H. Willard, L. L. Merritt, J. A. Dean and F. A. Settle, Instrumental Methods of Analysis; 6th Ed., CBS Publishers and Distributors, Chennai, 1986.
6. D. A. Skoog, D. M. West and D. J. Holler, Fundamentals of Analytical Chemistry, 7^{th} Ed., Harcourt College Publishers, Singapore, 2004.
7. A. Sharma, S. G. Schulman, Introduction to Fluorescence Spectroscopy; Wiley-Interscience, New York, 1999.
8. C. N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy; 4^{th} Ed., Tata McGraw-Hill, New Delhi, 1994.
9. A. I. Vogel, Text Book of Quantitative Inorganic Analysis; 6th Ed., Longman, New Delhi, 2000.
10. D. C. Harris, Quantitative Chemical Analysis; 4th Ed., W. H. Freeman Publications,New York, 1995.
11. S. C. Gupta, Fundamentals of Statistics; 6th Ed., Himalaya Publications, Delhi,2006.

Course Outcome:

CO1 : Able to understand the theory, principles and applications of various advanced spectroscopic techniques.

CO 2: Knowledge in data and error analysis.

CO 3: Understand chromatography techniques.

CO 4 : Expertise in knowing about thermo analytical methods.

CO 5: Knowledge in redox system and in polorography techniques.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓	✓	✓									
CO 2									✓		✓	✓
CO 3									✓		✓	✓
CO 4									✓		✓	
CO 5	✓			✓		✓					✓	

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER - II
ELECTIVE COURSE – I (B)
GREEN CHEMISTRY

Theory Hours :5	**Course code : P21CH2MBE2:2**
Exam Hours : 3	**Credits :4**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES:

- To impart knowledge of green chemistry
- To learn about the techniques used in green chemistry for synthesis of various organic compounds.

UNIT I

Introduction to Green Chemistry

Introduction to green chemistry – twelve principles of green chemistry – planning a green synthesis in a chemical laboratory – evaluating the type of reaction involved –rearrangement, addition, substitution, elimination and pericyclic reactions. Selection of appropriate solvent – aqueous phase reaction – reactions in ionic liquids –organic synthesis in solid state – solid supported organic synthesis – selection of starting materials – use of protecting group – use of catalyst – use of microwaves and sonication.

UNIT II

Addition and Condensation Reactions

Addition reactions – Michael addition in aqueous medium and solid state – Diels-
Alder reactions in aqueous phase.Condensation reactions – Aldol condensation of aldehydes with nitroalkanes andnitriles – Aldol condensation in solid phase – benzoin condensation under catalyticconditions – applications.

UNIT III

Oxidation and Reduction Reactions

Oxidation reactions – Baeyer-Villiger oxidation in aqueous phase and solid state –
enzymatic Baeyer-Villiger oxidation. Reduction reactions – Clemmensen reduction – mechanism – limitations – applications

UNIT IV

Phase-Transfer Catalyst Reactions

Phase-transfer catalyst reactions – Heck reaction – Michael addition reaction –oxidation of toluene to benzoic acid – Reimer-Tiemann reaction – Baker-Venkataraman synthesis – Williamson ether synthesis – Dozen reaction.

UNIT – V

Sonication Reactions

Sonication reactions – Barbier reaction – Reformatsky reaction – Simmons-Smith reaction – Strecker synthesis – Ullmann coupling reaction – Wurtz reaction –Bouveault reaction

REFERENCES

1. V. K. Ahluwalia, Green Chemistry; 2nd Ed., Ane Books Pvt Ltd., New Delhi, 2016. [UNIT- I, II, III, IV, V]
2. P. T. Anastas and J. C. Warner, Green chemistry Theory and Practice, Oxford University Press, New York, 2005. [Unit-I]
3. V. K. Ahluwalia and K. Agarwal, Organic Synthesis, Special Techniques, 2nd Ed., Narosa Publishing House, New Delhi, 2007. [Unit-I]

Course Outcome

CO 1:Able to enrich their knowledge in green chemistry by knowing various principles, evaluation of reactions and their uses.
CO2:Able to understand about addition and condensation reaction.
CO 3:Empower their knowledge in oxidation and reduction reaction.
CO5 : Acquaint many useful objectives through phase transfer.
CO 6: Strengthen their knowledge in sonication reactions.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1		✓			✓	✓	✓					
CO 2						✓	✓				✓	✓
CO 3							✓					
CO 4							✓					
CO 5							✓	✓	✓			
CO 6		✓	✓				✓				✓	✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)
SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)
SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER – II
MAJOR BASED ELECTIVE COURSE - II
II (C) BIO-ORGANIC CHEMISTRY

Theory Hours :6	**Course code : P21CH2MBE2:3**
Exam Hours : 3	**Credits :5**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES

1. To learn the preparation, properties of amino acids and proteins.
2. To study the activity of enzymes and cofactors.
3. To know basics of lipids and nucleic acids.
4. To learn the concept of bioenergetics.
5. To learn the principles of lead and analogue synthesis.

UNIT I: Amino Acids and Proteins

Structure, classification, synthesis and properties of amino acids – biosynthesis of amino acids – peptides – N-terminal and C-terminal residue analysis – solid phase peptide synthesis.

Proteins – classification and properties (denaturation, isoelectric point and electrophoresis), primary, secondary, tertiary and quaternary structures of proteins – biological roles of proteins.

UNIT II: Enzymes and Cofactors

Chemical nature of enzymes – characteristics of enzymes – colloidal nature, catalytic nature. Mechanism of enzymes – Michaelis-Menten hypothesis – Fischer's lock and key model – regulation of enzyme activity.

Stucture and biological functions of coenzyme A, NAD+, FAD and vitamin B12.

UNIT III: Lipids and Nucleic Acids

Lipids – definition – simple lipids – fats and oils – compound lipids – phospholipids, glycolipids – physical properties – solubility, melting point, surface tension, emulsification and geometric isomerism – chemical properties – reaction involving -COOH group, -OH group and double bonds. Nucleic Acid – definition – nucleosides and nucleotides – deoxyribonucleic acid (DNA) – internucleotides linkages – base composition – double helical structure.

UNIT IV: Bioenergetics

Concept of energy – thermodynamic principles – first law, second law, combining the two laws – relationship between standard free energy change and equilibrium constant. Standard free energy values of chemical reactions – Adenosine triphosphate (ATP) as universal currency of free energy in biological systems – ATP hydrolysis and equilibria of coupled reactions – inter conversion of adenine nucleotides.

UNIT V: Lead and Analogue Synthesis

Designing organic synthesis – disconnection approach – synthons and synthetic equivalents – one group disconnections: alcohol, acid and ketone – functional group interconversions. Asymmetric synthesis – basic principles – stereoselective and stereospecific reactions – reagents, catalysts and their applications (wherever applicable) in alkylation and hydrogenation – Jacobsen's catalyst – Evan's catalyst.

REFERENCES

1. J. L. Jain, Fundamentals of Biochemistry; S. Chand and Co., New Delhi, 2007 [Unit- I, II, III, IV].
2. N. C. Price and L. Stevens, Fundamental of Enzymology; Oxford University Press, UK, 1999 [Unit-II].
3. F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry: Part-A and Part-B; 5th Ed., Springer, Germany, 2008 [Unit-I, II, III].
4. S. Warren, Designing Organic Synthesis: The Disconnection Approach; 2nd Ed., Wiley, New York, 2008 [Unit-V].
5. H. B. Kagan, Asymmetric Synthesis; Thieme Medical Publishers, Germany, 2009 [Unit – V].

*****

COURSE OUTCOMES

CO1 Understand the preparation, properties of amino acids and proteins.
CO 2 Explain the activity of enzymes and cofactors.
CO3 To know basics of lipids and nucleic acids.
CO4 To learn the concept of bioenergetics.
CO 5 To learn the principles of lead and analogue synthesis.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1		✓			✓	✓	✓					
CO 2						✓	✓				✓	✓
CO 3							✓					
CO 4							✓					
CO 5							✓	✓	✓			

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)
SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)
SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER II
EXTRA DISCIPLINARY COURSE (EDC)
FOOD AND NUTRITION

Theory Hours :5	**Course code : P21CH2ED**
Exam Hours : 3	**Credits :4**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES

- This course aims in making the students to understand about carbohydrates and proteins
- This course can facilitates the students to inculcate many information about milk, fat, minerals
- To motivate the students to analyse the food quality**.**

Unit : I

Carbohydrates: Classification – available polysaccharides - unavailable carbohydrates or dietary fibres, carbohydrates in diets – digestion and absorption - regulation of blood glucose - insulin - adrenaline.

Unit II

Proteins : Sources and chemical nature – aminoacids – nitrogen balance – factors affecting nitrogen balance – physiological needs – dietary sources – biological tests – requirements – protein deficiency.

Unit III

Fats, Electrolytes and Minerals: Visible fats – phospholipids - digestion and absorption – essential fatty acids deficiency – dietary needs for fat salt – Na and K in the body. Water balance – Na excess – K deficiency – K excess,. Minerals – intake – absorption – substances – assisting absorption – recommended intake – trace elements – iodine – physiology – sources – prophylactic and therapeutic uses – fluorine – prevention of dentel carriers – fluorosis in man – fluoride and osteroporosis – opposition to fluoridation of water Pb – Hg – hazards.

Unit IV

Milk and Milk products: Composition of milk – flavour and aroma of milk – physical properties of milk – effect of heat on milk – pasteurisation – homgenisation – Milk Products – cream milk – ice cream – milk powder.

Unit V

Food and Nutrients: Food – classification – cereals – wheat – distribution of nutrients in grain and flour – starches – invalid foods – sugars – syrups, nutritive properties of vegetables – fruits – nutrition properties of meat, fish and oil of sea foods – novel protein foods.

Food Quality: Food adulteration – determination of adulteration in food products by simple qualitative test.

References:

1. M.Swaminathan, Food and nutrition.
2. Sri lakshmi, Food and nutrition.
3. Vijaya D.Joshi, Hand book of Nutrition and Dietics.

COURSE OUTCOMES

CO 1: Know about carbohydrates and its digestion, adsorption, chemistry of proteins, fat and minerals.
CO2 : Predict the composition of milk , pasteurization and homogenizations.
CO3: By this study, able to determine the food quality.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1						✓		✓			✓	✓
CO 2		✓				✓					✓	✓
CO 3			✓			✓					✓	✓

QUESTION PATTERN – 75 MARKS

SECTION-A- Answer all questions- 15x5=75 (2 questions from each unit, Essay type either or question)

SEMESTER –II
SKILL ENHANCEMENT COURSE –
TEXTILE CHEMISTRY PRACTICAL

Practical Hours : 2	**Course code : P21CH2SE2P**
Exam Hours : 2	**Credits : 2**
	Marks : Max marks -100
	Ext - 60
	Int - 40

OBJECTIVES

- To know the elementary ideas about textile chemistry.

I.Pre-treatment and dyeing, desizing, Scouring, Bleaching, Dyeing.

II. Combination on percentage of shade

0.5% shade, 1% shade , 2 % shade, 2% Combination shade

III. Fiber - Identification test

For cotton, Wool, Jute, Viscose , Silk, Polyster

IV. Preparation of Dye

Methyl orange and Phenol red

References

1. Chemistry of Dyes and Principles of dyeing by Dr.V.A.Shenai
2. Technology of textile fibre Dr.V.A.Shenai

COURSE OUTCOMES:

CO 1:Students will acquire knowledge about dying process.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓			✓							✓	✓

QUESTION PATTERN

Experiments - 60 MARKS

Internal - 40 MARKS

SEMESTER –II

SELF STUDY COURSE–I

GENERAL STUDIES FOR RESEARCH FELLOWSHIP AND LECTURERSHIP

Exam Hours : 2	**Course code : P212SS1** **Credits : 2** **Marks : Max marks -100** **Ext - 100**

UNIT-I

TEACHING APTITUDE

Teaching- Nature, objectives,characteristics and basic requirements.Learners characteristics,factors affecting teaching,methods of teaching,teaching aids evaluation systems.

UNIT-II

RESEARCH ATITUDE

Research-meaning, characteristics and types, steps of research, Methods of Research,Research Ethics.Paper, article,Workshop,Seminar,Conference and Symposium.Thesis Writing-Its Characterstics and format.

UNIT-III

MATHEMATICAL REASONING

Series- Completion and its types; Classification- verbal,Letter,Number; Coding and decoding.

UNIT-IV

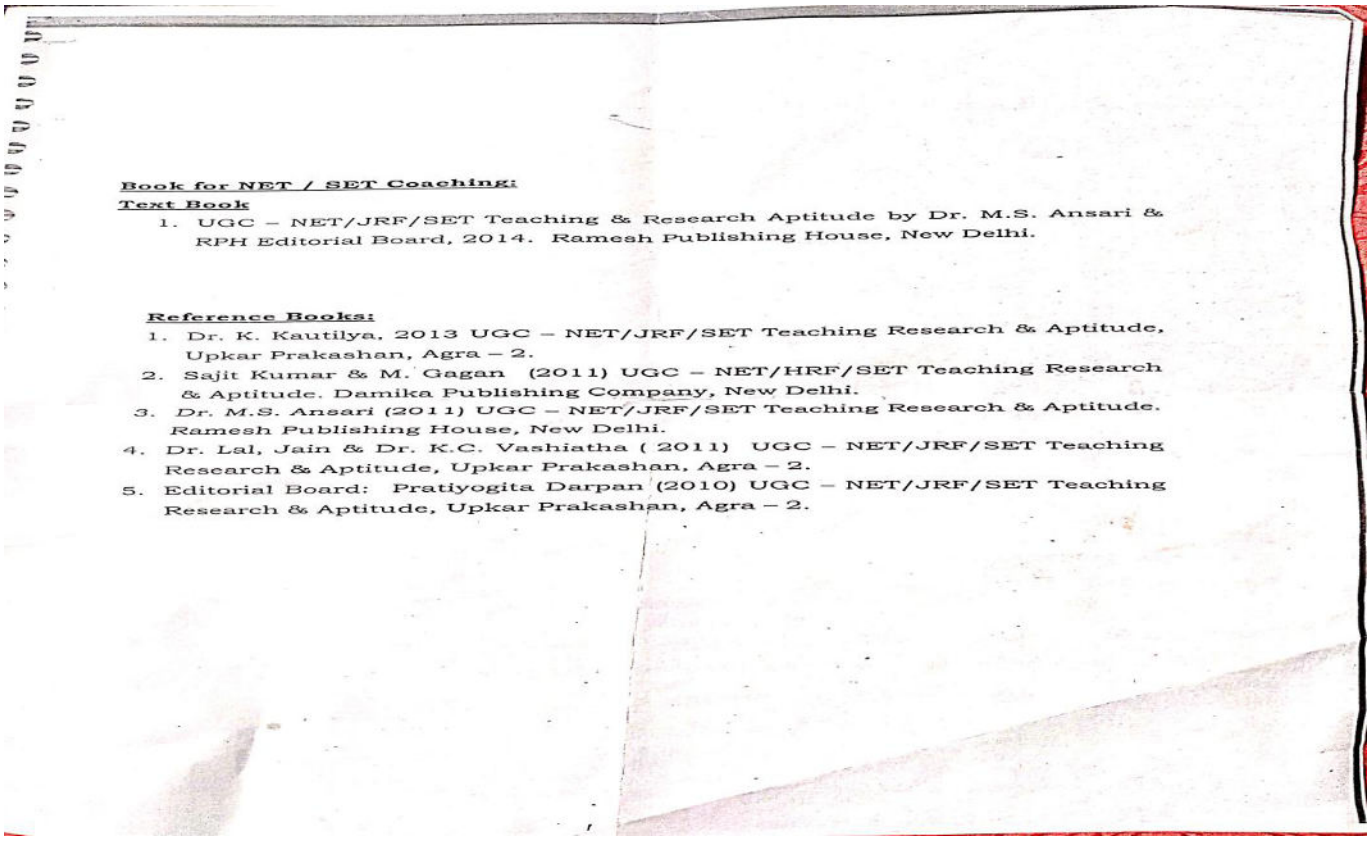
LOGIC-METHODLOGY AND DATA ANALYSIS

Statement; premises; Term-Types of Syllogism,Prepositions,Logical inferences; Fallacies or possible errors in logical conclusions-Types of Tables and Graphs, Interpretation of data- sources,acquisition and interpretation, qualitative and quantitative data,graphical representation and mapping of data.

UNIT-V

INFORMATION AND COMMUNICATION TECHNOLOGY

Overview of Computer- Hardware, Software, internet and e-mailing EDUSAT- Space Science and Communication- Milestones, Space Transportation-Earth observations.



Book for NET / SET Coaching:

Text Book

1. UGC – NET/JRF/SET Teaching & Research Aptitude by Dr. M.S. Ansari & RPH Editorial Board, 2014. Ramesh Publishing House, New Delhi.

Reference Books:

1. Dr. K. Kautilya, 2013 UGC – NET/JRF/SET Teaching Research & Aptitude, Upkar Prakashan, Agra – 2.
2. Sajit Kumar & M. Gagan (2011) UGC – NET/HRF/SET Teaching Research & Aptitude. Damika Publishing Company, New Delhi.
3. Dr. M.S. Ansari (2011) UGC – NET/JRF/SET Teaching Research & Aptitude. Ramesh Publishing House, New Delhi.
4. Dr. Lal, Jain & Dr. K.C. Vashiatha (2011) UGC – NET/JRF/SET Teaching Research & Aptitude, Upkar Prakashan, Agra – 2.
5. Editorial Board: Pratiyogita Darpan (2010) UGC – NET/JRF/SET Teaching Research & Aptitude, Upkar Prakashan, Agra – 2.

SEMESTER – III

CORE COURSE – IX

INORGANIC CHEMISTRY III

Theory Hours :6	**Course code : P21CHC309**
Exam Hours : 3	**Credits :5**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVE:

To study about the Coordination complexes, Substitution in Coordination complexes and Inorganic Photochemistry.

UNIT-I: ORGANO METALLIC CHEMISTRY - I

Carbon donors: Alkyls and aryls metallation, bonding in carbonyls and nitrosyls, chain and cyclic donors, olefins, acetylene and allyl system. Synthesis, structure and bonding of metallocenes (ferrocene only).

Reactions: Association, substitution, addition and elimination reactions, ligand protonation, electrophilic and nucleophilic attack on ligands. Carbonylation, decorboxylation, oxidative addition and fluxionality.

UNIT-II: ORGANO METALLIC CHEMISTRY - II

Catalysis: Hydrogenation of olefins (Wilkinson's catalyst), hydroformylation of olefins using cobalt or rhodium catalysts (Oxo process), oxidation of olefins to aldehydes and ketones (Wacker process), polymerization (Zeigler - Natta Catalyst); cyclo oligomerisation of acetylene using nickel catalyst (Reppe's catalyst); polymer-bound catalysts.

UNIT-III: COORDINATION CHEMISTRY - IV

Electron transfer reactions, outer and inner sphere processes; atom transfer reaction, formation and rearrangement of precursor complexes, the bridging ligand, precursor and successor complexes. Marcus theory. Complementary, non-complementary and two electron transfer reactions.

UNIT-IV: COORDINATION CHEMISTRY - V

Substitution Reactions: Substitution in square planar complexes, reactivity of platinum complexes, influences of entering, leaving and other groups, the Trans effect.

UNIT-V: COORDINATION CHEMISTRY - VI

Substitution of octahedral complexes of cobalt and chromium, replacement of coordinated water, solvolytic (acids and bases) reaction applications in synthesis (platinum and cobalt complexes only).

Inorganic Photochemistry: Photo-substitution, Photoredox and isomerisation process, application of metal complexes in solar energy conversion.

Text books

1. R.C. Mehrothra, A. Singh, Organo Metallic Chemistry, Wiley Eastern Co., (1992).
2. F. Basolo and R.G. Pearson, Mechanism of Inorganic Reaction, Wiley NY (1967).
3. J. Huheey, Inorganic Chemistry, Harper and Collins, NY IV Edition, (1993).
4. K.F. Purcell and J.C. Kotz, Inorganic Chemistry, W. Saunders Co., (1977).
5. S. FA Kettle, Coordination Chemistry, ELBS, (1973).
6. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, John Wiley and Sons, V Edition (1988).
7. D.F. Shrivers, Pw. Atkins and C.H. Langford, Inorganic Chemistry, OUP (1990).
8. Guillermo J. Ferraudi, Elements of inorganic photochemistry, Wiley (1988).
9. Arthur W. Adamson, Paul D. Fleischauer, Concepts of inorganic photochemistry, Wiley(1975).

Suggested References

1. G. Coates M.l. Green and K. Wade. Principles of Organometallic chemistry, Methven Co., London (1988).
2. P. Powell, Principles of Organometallic chemistry, Chappman and Hall. (1998).
3. G.S. Manku, Theoretical Principles of Inorganic Chemistry, McGraw-Hill Education, (1984).
4. M.C. Day and J. Selbin, Theoretical Inorganic Chemistry, Van Nostrand Co., New York (1974).
5. R.B. Heslop and K. Jones, Inorganic Chemistry, Elsevier Scientific Publ., (1976).
6. F. Basolo and R.G. Pearson, Mechanism of Inorganic Reaction, Wiley NY (1967).
7. M.C. Day and J. Selbin, Theoretical Inorganic Chemistry, Van Nostrand Co., New York (1974).
8. B.E. Dogulas DH McDaniel's and Alexander, Concepts and Models of Inorganic Chemistry, Oxford IBH (1983).
9. WU. Mallik, G.D. Tuli, R.D. Madan, Selected topics in Inorganic Chemistry, S. Chand and Co., New Delhi (1992).

Course outcome:

Students can able to

CO 1: Illustrate the concept of co-ordination chemistry

CO 2 : Illustrate the substitution in Co-ordination complexes and Inorganic photochemistry.

CO 3: Explain the application of catalyst in chemical reactions

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1		✓						✓				
CO 2				✓								✓
CO 3											✓	✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER – III
CORE COURSE – X
ORGANIC CHEMISTRY III

Theory Hours :6	**Course code : P21CHC310**
Exam Hours : 3	**Credits :5**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVE:
To understand the concepts of spectral techniques and to apply these techniques for the quantitative and structural analysis of organic compounds. To learn the chemistry of terpenes, alkaloids and free radicals and their importance.

UNIT-I: UV AND IR SPECTROSCOPY AND THEIR APPLICATIONS

Ultraviolet-Visible spectroscopy: Types of electronic transitions - chromophores and auxochromes - factors influencing the positions and intensity of absorption bands - absorption spectra of dienes, polyenes and unsaturated carbonyl compounds - Woodward
- Fieser rules and its applications.

Infra Red Spectroscopy: Vibrational frequencies and factors affecting them - identification of functional groups - intra and inter molecular hydrogen bonding – functional group region- finger print region - far IR region.

UNIT-II: NMR SPECTRA AND ITS APPLICATIONS
Nuclear spin - magnetic moment of a nucleus - nuclear energy levels in the presence of magnetic field - basic principles of NMR experiments - CW and FT NMR - ^{1}H NMR - Chemical shift and coupling constant - factors influencing proton chemical shift and vicinal proton - proton coupling constant- ^{1}H NMR spectra of simple organic molecules such as CH_3CH_2Cl and CH_3CHO.
AX and AB spin system - nuclear overhauser effect- chemical exchange.
^{13}C NMR - proton decoupling and Off resonance decoupling spectra - factors affecting ^{13}C NMR chemical shift - ^{13}C NMR spectra of simple organic molecules.

UNIT-III: PHYSICAL METHODS OF STRUCTURAL DETERMINATION

Mass spectroscopy - Principles - measurement techniques - (El, Cl, FD, FAB, SIMS) - presentation of spectral data - molecular ions - isotope ions - fragment ions of odd and even electron types - rearrangement ions - factors affecting cleavage patterns - simple and multicentre fragmentation – Mc Lafferty rearrangement - Mass spectra of hydrocarbons, alcohols, phenols, aldehydes and ketones. ORD and its applications - Octant rule - cotton effect - axial halo ketone rule - Problem solving (for molecules with a maximum number of C10)

.UNIT-IV: TERPENES AND ALKALOIDS

Introduction - classification - isoprene rule - structural determination of terpenoids'- Citral, geraniol - linalool - farnesol - α-pinene and camphor.

Introduction - isolation of alkaloids - total synthesis of quinine - morphine and reserpine.

UNIT-V: FREE RADICALS

Long and short-lived free radicals - methods of generation of free radicals - detection of free radicals by ESR - Addition of free radicals to olefinic double bonds - aromatic radical substitutions reactions - decomposition of diazo compounds – phenol coupling - Sandmeyer reaction - Gomberg reaction - Pschorr reaction - Ulmann reaction and Hunsdiecker reaction.

RECOMMENDED BOOKS

1. Francis A. Carey and Richard J. Sundberg, Advanced organic chemistry, III Edition (1990). G.A Swan,Introduction to alkaloids
2. I.L. Finar, Organic chemistry, Vol. II, 5thedition ELBS publication.
3. J. Dyer, Application of absorption spectroscopy of organic compounds, Prentice and Hall of India, Pvt., New Delhi.
4. J. March, Advanced organic reaction mechanism and structure, Tata McGraw Hill. James verghese ,Terpene Chemistry.
5. Neil S. Issac, Physical organic chemistry, ELBS publication 1987.
6. O.P. Agarwal, Chemistry of organic Natural Products, Goel Publishing House, Meerut.
7. P.S. Kalsi, Spectroscopy of organic compounds,Wiley Eastern Ltd., Chennai.
8. R.M. Silverstein, G.d. Bassler and Monsu, Spectrometric identification of organic compounds, John Wiley and Sons, New York.
9. S.M. Mukherji and S.P. Singh,Organic Reaction Mechanism, MacMillan India Ltd., Chennai (1990).
10. Schliemann, Introduction to the spectroscopic methods for the identification organic compounds, 2 volumes, Pergamon Press.
11. W. Kemp, Spectroscopy, Macmillan Ltd.,
12. Y.R. Sharma,Structural identification of organic compounds, S. Chand & Co.

Course outcome:

Students can able to

CO 1: Understand the concepts of Spectral techniques and application of quantitative and structural analysis of organic compounds.

CO 2: To learn the chemistry of terpenes.

CO 3: Understand the importance of alkaloids.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓										✓	✓
CO 2		✓		✓			✓		✓		✓	✓
CO 3	✓		✓		✓						✓	✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER – III
CORE COURSE – XI
PHYSICAL CHEMISTRY II

Theory Hours :6	**Course code : P21CHC311**
Exam Hours : 3	**Credits :5**
	Marks : Max marks -100
	Ext - 75
	Int- 25

OBJECTIVES:

To understand the behavior of kinetic reactions and fast reaction. To understand the behavior of electrolytes in solution. To know the structure of the electrode surface. To differentiate electrode kinetics from other types of kinetic studies. To know the applications of electrode process. To study the concept and applications of group theory.

UNIT-I: KINETICS OF COMPLEX REACTIONS & FAST REACTIONS

Kinetics of complex reactions, reversible reactions, consecutive reactions, parallel reactions, chain reactions, general treatment of chain reactions - chain length - Rice Herzfeld mechanism - explosion limits.

Study of fast reactions - relaxation methods - temperature and pressure jump methods- stopped flow and flash photolysis methods.

UNIT-II: ELECTROCHEMISTRY – I

Mean ionic activity and mean ionic activity coefficient - activity coefficient of strong electrolytes - determination of activity coefficient by electrochemical method.

Debye Huckel limiting law - qualitative and quantitative verification - limitation - Debye Huckel limiting law at appreciable concentrations of electrolytes - Debye - Huckel - Bronsted equation.

UNIT-III: ELECTROCHEMISTRY – II

Electrode - electrolyte interface - adsorption at electrified interface - electrical double layer - electro capillary phenomenon - Lippmann equation - Structure of double layers - Helmholtz - Perrin, Guoy - Chapman and Stern model of electrical double layers. Diffusion - Fick's law of diffusion - Effect of ionic association on conductance-electro kinetic phenomena -membrane potential.

UNIT-IV: GROUP THEORY – I

Definition of basic terms in group theory – Group – Abelian group, cyclic group, subgroup, group multiplication table - similarity transformation and class, symmetry elements and symmetry operations -Point groups (any examples limited to n = 4 of C_{nv}, C_{nh}, D_{nh}, D_{nd}, & T, T_d, O, O_h), Reducible and Irreducible representations - direct product representation. Character Table - explanation of various column and Mullliken Symbol.

UNIT-V: GROUP THEORY – II

Orthogonality theorem and its consequences - construction of character table for C_{2V}, C_{3V}, C_{2h}, and D_{2d} point groups - hybrid orbitals in nonlinear molecules (CH_4, BF_3, and NH_3). Determination of representations of vibrational modes in nonlinear molecules (H_2O, NH_3, BF_3 and $[PtCl_4]^{2-}$). Symmetry selection rules of Infra-red and Raman spectra.

TEXT BOOKS

1. J. Rajaram and J. C. Kuriacose, Kinetics and Mechanism of Chemical Transformations. Mac Millan India Ltd (1993).
2. K. J. Laidler, Chemical Kinetics, Harper and Row, New York (1987).
3. K. L. Kapoor, A text book of Physical Chemistry, Mac Millan India Ltd., (2001).
4. S. Glasstone, Introduction to Electrochemistry, Affiliated East West Press, New Delhi (1960).
5. D. R. Crow, Principles and Applications to Electrochemistry, Chapman and Hall (1991).
6. K.V. Raman, Group Theory and its Applications to Chemistry, Tata Mc Graw Hill Publishing Co., (1990).
7. P. K. Bhattacharya, Group Theory and its Applications, Himalaya Publishers.
8. K.V. Ramakrishnan and M. S. Gopinath, Group Theory in Chemistry, Vishal Publications (1998).

SUGGESTED REFERENCES

1. R. G. Frost and Pearson, Kinetics and Mechanism, Wisely, New York (1961).
2. C. Capellos and B. H.J. Bielski, Kinetic Systems, Wisely Interscience, New York (1972).
3. Amdur and G.G. Hammes, Chemical Kinetics, Principles and Selected Topics, McGraw Hill, New York (1968).
4. G. M. Harris, Chemical Kinetics, D. C. Health and Co., (1966).
5. J. Robbins, Ions in Solution - An Introduction of Electrochemistry, Clarendon Press, Oxford (1972
6. John O. M. Bockris, Amulya K.N. Reddy, Modern Electrochemistry 2B: Electrodics in Chemistry, Engineering, Biology and Environmental Science
7. F. A. Cotton, Chemical Applications of Group Theory, John Wiley and Sons inc., New York (1971).
8. N. Thinkham, Group Theory and Quantum Mechanics, McGraw Hill Book Company, New York (1964).
9. S. Schonland, Molecular Symmetry, Vannostrand, London (1965).
10. Alan Vincent, Molecular Symmetry and Group Theory-Programme Introduction to Chemical Application, Wiley, New York (1977).
11. S. Swarnalakshmi, T. Saroja and R. M. Ezhilarasi, A simple Approach to Group Theory in Chemistry, University press (India) private Ltd (2008).

Course outcome:

Students can able to

CO 1: Understand the behavior of kinetics on chemical reactions.

CO 2: Illustrate of the structure of componds through group theory

CO 3: Construct the character table.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓	✓✓				✓					✓	✓
CO 2				✓		✓			✓		✓	
CO 3	✓				✓			✓			✓	✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER – III
CORE COURSE - XII
PHYSICAL CHEMISTRY PRACTICAL – I

Practical Hours : 6	**Course code : P21CHC312P**
Exam Hours : 3	**Credits : 3**
	Marks : Max marks -100
	Ext - 60
	Int - 40

OBJECTIVES:

- To learn about principles and techniques involved in TT, molecular weight of substance by Rast's method, CST, phase diagram, Kinetics and Adsorption.

Experiments:

1. Determination of molecular weight of substance by Transition Temperature method.
2. Determination of molecular weight of substance by Rast's method.
3. Determination of Critical Solution Temperature(CST) of phenol – water system and effect of impurity on CST.
4. Study of phase diagram of two components forming a simple eutectic.
5. Study of phase diagram of two components forming a compound.
6. Kinetics – Acid hydrolysis of an Ester – Comparison of strength of acids.
7. Kinetics – Acid hydrolysis of an Ester – Determination of Energy of Activation (Ea)
8. Kinetics – Persulphate – Iodine reaction – Determination of order, effective of ionic strength on rate constant.
9. Adsorption – Oxalic acid/Acetic acid on charcoal using Freundlich isotherm.

References:

1. Findlay's Practical Physical Chemistry Revised and edited by B.P.Levitt, 9th edition.
2. J.N.Gurtur and R.Kapoor, Advanced Experimental chemistry, Voli,Chand&co., Ltd, New Delhi.

Course outcome:

CO 1:Able to find out transition temperature and determine the molecular weight of organic molecules by Rast's method.

CO 2: Determine the critical solution temperature and Identify the effect of impurity on CST.

CO 3:To draw Phase diagram for two component system

CO 4: Able to perform acid hydrolysis of an ester

CO 5:Determine activation energy, rate constant, and dissociation constant ,

CO 6: Knowledge in basics of adsorption

CO 7:It gives basic ideas and motivate to research.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1				✓			✓				✓	
CO 2		✓						✓				
CO 3	✓			✓			✓				✓	✓
CO 4		✓		✓				✓			✓	
CO 5		✓		✓			✓	✓			✓	✓
CO 6		✓						✓			✓	

QUESTION PATTERN

Experiments - 60 MARKS

Internal - 40 MARKS

SEMESTER -III
ELECTIVE COURSE – III (A)
MEDICINAL CHEMISTRY

Theory Hours :6	**Course code : P21CH3MBE3:1**
Exam Hours : 3	**Credits :4**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES:

- To learn role of chemistry in medicinal field.
- To know about first aid, anti biotic, anesthetics and anti oxidant

UNIT - I

First aid– Definition - rules of first aid – first aid for cuts, abrasions, bruises, bleeding, fractures, burns, fainting and poisonous bites. First box –detection hallucinogens and poisons and antidotes for poisoning

Some common poison and their antidotes- Acid poisoning, alkali poisoning , poisoning by disinfectants, Poisoning of hallucinogens atropine, alcohol, Mercury poisoning.

UNIT- II

Indian medicinal plants –Adathoda vasica, Ocimum sanctum, Hibiscus rosa-sinensis, Mangifera indica, Azadirachta indica, Ficus,Solanum trilobatum, Phyllanthus niruri.

Biological role of some inorganic compounds –Sodium, potassium ,calcium , iodine, copper ,zinc and its compounds

UNIT - III

Antibiotics : Definition.

Chloromphenicol –properties, structure, uses , SAR (Structure activity relationship). Pencillin- structure, uses , SAR.

Anesthetics-Definition - Characteristics

General anesthetics – volatile general anesthetics chloroform preparation, properties ,advantages and disadvantages. Non-volatile general anesthetics –thiopental sodium preparation ,properties , advantages and disadvantages.

Local anesthetics – Requisites, cocaine, procaine, amithocaine structure , properties, advantages and disadvantages.

UNIT- IV

Organic pharmaceutical Aids- Classification.

Preservatives – Definition , Characteristics, Benzoic acid, Hydroxy benzoate, sodiumbenzoate properties and its uses

Antioxidant –Definition, galic acid, propyl galate, properties and uses.

General study of Sequestrants, emulsifying agents, colouring, flavouring and sweetening agents. Stablizing and suspending agents, ointment bases and related agents and solvents

UNIT - V

Important drugs – Availability, uses and side effects ofAspirin,paracetamol, trimethoprim, ibuprofen, gentamycin, diazepam, doxicycline, erthromycin, tetracycline, ranitidine, digoxin, verapamil,glibenclamide,cephalexin, rifampicin, furosemide, phenobarbitone, nitroglycerin, captopril, theophyline

Diabetes – Definition,types, control of diabetes.

AIDS – causes , symptoms,prevention and treatment.

References :

1. Jayashreeghosh, a text book of "Pharmaceutical Chemistry".S.Chand Publications, Delhi
2. Alfred Burger, "Medicinal Chemistry" part I & II, 3rd edn, Willey interscience.
3. Goodman and Gilman "Pharmacology and Pharmacothearputics" .
4. AhsuloshKar, "Medicinal chemistry" Wiley Eastern, Madras.
5. Harkrishansingh and V.K.Kapoor, "Organic pharmaceutical Chemistry", VallabhPrakashan, Delhi.

Course outcome:

Students will acquire the knowledge of

CO 1: First aid, medicinal plants, antibiotics, anesthetics and organic pharmaceutical aids.

CO 2: Availability, uses and side effects of some important drugs.

CO 3: Biological role of some inorganic compounds.

CO 4: Cause, symptoms, treatment and prevention of Deficiency disease diabetics and syndrome disease.

CO 5: Creates the interest to work in pharmaceutical companies.

CO 6: Motivates to research on identification of new drugs.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓			✓		✓						✓
CO 2				✓		✓		✓				✓
CO 3	✓							✓				✓
CO 4	✓											
CO 5				✓				✓				✓
CO 6		✓			✓		✓					✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER - III
ELECTIVE COURSE - III (B)
CHEMISTRY IN EVERY DAY LIFE

Theory Hours :6	**Course code : P21CH3MB3:2**
Exam Hours : 3	**Credits :4**
	Marks : Max marks -100
	Ext - 75
	Int- 25

OBJECTIVES:

- To study about the industrial waste, chemistry of soap, cement, pulp, paper, detergent and perfumes

UNIT I

Basic Ideas and Industrial Wastes: Basic idea about unit operation – flow chart – chemical conversion – batch versus continuous processing – chemical process selection – design – chemical process control.

Types of industrial wastes – treatment of wastes or effluent with organic impurities – treatment of wastes or effluent with inorganic impurities –treatment of some important chemical wastes.

UNIT II

Petroleum and Petrochemicals: Introduction – saturated hydrocarbons from natural gas – uses of saturated hydrocarbons – unsaturated hydrocarbons – acetylene, ethylene, propylene, butylene – aromatic hydrocarbons – toluene and xylene.Preparation of rectified spirit from beat – methylated spirit – preparation of absolute alcohol from rectified spirit – petrochemicals in India.

UNIT III

Manufacture of Cement: Introduction – types of cement – high alumina cement, water proof cement, slagcement, acid resisting cement, white cement, coloured cement, Pozzolana cement. Setting of cement – properties of cement – testing of cement – uses of cement –concrete – cement industries in India.

UNIT IV

Pulp and Paper and Manufacture of Paper: Introduction – manufacture of pulp – types of pulp – sulphate or craft pulp, soda pulp, Rag pulp – beating, refining, filling, sizing and colouring. Calendaring – uses – paper industries in India.

UNIT V

Soaps, Detergents and Perfumes: Introduction – types of soaps – hard and soft soaps – manufacture of soap (hot and continuous process only) – cleansing action of soap – detergents – surface active agents – biodegradability of surfactants, amphoteric detergents. Introduction – production of natural perfumes – flower perfumes – jasmine, rose and lily – production of synthetic perfumes – muscone and nitro-musks.

REFERENCES

1. B. K. Sharma, Industrial Chemistry; 8th Ed., Goel Publishing House, New Delhi, 1997. (Unit–I, II, III, IV and V)
2. R. N. Shreve, and J. A. Brink Jr. Chemical Process Industries; 4th Ed., McGraw Hill, Toronto, 1977. (Unit–I, II, III, IV and V)
3. A. C. S. Brain, Production and Properties of Industrial Chemicals; Reinhold, New York, 1989. (Unit–I)

Course outcome:

Students will acquire

CO 1: Basic ideas about industrial waste and treatment

CO 2: Knowledge of importance petroleum, petrochemicals, soap, cement, pulp, paper, detergent and perfumes

	PO 1	PO 2	PO 3	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓		✓	✓	✓		✓			✓	✓
CO 2			✓	✓			✓			✓	✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER III
ELECTIVE COURSE - III. (C)
SOLID STATE CHEMISTRY

Theory Hours :6	**Course code : P21CH3MBE3:3**
Exam Hours : 3	**Credits :4**
	Marks : Max marks -100
	Ext - 75
	Int- 25

OBJECTIVES

1. To learn the crystal structures of few inorganic solids.
2. To study the chemistry of crystallization and vapour phase transport.
3. To learn the applications of magnetic materials.

4. To study the chemistry of organic solids.

UNIT I: Crystal Structure and Crystal Engineering of Organic Solids

Types of close packing – hcp and ccp – packing efficiency – SC, BCC, and FCC, radius ratio rule – applications – polyhedral description of solids – structure types: Na2O, Cs2O, rutile, perovskite (ABO3), ReO3, K2NiF4, spinels and antispinels.

Hydrogen bonded supramolecular patterns involving water / carboxyl / halide motifs – concepts of different types of synthons based on non-covalent interactions – principles of crystal engineering and non-covalent synthesis – polymorphism and pseudopolymorphism – supramolecular isomorphism, polymorphism and crystal engineering of pharmaceutical phases.

UNIT II: Metallo Organic Frameworks

M.O.Fs (Metallo Organic Frameworks) – organometallic systems – combinations of different interactions to design molecular rods, triangles, ladders, networks, etc. Design of nanoporous solids.

Interligand hydrogen bonds in metal complexes – implications for drug design – crystal engineering of NLO and OLED materials.

UNIT III: Preparative Methods in Solid State Chemistry

Experimental procedure, coprecipitation as a precursor to solid state reaction, other precursor methods, kinetics of solid state reactions – crystallizations of solutions, melts, glasses and gels, solutions and gels: zeolite synthesis – precipitation from solution or melt: flux method, epitaxial growth of thin layers, verneuil flame fusion method.

Graphite intercalation compounds, transition metal dichalcogenide and other intercalation compounds, ion exchange reaction, synthesis of new metastable phases by 'Chimie Douce'.

Electrochemical reduction methods – preparation of thin films, chemical and electrochemical methods, physical methods – growth of single crystals, Czochralski method, Bridgman-Stockbarger methods – zone melting.

Vapour phase transport, hydrothermal methods, comparison of different methods – high pressure and hydrothermal methods and dry high pressure methods.

UNIT IV: Magnetic Materials and Optical Properties

Selected examples of magnetic materials and their properties – metals and alloys, transition metal oxides, spinels, garnets, ilmenite and perovskites.

Magnetoplumbites – applications – structure/property relations – transformer, information storage, magnetic bubble memory devices, permanent magnets.

Luminescence, Lasers and phosphors – definitions and general comments, configurational coordinate model, some phosphor materials, anti-Stokes phosphors – lasers – the ruby laser, Neodymium lasers

UNIT V: Organic Solid State Chemistry

Topochemical control of solid state organic reactions – intramolecular reactions – conformational effects – intermolecular reactions – molecular packing effects – photodimerization of 2-ethoxycinnamic acid (α form, β form, γ form) – photopolymerization of 2,5-distyrylpyrazine – photopolymerizations of diacetylenes.

Asymmetric syntheses – dimerization of anthracene – control of molecular packing arrangements.

Organic reactions within inorganic host structures – electrically conductive organic solids – organic metals, conjugated systems, doped polyacetylene, polyparaphenylene, polypyrrole – organic charge transfer complexes – new superconductors

REFERENCES

1. A. R. West, Solid State Chemistry and Its Applications; 2nd Ed., John Wiley and sons, New York, 2014 (Unit III – V).
2. J. M. Lehn, Supramolecular Chemistry; VCH, Weinheim, 1995.
3. G. R. Desiraju, Crystal Engineering: The Design of Organic Solids; Elsevier, Amsterdam, 1989.
4. G. R. Desiraju, and T. Steiner, The Weak Hydrogen Bond in Structural Chemistry and Biology; Oxford University Press: Oxford, 2002.
5. G. A. Jeffrey, Introduction to Hydrogen Bonding; Oxford University Press, New York, 1997.
6. J. M. Lehn, Transition Metals in Supramolecular Chemistry; Vol 5, John Wiley and Sons, New York, 1999.
7. C. N. R. Rao, Current Science, 2001, 81, 1030.
8. Journals:
   (i) Crystal Growth and Design.http://www.pubs.acs.org/journals/cgdefu/index.html
   (ii) Crystal Engineering Communication, http://www.rsc.org /Publishing/ Journals /ce/ index.asp

COURSE OUTCOMES

CO1 Understand the crystal structures of few inorganic solids.

CO 2 Understand the chemistry of crystallization and vapour phase transport.

CO 3 To learn the applications of magnetic materials.

CO4 To study the chemistry of organic solids.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓		✓		✓	✓		✓			✓	✓
CO 2			✓		✓			✓			✓	✓
CO3	✓				✓			✓				
CO 4	✓					✓					✓	

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SELF STUDY COURSE- II
CHEMISTRY FOR COMPETITIVE EXAMINATIONS

1.Periodic properties

Varition of atomic volume, atomic and ionic radii, ionisation potential , electron affinity and electronegativity along periods and groups – Factors affecting periodic properties **VSEPR Theory:** Shapes of simple inorganic molecules ($BeCl_2$, BF_3, $SiCl_4$, PCl_5, SF_6, IF_7, H_2O, NH_3, XeF_6) containing lone pair and bond pairs of electrons- Lewis structures.

2.Industrial Chemistry

Fuel gases-water gas, Producer gas, LPG gas, Gobar gas and Natural gas. Fertilizers – NPK and Mixed fertilizers, micro nutrients and their role in plant life and biofertilizers, Soap and Detergents and elementary idea about preparation and manufacture. Cleaning action of soap and detergents.

3. Nuclear chemistry:

Introduction – composition of nucleus and nuclear forces.

Nuclear stability –n/p ratio, mass defect, binding energy, packing fraction and magic numbers, shell and liquid drop models.

Isotopes –detection and separation. Isobars, Isotones and Isomers.

4. Organic reactions

Aldol, Perkin, Knoevenagal and Benzoin condensation, Claisen, Reformatsky, Wittig and Cannizaro reactions. Pinacol - pinacolone rearrangement. Beckman Benzidine, Hoffmann, Curtius, Benzilic Acid, Cope and Oxycope rearrangement and fries rearrangement (Mechanisms not necesary)

5. Analytical chemistry

Laboratory hygiene and safety. Storage and handling of corrosive chemicals, simple first aid procedure for accidents. Separation and purification techniques. Solvent extraction, Soxhlet extraction. Chromatography; Paper chromatography-principles, medium, slvents used,mechanism, factors influencing Rf values.

REFERNCES

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 Jeevan Arnikar , Essentials of nuclear chemistry, New Age International (P) Ltd., (2005).
5. Hari Jeevan Arnikar,Nuclear Chemistry Through Problems, New Age International (P) Ltd., (2007).
6. G. T. Seaborg, Transuranium elements, Dowden Hitchinson and Ross, (1978).
7. Nishit Mathur, 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.,
11. T. Pradeep, Nano: The essentials., McGrew Hill Education.(2007)

12. D. B. Hibbert and J. J. Gooding, Data Analysis for Chemistry; Oxford University Press, UK, 2006.
13.J. Topping, Errors of Observation and Their Treatment; 4th Ed., Chapman Hall, London, 1984.
14. A. Braithwaite and J. F. Smith, Chromatographic Methods; 5th Ed., Springer, Germany; 1995.
15. V. K. Srivastava and K. K. Srivastava, Introduction to Chromatography; 2nd Ed., Holden Day, New York, 1985.

COURSE OUTCOMES

CO1. Understand the laboratory hygiene and safety
CO 2. Understand industrial applications of chemistry
CO 3 To learn the applications soap and detergents
CO4 To study the basics of nuclear chemistry.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓		✓		✓	✓		✓			✓	✓
CO 2			✓		✓			✓			✓	✓
CO3	✓				✓			✓				
CO 4	✓					✓					✓	

SEMESTER – IV
CORE COURSE - XIII
PHYSICAL CHEMISTRY III

Theory Hours :6	**Course code : P21CHC413**
Exam Hours : 3	**Credits : 5**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES:

To study the electrochemical kinetics, over potential, corrosions and fuel cells. To know the solid state and its properties. To Study the principles and applications of spectroscopy. To study statistical thermodynamics,

UNIT-1: ELECTROCHEMISTRY- III

Mechanism of electrode reactions - polarization and over potential - the Butler-Volmer equation for one step and multistep electron transfer reactions - significance of electron exchange current density and symmetry factors - transfer coefficient and its significance - mechanism of the hydrogen and oxygen evolution reactions.
Corrosion and passivation of metals - Pourbaix diagram - Evan's diagram - fuel cells - electrodeposition - principle and applications.

UNIT-II: SOLID STATE

Classification of solids - Imperfection in solids - point, line and plane defect - Electrons and holes - Non-stoichiometry - Imperfection and physical properties of solids (brief study). **Electrical properties** - electrical conductivity - Hall effect - dielectric properties - piezo electricity, Ferro electricity and conductivity; **Optical properties** - Photo conductivity -luminescence - color center - lasers - refraction - birefringence;
Magnetic properties - diamagnetism - paramagnetism - ferro - antiferro and ferrimagnetisms. Calculation of magnetic moments. Mechanical and thermal properties.

UNIT-III: SPECTROSCOPY - I

Microwave spectroscopy – Rotational spectroscopy of rigid rotator - non rigid rotator - diatomic and polyatomic molecules.

Vibrational spectroscopy - Harmonic oscillator - anharmonicity - vibrational spectra of polyatomic molecules - vibrational frequencies - group frequencies - vibrational coupling- overtones - Fermi resonance.

Raman Spectroscopy- Raman effect, Stoke's and Anti-stoke's lines, rotational and vibrational Raman spectra.

Electronic spectroscopy - Progressions and sequences, selection rules, Franck - Condon principle, types of electronic transitions - solvent effects.

UNIT-IV: SPECTROSCOPY- II

Resonance spectroscopy - Zeeman effect - equation of motion of spin in magnetic fields - chemical shift - spin-spin coupling - NMR of simple AX and AMX type molecules - calculation of coupling constants - ^{13}C, ^{19}F, ^{31}P NMR spectra - applications - a brief discussion of Fourier Transformation Resonance Spectroscopy.

UNIT-V: STATISTICAL THERMODYNAMICS- I

Objectives of statistical thermodynamics - concept of thermodynamic and mathematical probabilities - permutations and combinations, distribution of distinguishable and non- distinguishable particles. Stirling approximation, Maxwell - Boltzmann distribution law - Fermi - Dirac and Bose - Einstein statistics - comparison with Maxwell -Boltzmann distribution law and their applications - radiation law - electron gas in metals. Partition function - evolution of translational, vibrational and rotational partition functions for mono and diatomic ideal gases.

Text Books

S.Glasstone, Introduction to Electrochemistry, Affiliated East West Press, New Delhi (1960).

D.R. Crow, Principles and Applications to Electrochemistry, Chapman and Hall (1991).

S. Glasstone, Introduction to Electrochemistry, Affiliated East West Press, New Delhi (1960).

P.H.Rieger, Electrochemistry, Chapman and Hall, New York (1994).

R.Crow, Principles and Applications to Electrochemistry, Chapman and Hall (1991). Lesley E.Smart, Elaine A.Moore, Solid State Chemistry - An Introduction

Charles Kittel - Introduction to Solid State Physics

Anthony R. West - Solid State Chemistry and its Applications

C.N. Banwell and E.M. McCash, Fundamentals of Molecular spectroscopy, IV - Edition, Tata McGraw Hill (2005).

N. Sathyanarayana, Vibrational Spectroscopy, New Age International Publishers (2004). Caringtion and Ad. Mclachlan, Introduction to Magnetic Resonance, Harper and Row, New York (1967).

M. C.Gupta, Statistical thermodynamics, Wiley Easter, New Delhi (1990).

R.Hasee, Thermodynamics Of Irreversible Process, Addition Wesley, Reading, Mass(1969).

Suggested References

J.O.M. Bokris and A. K. N. Reddy, Electrochemistry, Vol. 1 and 2, Plenum, New York (1977).

P. Dalahay, Electrode Kinetics and Structure of Double Layer, Inter Science, New York (1965).

J.Robbins, Ions in Solution-An Introduction to Electrochemistry, Clarendon Press, Oxford (1993).

H.Reiger, Electrochemistry, Chapman and Hall, New York (1994).

W.J. Moore, Physical Chemistry, Orient Longman, London (1972).

J.M. Murrell, S.F.A. Kettle and J.M. Tedder, The Chemical Bond, Wiley (1985). R.C. Ropp, Solid State Chemistry

C N. Banwell, Fundamentals of Molecular Spectroscopy, Mc Graw Hill (1966).

Raymond Chang, Basic Principles of Spectroscopy, McGraw Hill Ltd., New York (1971).

G M. Barrow, Introduction to Molecular Spectroscopy, Mc Graw Hill, New York (1962). W. Kemp, NMR in Chemistry, Mc Millan Ltd., (1986).

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P. Staughan and S. Walker, Spectroscopy, Vol. I, II & III, Chapman and Hall (1976).

J.K. Sanders and B.K. Hunter, Modern NMR Spectroscopy, A Guide for Chemists, Oxford University Press, Oxford (1987).

Jk.M. Sanders, E.C. Constable and B.K. Hunter, Modern NMR Spectroscopy - a Work Book of Chemical Problems, Oxford (1989).

Francis W Sears and Gerhard L Salinger, Thermodynamics, kinetic theory, and statistical thermodynamics.

P. Dalahay, Electrode Kinetics and Structure of Double Layer, Inter Science, New York (1965).

Course outcome:

Students will be able to

CO 1: Understand the electrochemical kinetics, over potential, corrosions and fuel cells

CO 2: Illustrate about solid –state and its properties.

CO 3:To Study the principles and applications of spectroscopy. To study statistical thermodynamics.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓		✓		✓	✓		✓			✓	✓
CO 2			✓		✓			✓			✓	✓
CO3	✓				✓			✓				

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)

SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)

SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER - IV
CORE PRACTICAL- XIV
PHYSICAL CHEMISTRY PRACTICAL – II

Practical Hours : 6	**Course code : P21CHC414P**
Exam Hours : 6	**Credits : 4**
	Marks : Max marks -100
	Ext - 60
	Int - 40

OBJECTIVES:

- To impart knowledge of conduct metric and potentiometric titration by electrical aspects.

I. Conductometric Titrations

1.Acid – base titrations
2.Precipitation titration
3.Displacement titrations
4.Determination of dissociation constant of weak acids
5.Solubility product of sparingly soluble silver salts

II.Potentiometric Titration

1.Acid – base titrations
2.Precipitation titration
3. Redox titrations
4. Determination of dissociation constant of weak acids
5. Determination of solubility of silver salts

III. Determination of pH of a Buffer solution (CH_3COONa + HOAc)

References

1. Findlay's Practical Physical Chemistry Revised and edited by B.P. Levitt,9th edition.
2. J.N.Gurtur and R.Kapoor, Advanced Experimental chemistry, Voli. Chand & Co., Ltd, New Delhi.
3. J.B.Yadhav, Practical Physical Chemistry.

Course outcome

Students will knowledge of
CO 1:Different types of conductometric titrations and potentiometric titrations
CO 2:Calculation of dissociation constant, solubility product silver salts and P^H of buffer solutions.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1			✓								✓	✓
CO 2			✓		✓				✓		✓	✓

QUESTION PATTERN

Experiments - 60 MARKS

Internal - 40 MARKS

SEMESTER - IV
ELECTIVE COURSE - IV(A)
RECENT TRENDS IN CHEMISTRY

Theory Hours :6	**Course code : P21CH4MBE4:1**
Exam Hours : 3	**Credits :4**
	Marks : Max marks -100
	Ext - 75
	Int - 25

OBJECTIVES:

- To learn about basics of computers, nano chemistry,green chemistry and molecular modeling basics.

UNIT – I

Introduction to computing and networking:

Introduction to computers and computing – hardware – basic organization of a computer – CPU – main memory – secondary storage – i/o devices – software system and applications of software – high and low level languages compilers – algorithms and flow charts.

Introduction to networking –Computer networks – LAN, WAN, internet and internet – worldwide web – internet for chemists – online search of chemistry databases –e-journals - search engines for chemistry.

UNIT – II

Nano chemistry

Introduction to nanotechnology – molecular nanotechnology – nano manipulator,nano tweezers, atom manipulation – nano materials– preparation of nano material -plasma arcing method, chemical vapor deposition method, electro deposition method– applications of nano materials (batteries, medical implants, motor vehicles and aircraft – nano tubes – properties and uses of nano tubes, nano medicines, environmental applications. Fullerenes - properties & uses.

UNIT –III

Chemical Literature

Introduction to primary sources (journals and patent), secondary sources (chemical abstract, Dictionary, Monographs and Review articles), Chemical abstracts – Subject index – author index and formula index and other indexes with examples – current contents – organization – methods of using the titles and index – preparation and presentation of research papers in journals and seminars.

UNIT – IV

Green chemistry:

Principles(12) - inception – scope – areas – green solvents – biocatalyst and biocatalysis – synthesis of safer product. Green chemistry – photochemical principles – photo oxidation – photo degradation – removal of hazardous chemicals from water – cleaner production concept – implementation – Government role .

UNIT-V

Molecular modeling basics

Molecular modeling – coordinate systems – Cartesian and internal coordinate systems – bond lengths, bond angles and torsion angles, potential energy surfaces. Molecular mechanics – applications and parameterization – advantages and limitations of force fields.

References

1. E.Balaguruswamy, programming in ANSIC", Tata McGraw Hill. 2nd edition, NewDelhi, 1999.
2. Robert Lafore, "Object Oriented Programming in Turbo C++",Galgotia, New Delhi, 1995.
3. K.V.Raman , Computers in chemistry, Tata McGraw Hill, New Delhi 1993.
4. M.M.Srivatsava, Rashmisaneni chemicals for green environment, Narosa publishing house, New Delhi.
5. T.Pradeep, "Nano the essentials – understanding nano science and nano technology" Tata McGraw Hill publishing Ltd, New Delhi.
6. A.R.Leach, Molecular Modeling Principles and applications, 2nd edition prentice Hall, 2001.
7. Green chemistry, Ahluwalia

COURSE OUTCOMES:

CO 1:Able to work with computer for their research purpose
CO 2:Able to differentiate bulk and nano materials and apply their ideas in research.
CO 3:Able to choose innovative research for further studies
CO 4:Able to apply the applications of green chemistry to survive with pollution free environment
CO 5:Explain the basic modeling of electrons and atoms.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓										✓	
CO 2		✓					✓				✓	✓
CO 3				✓							✓	✓
CO 4									✓		✓	✓
CO 5				✓			✓					

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)
SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)
SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER - IV
ELECTIVE COURSE - IV (B)
EXPERIMENTAL METHODS IN CHEMISTRY

Theory Hours :6 **Exam Hours : 3**	**Course code : P21CH4MBE4:2** **Credits :4** **Marks : Max marks -100** **Ext - 75** **Int- 25**

OBJECTIVES

- To learn about the basic concepts of surface imaging and application.
- To learn about chemical analysis, electro analytical techniques, separation methods and applications.

UNIT I

SURFACE IMAGING: Basic concepts in surface imaging – Principle, Instrumentation and Applications –secondary electron microscopy(SEM), secondary Auger microscopy(SAM), scanning probe microscopy(SPM), scanning tunneling microscopy(STM), transmission electron microscopy(TEM).

UNIT II

CHEMICAL ANALYSIS: Non-destructive techniques – X-ray absorption , Diffraction and fluorescence spectroscopy – theory, instrumentation and applications. Destructive technique – Atomic absorption spectroscopy – principle, instrumentation–EMR sources – cells – furnaces – detectors – interferences and their corrections –applications of AAS.

UNIT III

ELECTROANALYTICAL TECHNIQUES: Polarography – Theory, apparatus ,DME, diffusion, kinetic and catalytic currents, current voltage curves for reversible and irreversible systems, qualitative and quantitative applications to inorganic systems. Amperometric titrations – Theory, apparatus, types of titration curves, successive titrations and two indicator electrodes , applications – Complexometric titrations –chelating agents, types of EDTA titration – direct and back titrations, replacement titrations – masking and demasking reagents.

UNIT IV

SEPARATION METHODS - I: Normal and Reversed-phase liquid chromatography – Theory and applications – HPLC– principle, instrumentation, apparatus and materials,
column efficiency and selectivity , applications – GC chromatography – principle, instrumentation, retention volume, resolution and applications.

UNIT V

SEPARATION METHODS – II: Gel chromatography or Gel Permeation Chromatography – Principle, Materials, Gel preparation, column Packing and Detectors – applications and advantages of gel

chromatography.Ion Exchange Chromatography – Definition, Principle, cation and anion exchangers – regeneration - column used in separations - Ion exchange capacity and techniques –Applications.

References:

1. R.Wiesendanger, scanning probe microscopy and spectroscopy, Cambridge university press, 1994
2. Frank A.Settle, Handbook of instrumental techniques for analytical chemistry, Prince Hall ,Newjersey,1997
3. Gurdeep R. Chatwal, Sham K. Anand, Instrumental methods of chemical analysis, Himalaya Publishing House,2011
4. P.Atkins and J.de paulaatkins, Physical chemistry, 8th Ed., Oxford university Press, Newdelhi, 2008
5. F.scholz, Electroanalytical methods, Springer,2ndEd.,2010.

M.Sc – CHEMISTRY.

COURSE OUTCOMES

CO1:Able to explain principle and instrumentation and application of SEM, SPM,STM etc.,
CO 2:Able to explain the application of AAS.
CO 3: Empowers their knowledge in electro analytical technique.
CO 4:Able to know about separation techniques for research purpose.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓			✓					✓			
CO 2	✓		✓						✓			
CO 3	✓		✓						✓		✓	
CO 4	✓		✓		✓	✓			✓			✓

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)
SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)
SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

SEMESTER - IV
ELECTIVE COURSE - IV (C)
POLYMER CHEMISTRY

Theory Hours :6	**Course code : P21CH4MBE4:3**
Exam Hours : 3	**Credits :4**
	Marks : Max marks -100
	Ext - 75
	Int- 25

OBJECTIVES

(1) step-growth and chain-growth polymerization, with respect to synthesis mechanisms and kinetics,

(2) crystalline melting temperature and glass transition temperature, including the influence of kinetics, and

(3) the flow properties of polymer melts and polymer solutions, with respect to both temperature and molecular weight.

UNIT I (15 HOURS)

1.1 Basic Concepts: An introduction to polymers and macromolecules. Natural and synthetic polymers. Molecular forces and chemical bonding in polymer.Classification of polymers – addition and condensation polymers.

1.2 General methods of preparation of polymers: Polymerization through functional groups (step growth) multiple bonds (chain growth) and ring opening. Co-ordination polymerization. Mechanisms of free radical, cationic and anionic polymerization reactions.

1.3 Polymerization Techniques:

Bulk, solution, suspension and emulsion polymerization.

UNIT II

2.1 Polymer Structure:

Linear, Branched and cross linked polymers. Stereo chemistry of polymers isotactic, sydiotactic and atactic.

2.2 Properties of polymers:

The crystalline melting point. The glassy state and the glass transition temperature. Solubility of polymers. Thermal analysis of polymers. Polymer degradation – thermal, mechanical, high energy radiation,

oxidative and hydrolytic.

2.3 Molecular weight of polymers:

Number average molecular, weight average molecular weight. Viscosity and molecular weight. Osmometry, light scattering and gel permeation chromatography. End group analysis.

UNIT III

(15 HOURS)

3.1 Co-polymerization:

Definitions – homo and copolymers. Block copolymers and graft copolymers.

3.2 Kinetics of Polymerization:

Kinetics of free radical polymerization, kinetics of cationic polymerization. Meankinetic chain length, Degree of polymerization. Inhibition and retardation. Chain transfer.

3.3 Adipic acid, Sebacic acid, PMDA, hexa methylene diamine, Caprolacturm, lorohydrins, vinyl acetate, acrylonitrile and ethylmethacyrlate.

3.4 Poly olefins:

Polyethane, PTFE, freons, PVC, PVA, Chloro sulphonated, polyethylene polypropylene and polystyrene.

UNIT IV

4.1 **Natural and synthetic rubbers**:

Constitution of natural rubbers. Butyl, Buna, Buna-s, Buna –n, Neoprene, SBR, Thiocol, polyurethane and silicone rubbers. Compounding of rubber, Reclaimed rubber, Spongy rubber, Foam rubber and Thermocol polymers related natural rubber – chlorinated rubber, oxidized rubber, Cyclised rubber and ebonite.

4.2 Acrylic Polymers:

Polymers of acrylic acid and methacrylic acid and poly acrylate.

4.3 **Polymer Processing Calendaring** – die casting rotational casting – compression, injection moulding.

UNIT V

5.1 **Plastics and resins:**

Definitions – Thermo plastic and thermo setting resins. Constituents of plastic fillers, dyes, pigments, plasticizers, lubricants and catalysts. Importance of thermoplastic resins acrylic, poly vinyl and animal glues.

5.2

Textile fibres:

Definitions and polymers requirements for fibers, Polyamides – Nylon 6, Nylon 66 and Nylon 610, Polyester – terylene, cellulose acetate, viscose rayon.

5.3

Advances in polymers: Bio polymer biomaterial, polymers in medical field.

TEXT BOOK

Billmeyer F.W. Tex Book of Polymer Science Jr. John Wiley and Sons, 1984.

REFERENCES :

1.Gowariker V.R. Viswanathan N.V. And Jayader Sreedhar, Polymer Science
Wiley BEastern Ltd., New Delhi 1978

2. Sharma, B.K. Polymer Chemistry, Goel publishing house, Meerut, 1989.Arora M.G. Singh M and Yadav M.s. Polymer Chemistry, 2nd revised edition,

At the end of the course the students should be able to:

CO 1step-growth and chain-growth polymerization, with respect to synthesis mechanisms and kinetics,

CO 2 crystalline melting temperature and glass transition temperature, including the influence of kinetics,

And

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	✓			✓					✓			
CO 2	✓		✓						✓			
CO 3	✓		✓						✓		✓	

CO 3 the flow properties of polymer melts and polymer solutions, with respect to both temperature and molecular weight.

QUESTION PATTERN – 75 MARKS

SECTION –A –Answer all questions – 20X1= 20 (4 multiple choice questions from each unit)
SECTION –B –Answer all questions – 5X5= 25 (2 questions from each unit, either or type)
SECTION –C –Answer any 3 questions – 10X3= 30 (1 question from each unit, Essay type question)

VALUE ADDED COURSE
CHEMISTRY FOR ENTREPRENEUR

Objectives :

1) This skill based course inculcates Entrepreneurial knowledge to the students
2) To provide the practical training to the students in consumer product preparations
3) To understand Marketing, Licensing, legal aspects.. Evaluation of the product, Packing regulations and advertisements.

UNIT 1

1.1: SOAPS. Manufacture of soaps. Formulation of toilet soaps. Different ingredients used. Their functions. Medicated soaps. Herbal soaps.. Soft soaps. Shaving soaps and creams. ISI specifications. Testing procedures/limits.

1.2: . Manufacture of herbal sanitizers, preservation of sanitizers.

UNIT 2

2.1 **SHAMPOOS:** Manufacture different kinds of shampoos – anti-dandruff, anti-lice, herbal and baby shampoos. Hair dye. Manufacture of conditioners. ISI specifications. Testing procedures and limits.

2.2: COSMETICS:

Face and skin powders. Ingredients, functions. Different types. Snows and face creams. Chemical ingredients used. Anti perspirants. Sun screen preparations. UV absorbers. Skin bleaching agents. Depilatories. Turmeric and Neem preparations. Vitamin oil. Nail polishes: nail polish preparation, nail polish removers. Article removers. Lipsticks, roughes, eyebrow pencils. Ingredients and functions – hazards. ISI specifications.

UNIT 3

3.1Leading firms, brand names, choosing the right product. Packing regulations. Marketing. Licensing legal aspects. GMP – ISO 9001 – consumer education. Evaluation of the product – advertisements.

Reference books

1. Gobala Rao.S , Outlines of chemical technology, Affiliated East West press,1998
2. Kafaro, Wasteless chemical processing, Mir publishers, 1995.
3. Sawyer.W, Experimental cosmetics,Dover publishers, New york, 2000.

Outcomes:

1.After successful completion of the course the candidates become as an efficient entrepreneur
2.Able to lead a small scale Industries and providing job oppurtunities for others
3. Able to provide eco friendly and organic products to the society

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1				✓	✓	✓			✓		✓	✓
CO2				✓	✓	✓			✓		✓	✓
CO3				✓	✓	✓			✓		✓	✓