Department of Chemistry
School of Basic Sciences

M.Sc
Industrial Chemistry

Program Specific Outcome

After completion of this program the candidate will be:

**PSO1**: To equip the chemistry graduates to be placed in various sectors of different industries having chemistry background.

**PSO2**: To facilitate the students to be a entrepreneur for small industries

**PSO3**: To make the students knowing various technical skill in IC.

**PSO4**: To understand managerial skills simultaneously with IC skills.

**PSO5**: To learn supply chain management of manufacturer end to customer end.

**PSO6**: To learn the basic principles of human resource management and marketing management.

**PSO7**: To learn various parameters of quality control and quality assurance in the chemical industrial.

**PSO8**: To learn the in depth concepts of paint chemistry and fibre, Dye, fuel and other allied synthetic products.

**PSO9**: To understand the overall background of chemical industries.

**PSO10**: To create a post graduates of job giving rather than job seeking.
M.Sc
Industrial Chemistry

Curriculum and Syllabus
(Based on Choice based credit system)
2016 – 2017

Department of Chemistry
School of Basic Sciences
MSC INDUSTRIAL CHEMISTRY CURRICULUM  Total No. of credits: 90

<table>
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# List of Discipline Specific Elective Courses

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List of Generic Elective Courses

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<td>5.</td>
<td>Introduction to nanoscience and nanotechnology</td>
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<td>6.</td>
<td>Food Chemistry and Adulteration</td>
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Objectives:

To study the history of dye, synthesis of dyes, classification of dyes and colouring of dyes.

Unit I History and classification of Dye

History of dye stuff - role of color - indigo - purple of the ancient natural mordant dye - era of synthetic dyes - diazotization - reactive dyes - colour and constitution - chromophores - auxochromes - bathochromic groups - hypochromic group - V B approach of colours - steric effect and color.

Classification of dyes according to constitution to applications - classification of textile chemicals - surface active agents, non-surface active agents - Dye stuff intermediates. Basic chemicals – induction of different substitute – sulfanilic acids – naphthalene mono and disulphanilic acid – nature of compounds – reduced and halogenated compounds – alkali function, Diazotisation.

Unit II Synthesis of Dyes

Synthesis of the following dyes – Methyl orange II – Naphthol blue, Bismark brown, para red, Malachite green – Magenta, phenol red, safranine, acridine yellow, quinoline blue, alizarin, copper pathalocyanin. General properties of dye stuff - Linearity – co-planarity – Fastness properties.


Unit III Characterization of Dyes


Unit IV Dyes type -I


**Unit V Dyes type-II**


**Total: 75 hours**

**Outcomes:**

- To know about history of dyes
- To familiarize about types of dyes
- To learn about synthesis of various dyes
- To study about the mechanism and treatment of dyeing
- To understand the types, Characteristics of acid and basic dyes
- To know the Mordant dye and studies related to chromium complexes
- To study on Azo compound dyes
- To understand the fundamental and properties Vat dyes
- To learn about nature and types of sulphur dyes
- To know the structure, properties and function of Disperse dyes
- To learn the reactivity and bonding of Reactive dyes
- To study the fibres and various industrial dyeing process

**Reference Books:**

1. V.A. Shenai – Principles of Dyeing & Technology of Dyeing - Sevak publication.
3. K.V.Datye – Processing of synthetic fibres – John Wiley
Objectives:
To study of fuels, classification of fuels, refining of gasoline and analysis of gases by gas chromatography

Unit I  Classification of fuels 15

Classification of fuels – Solid, liquid and gaseous fuels - sampling procedure- Type of fuels - Characteristic of a good fuels, Types of fossil fuels. Solid fuels, origin - classification of coal by rank - Analysis of coal-Ultimate and Proximate analysis-Volatility - ash content-Moisture content (Dean and Stark Method) - significance of these parameters for industrial applications-Metallurgical/Boiler/Thermal power plants. Calorific value of solid fuels by bomb calorimeter.

Unit II  Liquid fuels 15

Liquid fuels-petroleum-origin of petroleum-classification-refining of crude oil-cracking-thermal & catalytic cracking-process. Details and advantages - fractional distillation - extraction & azeotropic distillation-products-gasoline-kerosene, diesel and waxes-various grades of gasoline-aviation fuel-jet fuels and their uses.

Unit III Characteristics of Fuels 15

Refining of gasoline-octane number-improvement of antiknock properties-diesel oil- cetane number-significance-kerosene as a fuel-liquid fuels-characterisation-determination of viscosity by redwood viscometer, Saybolt viscometer - flash point, fire point, aniline point, pour point, cloud point, carbon residue - determination of these characteristics and their significance in assessing the quality of liquid fuels - calorific value-determination

Unit IV  Gaseous fuels 15


Unit V  Analysis of Fuels 15

Analysis of gases, petrol, kerosene by gas chromatography - IR study- a brief description (introductory level).

Total: 75 hours
Outcomes:
- To study the different classification of fuel
- To learn the various analysis methods namely Ultimate and Proximate
- To understand the various types of refining process
- To learn the different grades of gasoline
- To familiarize the various properties of liquid fuel
- To learn the determination of calorific value of liquid fuel
- To understand the various types of gaseous fuel
- To know the various properties of gaseous fuel
- To learn the determination of calorific value of gaseous fuel by Hempel and Orsat method
- To learn the spectral analysis of different fuels by IR and Gas chromatography

Reference Books:

4. Fuels and their combustion by Haslam of Russell, 1925.
10. Fuel and Fuel technology by Francis (W)
16CMIC13  ORGANIC NAME REACTIONS AND SYNTHESIS OF REAGENTS  

Objectives:
To study condensation reaction oxidation and reduction reaction. To know the synthesis and application of important reagent.

Unit I  Organic Reactions - I
Condensation reactions of the following; Aldol, Claisen ester condensations. Cannizzaro reaction, Dieckmann cyclisation, Reformatsky reaction, Dakin reaction, Etard reaction, HVZ reaction, Umpolung synthesis and Stephen reaction.

Unit II  Organic Reactions – Oxidations
Barton reaction, Jones oxidation, Oppenauer oxidation and Michel addition.

Unit III  Organic Reactions – Reductions
Birch reduction, Clemmenson reduction, Meerwin P.V reduction, rosenmund reduction.

Unit IV  Organic Reagents- I
Synthesis and applications of the following reagents: 9-BBN, n-butyl lithium, ceric ammonium nitrate(CAN), DCC, Grignard reagent, LDA, Gilman reagent, NBS and PCC.

Unit V  Organic Reagents- II
Use of the following reagents in organic synthesis and functional group transformations-complex metal hydrides, Hilmans reagent, lithium dimethyl cuprate,, dicyclohexyl carbodimide,1,3-dithiane, woodward and provost hydroxylation, selenium dioxide, crown ethers and Peterson’s synthesis, Wilkinson’s catalyst, Baker yeast.

Outcomes:
- To learn Aldol, Cannizzaro, Claisen ester condensation reactions
- To understand Dieckmann, Dakin, HVZ, Stephen reactions
- To study about Organic reaction and its oxidation process
- To familize Organic reactions and its reduction process
- To gain knowledge related to synthesis of various organic reagents
- To know Organic reagents and its applications

Total: 60 hours
• To learn Organic synthesis using various organic reagents
• To understand studies on functional group transformations

Text Books:


Reference Books:


16PMIC11 PRACTICAL - I ORGANIC CHEMISTRY

Objectives:

To study the qualitative analysis and estimation of simple organic compounds.

I. QUALITATIVE ANALYSIS OF SIMPLE ORGANIC COMPOUNDS

1. Identification of carboxylic acids,
2. Esters,
3. Phenols,
4. Amines,
5. Nitro compounds,
6. Ketones,
7. Aldehydes,
8. Carbohydrates,
9. Urea,
10. Thiourea.

II. ESTIMATION OF ORGANIC COMPOUNDS

1. Estimation of Phenol
2. Estimation of aniline
3. Estimation of glucose
4. Estimation of methyl ketone
5. Estimation of aldehydes / ketone
6. Estimation of vinegar
7. Estimation of vitamin –C

Total: 60 hours
Outcomes:
- To understand different functional groups
- To identify organic compounds based on appearance and odour
- To introduce various reagents and their respective reactions in identify functional groups
- To distinguish one functional group from other
- To acquire professional skills in identifying functional groups
- To learn quantitative methods of organic compounds
- To introduce back titration in estimation of analyte
- To equip with apparatus handling in estimation

Text Book:

Reference Book:

Objectives:
To study the chemical kinetics, photochemistry and atomic structure. To know the common drugs used in the home, prevention and control of adverse reactions from drugs.

Unit I Chemical Kinetics
Expression for rate of reaction – rate constant, order and molecularity of a reaction- differential and integrated forms of rate expressions for first, second and zero order reactions- examples- time for half change for first and second order reactions- Experimental methods of determining order of reactions- pseudo unimolecular reactions- examples- Experimental determination of rate constants of inversion of cane sugar and alkaline hydrolysis of esters

Unit II PhotoChemistry
Unit III  Atomic Structure  15

Structure of the atom- Dalton’s theory- Rutherford’s model- Bohr’s model-mass number- Somerfeld’s extension of Bohr’s theory-Heisenberg’s uncertainty principle- Dual character of electron- Debroglie wave equation- Quantum numbers. The periodic table- the long form of the periodic table- electronic configurations of element- division of element into s,p,d,f blocks. Atomic properties.

Unit IV  Metals and metallurgy  15


Unit V Pharmaceutical Chemistry  15


Total: 75 hours

Outcomes:

- To determine the factors that affect the rate of chemical reactions using collision theory
- To understand the concept of reaction mechanism and the rate law for the reactio
- To learn about different laws of photochemistry.
- To understand the kinetics of decomposition
- To familiarize with the structure of the atom and its atomic properties
- To learn the periodic table and detailed study of the elements present in it
- To understand the nuclear fusion and fission mechanism
- To learn the different kinds of drug and its control and adverse effects

Reference Books:


5. N.J. Turro, 1978, Modern Molecular Photochemistry, Benjamin, Cummings, Menlo
Objectives:
To study the general and structural aspects of cellulose and cotton fibers. To know the classification, properties, uses and identification of different kinds of synthetic fibers. To learn the various processes and printing machinery of textile chemistry.

Unit I Introduction
General aspects, cellulose & cotton fibres – classification of fibres – properties, count, denier tex, staple length, spinning properties, strength, elasticity and creep.


Unit II Types of Fibres

Unit III Synthetic fibres-I
Synthetic fibres – polyamide fibres and polyester fibres, polymerization, condensation – addition polymerization – molecular weight – linear symmetry – orientation, intermolecular, cohesive forces,
molecular rigidity. Polyamide fibre-chemical nature-manufacture, properties and spinning of nylon 6, nylon 66 – other polyamide–antistatic nylon – copolyamide - nylon degradation.

Unit IV Synthetic fibres-II


Unit V Textile Chemistry


Total: 75 hours

Outcomes:
- To understand the durability and quality of fibers
- To differentiate cellulose and cotton fibers
- To classify different kinds of fibers in terms of their strength
- To know the manufacturing of fibers from natural resources
- To familiarize with the synthesis and properties of synthetic fibers
- To learn the methodology and mechanism of printing and painting in textiles
- To understand the stages of printing and dyeing in textile industries
- To learn various processes like steaming, ageing involved in textile industries

Reference Books:

1. V.A. Sheani – Textile fibres – Sevak publications.
2. B.K. Kesavan and Mishra – Fibre Science – SSMIIT.
5. H.A. Shah – Technology and Management of Printing BITRA.
Objectives:
To learn the quantitative determination of compound by volumetric titration method. To learn the qualitative analysis of a given salt mixture.

1. Qualitative analysis of simple inorganic compounds

   Identification of simple anions:
   Chloride, Sulphate, phosphate, carbonate, bromide, iodide, nitrate, sulphide, nitrite,
   Fluoride.
   Identification of cations:
   Ca, Mg, Ba, Co, Ni, Zn, Mn, Fe, Cr, V, U, Cu, Cd, Hg, As, Sb, Bi.

2. Estimation of the following:

   (i) Total hardness in water of EDTA
   (ii) Estimation of Ca, Mg, and chloride in water.
   (iii) Estimation of purity of washing soda.
   (iv) Estimation of available chloride in bleaching powder.
   (v) Estimation of calcium in egg shell.

Outcomes:
- To identify the simple anions
- To identify the simple cations
- To analysis the simple Inorganic compounds
- To estimate the total hardness of water in EDTA
- To estimate the ions in water
- To determine calcium in egg shells
- To determine washing soda purity
- To determine the chloride in bleaching powder

Total: 60 hours

TEXT BOOKS:


REFERENCE BOOKS:

Objectives:
To obtain the knowledge in different instrumental analysis and to know the determination of various inorganic elements by different methods.

1. Determination of lead in red lead
2. Determination of BaSO$_4$ content.
3. Determination of ZnS content in lithophone.
4. Determination of moisture and silica content in cement.
5. Determination of mixed oxide content in cement.
8. Determination of flash point and fire point for fuels.
9. Determination of pour point and cloud point for lubricants.
10. Determination of moisture in coal/coke by distillation method (Dean and stark method)
12. Determination of viscosity of engine oil by Redwood viscometer.
14. Analysis of CO, CO$_2$ and NO$_x$ in exhaust gases.
15. Determination of BOD and COD of municipal sewage and industrial wastewater.
17. Determination of phosphate in a fertilizer.

Total: 60 hours
Outcomes:
- To determine lead in red lead
- To determine barium sulphate content
- To analysis CO, CO₂ and NOₓ, the simple Inorganic compounds
- To determination of flash point and fire point for fuels
- To determination of moisture in coal/coke by distillation method
- To determine BOD and COD of municipal sewage and industrial wastewater
- To determine organics, suspended and total solids in wastewater
- To determine phosphate in a fertilizer.

REFERENCE BOOKS:
2. Vogel’s Text book of qualitative analysis, ELBS
5. Vogel’s Text book of Organic analysis, ELBS

Objectives:
To study the classification and drying mechanism of paints. To know paint additives, emulsion paint, resins, thermosetting alkyd and water based epoxy coatings.

Unit I

Unit II
Unit III


Unit IV


Unit V

Thermosetting alkyds – polyester and acrylic paints based on nitrogen resin – urea formaldehyde resins – melamine formaldehyde resins – acrylic nitrogen resins.


Total: 75 hours

Outcomes:
- To understand what is paint
- To know the various ingredients present in paint
- To learn the different mechanism of drying of paints
- To know various additives used in paint and their properties
- To learn what is laquers and emulsion paint
- To know oil paint and varnishers
- To understand the concept of alkyd finishes
- To learn poly urethane and one pack paints
- To understand the various paints based on nitrogen resin
- To master the advanced level of different finishes namely UV curing finishes and solventless finishes

Reference Books:
1. V.A. Shenai – Technology of Bleaching Sevak publications.


5. JT Marsh – Textile finishing Textile Institute, Manchester.

16CMIC32 ANALYTICAL TECHNIQUES 5 0 0 4

Objectives:
To learn the theory, instrumentation and application of potentiometry, Conductometry, Biamperometry, Nephelometry, Fluorimetry, Polarimetry, Refractometry, Flame Photometry, and Atomic Absorption Spectroscopy. To understand radio analytical techniques and thermal methods.

Unit I


Unit II

Nephelometry, Fluorimetry, Polarimetry, Refractometry - Theory, Instrumentation and Applications.

Unit III

Flame Photometry, and Atomic Absorption Spectroscopy - Theory, Instrumentation and Applications.

Unit IV

Radio analytical Techniques, Isotope dilution analysis, Radioimmunoassasy, Radiochromatography and Radio electrophoresis, Activation analysis.

Unit V

Thermal methods - Thermogravimetric and differential thermal analysis, thermometric titrations, differential scanning calorimetry – basic instrumentation and applications.

Total: 75 hours

Outcomes:
- To learn the various instrumental methods, potentiometry, conductometric, biamperometry
- To learn what is nephelometry, fluorimetry, polarimetry, refractometry
- To understand what is flame photometry and atomic absorption spectroscopy
- To learn what is radio analytical techniques
- To learn the concept, what is thermal methods and their types
- To know the application of flame photometry and atomic absorption spectroscopy
- To know the application of nephelometry, fluorimetry, polarimetry, refractometry
- To understand the application of TGA, DTA, DSC and their titration
Reference Books:

1. Fundamentals of analytical chemistry- Skoog and West.
2. Instrumental methods of analysis – Willard, Merritt, Dean and Settle.
3. Analytical chemistry – G.Dick.
4. Quantitative chemical analysis – Saunders and Toppan.

16CMIC33 OPERATIONS MANAGEMENT 3 0 0 3

Objectives:
The course is to understand the strategic role of operations management in creating and enhancing a firm’s competitive advantages and to understand the concepts of layout, planning, maintenance, quality and inventory control, material and store management.

UNIT – I INTRODUCTION TO OPERATIONS MANAGEMENT 12

UNIT – II CAPACITY PLANNING 12

UNIT – III MAINTENANCE MANAGEMENT & QUALITY CONTROL 12

UNIT – IV TIME & WORK STUDY 12
UNIT – V  VENDOR DEVELOPMENT & STORES LOCATION


Total: 60 hours

Outcomes:

- To understand about the fundamental production and operations concepts.
- To analyze the product layout using Line Balancing
- To gain knowledge on calculation of capacity
- To understand the various planning concepts.
- To analyze the failure for maintenance.
- To understand the implementation of quality tools.
- To understand the implementation of time and motion.
- To understand the various risk factors of ergonomics.
- To evaluate the selection of vendor.
- To evaluate the classification of inventory

TEXT BOOKS:


REFERENCES:

Objective:
To determine the molecular weight of the given compound by viscosity and Rast Cryoscopic method. To verify Debye – Huckel – Onsagar equation and Lambert – Beer’s law. To understand the techniques of polarimetry, conductivity and potentiometry method.

1. Study of inversion of cane sugar in the presence of acid using polarimeter.

2. Determination of molecular weight of a polymer by viscosity method.

3. To study refractive index- concentration relationship for solutions.

4. Determination of dissociation constant of weak electrolyte by conductivity method.

5. (i) Determination of cells constant
   (ii) Verification of Debye – Huckel – Onsagar equation for strong electrolytes.
   (iii) Determination of pKa of a weak acid using Henderson equation.

6. Potentiometric titration of Cl⁻ vs Ag⁺

7. Construction of phase diagram of two component systems forming simple eutectic.

8. Molecular weight determination by Rast Cryoscopic method.

9. Verification of Lambert – Beer’s law.

10. Determination of rate constant for the acid catalysed hydrolysis of esters.

11. Determination of second order rate constant for peroxydisulphate –iodide reactions in the presence and absence of added neutral salt.


13. Determination of equilibrium constant for I₂ + I

14. Determination of concentration of KI

Total: 60 hours
Outcomes:

- To enhance the knowledge of experimental techniques in physical chemistry
- To know the study of inversion of cane sugar in the presence of acid
- To learn the determination of molecular weight of polymer
- To study the refractive index and concentration relationship for solution
- To determine the molecular weight of sample by different method
- To equip the knowledge of the students in rate constant determination
- To know the determination of equilibrium constant
- To improve the knowledge of construction of phase diagram
- To enhance the determination of the cell constant value
- To equip the knowledge of students in potentiometric titration

TEXT BOOKS:


REFERENCE BOOKS:


Syllabus

Discipline Specific Elective Courses

16DMIC11 PRINCIPLES OF MANAGEMENT 4 0 0 3

Objectives: The course is to understand the management and administration, functions of management, formal and informal organization, staffing, creativity and innovation, process of communication.

UNIT – I INTRODUCTION TO MANAGEMENT PRINCIPLES 12

UNIT – II PLANNING 12

UNIT – III ORGANIZING 12

UNIT – IV DIRECTING 12

UNIT – V CONTROLLING 12

Total : 60 hours
Outcomes:
- To enhance the knowledge of management studies.
- To learn about planning process.
- To learn about organising process.
- To learn about directing process.
- To know the controlling process.
- To learn about the globalization and liberalization.

TEXT BOOKS:

REFERENCES:

L T PC

16DMIC12 MANAGEMENT INFORMATION SYSTEM 4 0 0 3

Objectives: The course is to understand the management and information system, functions of management, accounting, financial and personnel information system.

UNIT I


UNIT II

UNIT III

Functional management information system: Production information system – marketing information system. 12

UNIT IV

Accounting information system – Financial information system - Personnel information system-Interrelationship of functional management information systems. 12

UNIT V

Hardware, software acquisition, Ergonomic factors to be considered, cost – benefit analysis-Quality Assurance – System security – Training strategies.

General Characteristics of computer – CPU, I/O devices – Operating Systems – Programming language – application software. 12

Total: 60 hours

Outcomes:

• To enhance the knowledge of management studies.
• To learn about Evolution of information system.
• To learn about Requirement Analysis.
• To learn about Hardware, software acquisition.
• To know the Operating Systems.

BOOKS FOR REFERENCE


16DMIC21

**HUMAN RESOURCE MANAGEMENT**

**Objectives:** The course is to understand the Importance of Human Resources and functions of HR management, evaluation information methods, labours law and managerial practices.

**UNIT – I Introduction of human resource management:**

Definition, Importance of Human Resources, Objectives of Human Resource Management, Qualities of a good personnel manager – Evolution and growth of Personnel Management in India.


Human Resource planning: Long and short term planning, Job analysis, skills inventory, job description and job specification.

**UNIT-II Function of HR Management**

Recruitment and selection: purposes, types and methods of recruitment and selection, relative merits and demerit of the different methods; personnel search, selection instruments, reduction of recruitment costs.

Functions of human resources management from procurement to separation: placement, induction, transfers, promotions, disciplinary actions, termination of services: Resignation, dismissal, retrenchment and voluntary retirement schemes, exit, interview, prevention of employee turnover.
UNIT-III Evaluation Methods

Performance evaluation: Ranking, rating scales, critical incident method, removing subjectivity from evaluation, MBO as a method of appraisal, Job evaluation, criteria for promotions and job enrichment.

UNIT-IV Labors Law

Wage and salary administration: meanings, calculations of wage, salary, perquisites, compensation package, cost of living index and calculation of dearness allowance, rewards and incentive: financial and non-financial incentives, productivity-linked bonus, compensation Criteria.

UNIT – V Managerial Practice

Personnel Office Management: Functions of the office, correspondence, O 7 M in personnel departments, Maintenance of Personnel records.

Time Management: Importance of Time factor, Time waster, Prioritizing Work Scheduling, Functions of the Time Office, Flexible Work arrangements.

Total: 60 hours

Outcomes:
- To enhance the knowledge of Human Resource management studies.
- To learn about evaluation methods.
- To learn about HR management.
- To know the labors law.
- To learn about managerial practice.

BOOKS FOR REFERENCES

2. Beardwell and Cen Holder, Human resource Management Macmillan India Ltd.,
Objectives:
To study the types of polymerization, polymerization techniques, crystallinity in polymers, applications of polymer, polymer degradation and additives for polymers.

Unit I
Basic concepts of polymers. Monomer, Repeat unit, degree of polymerization. Classification of polymers, Stereochemistry of polymer, nomenclature of stereo regular polymers.

Unit II
Polymerisation techniques; bulk, solution, suspension and emulsion polymerization.
Kinetics of polymerization; General kinetics and mechanism of polymerization - free radical, step growth, ionic and poly condensation polymerization.
Measurement of molecular weight and size; number average and weight average molecular weights, polydispersity and molecular weight distribution in polymers, the practical significance of polymer molecular weight and size of polymers.

Unit III
Glass transition temperature, concepts of glass transition temperature and associated properties, glassy solids and glass transition, factors influencing glass transition temperature (Tg).
Crystallinity in polymers; Polymer crystallization, structural and other factors affecting crystallisability, effect of crystallinity on the properties of polymers.

Unit IV
Processing: Calendering, die casting, film casting, compression, moulding, injection moulding, blow moulding, extrusion moulding, thermoforming, foaming and reinforcing techniques.

Unit V
Synthetic resins and plastics; Manufacture and applications of polyethylene, PVC, Teflon, poly styrene, polymethylmethacrylate, poly urethane, phenol – formaldehyde resins, urea- formaldehyde resins and epoxy polymers.
Polymer degradation: Types of degradation- thermal, mechanical, photo, hydrolytic and oxidative degradations.
Additives for polymers: Fillers, plasticizers, thermal stabilizers, photo stabilizers, anti oxidants and colourants.

Total: 60 hours
Outcomes:

- To know about basic ideas of polymers like monomer, repeat unit and degree of polymerization.
- To learn about the stereochemistry and nomenclature of polymers.
- To understand the various types of polymerization.
- To know the preparation and polymerization techniques.
- To understand the number average and weight average molecular weights.
- To learn about the concepts of glass transition temperature.
- To know the various factors influencing glass transition temperature.
- To understand the principle of crystallinity.

Reference Books:

1. Text Book of Polymer Science, Billmeyer.
2. Polymer Science, Gowariker.
3. First course in Polymer Chemistry, Strepikhey et al.

Objectives:

The course is to understand marketing, importance, market segmentation, market research and control, industrial markets, product positioning, sampling techniques, online marketing and promotion mix.

Unit I Introduction

Unit II Consumer markets

Unit III Market segmentation
Unit IV  

**Marketing programme**


Unit V  

**Marketing research and control**


**Total: 60 hours**

**Outcomes:**

- To understand about the marketing and its importance
- To analyze the Micro and Macro Environment.
- To gain knowledge on Consumer Behavior
- To understand the various characteristics of industrial markets
- To analyze the various Levels and Bases for Segmentation
- To understand the implementation of Returns Management.
- To understand the implementation of Public Relations, Personal Selling
- To understand the various data types & sources, sampling techniques
- To evaluate the Current and Future Demand
- To evaluate the Marketing Audit, Online Marketing.

**Text Books:**


**Reference Books:**

OBJECTIVES:
To study the general aspects of alkaloids, steroids, camphor, squalene, Acetic acid, carbohydrates and polysaccharids.

UNIT – I  Alkaloids  12
Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure, stereochemistry, synthesis of the following: Ephedrine, Atropine, Quinine and Morphine.

UNIT – II  Steroids-I  12
Occurrence, nomenclature, basic skeleton, Diel’s hydrocarbon, stereochemistry, isolation, structure determination and interconversions of steroids.

UNIT – III  Steroids-II  12
Bile acids, Androsterone, Testosterone, Estrone, Progesterone, Aldosterone and bio synthesis of cholesterol.

UNIT – IV  Terpenoids  12
Terpenoids-Classification, Isoprene rule, Structural elucidation by chemical degradation and synthesis of camphor, Squalene, and Abetic acid.

UNIT – V  Carbohydrates  12
Carbohydrates –Oligosaccharides, trisaccharides glycosides. Structural Elucidation of Starch and cellulose, Primary concept.

TOTAL : 60 hours

OUTCOMES:
- To learn the general aspects of alkaloids in plants.
- To know the structure, stereochemistry and synthesis of quinine and morphine.
- To learn about the occurrence, nomenclature and basic skeleton of steroids.
- To elucidate the structure and interconversions of steroids.
- To understand the types of steroids.
- To familiarize the classification of terpenoids and synthesis of camphor.
- To know how to elucidate the structure of terpenoids by chemical degradation method.
- To understand how to elucidate the structure of starch and cellulose.

**TEXT BOOKS:**

   New York, 1957.
3. Francis A. Carey and Richard J. Sundberg, Advanced Organic Chemistry-Part B,
4. S.M. Mukherji and S.P. Singh, Organic Reaction Mechanism, Macmillan India
   Ltd., 1990.

**REFERENCE BOOKS**


**NUCLEAR AND PHOTOCHEMISTRY**

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**Objectives:**

- To understand Nuclear fission and nuclear fusion, reaction and applications of tracers
- To study; the features of inorganic photochemistry like solar energy conversion and photo electrochemistry.

**UNIT-I  Electron Capture Detectors**

Orbital electron capture: nuclear isomerism, internal conversion, detection and determination of activity by cloud chamber, nuclear emulsion, bubble chamber, G.M., Scintillation and Cherenkov counters.
UNIT-II Nuclear fission and fusion reactions

Nuclear fission and fusion reactions as energy sources: direct reactions, photonuclear and thermo nuclear reactions. Components of nuclear reactors – the breeder reactor – nuclear reactors in India.

UNIT-III Tracer study in Analytical Chemistry

Applications of tracer in study of reaction mechanism and in analytical chemistry – neutron activation analysis – isotope dilution analysis – Carbon dating - radioactive tracer in the diagnosis and treatment in field of medicine.

UNIT-IV Photochemistry

Physical properties of electronically excited molecules – Dipole moment, pKa and redox potentials - Fluorescence, phosphorescence and delayed emission - Stern Volmer equation- Derivation, limitations and applications - Photosensitisation and chemiluminescence - Experimental techniques-

UNIT- V Photo redox reactions and Photo substitution reactions

Photo redox reactions and photo substitution reactions in coordination chemistry - photovoltaic and photo galvanic cells. Photo electro chemistry, Aspects of solar energy conversion.

TOTAL: 60hours

Outcomes:

- To learn what is cloud chamber and bubble chamber.
- To know various reactions of nuclear fission and nuclear fusion.
- To familiarize the nuclear reactors in India.
- To apply tracer study in analytical chemistry.
- To learn how radioactive tracer is used in diagnosis and treatment in the field of medicine.
- To understand fluorescence, phosphorescence and delayed emission.
- To know what is photo voltaic and photo galvanic cells.
- To learn the concepts of solar energy conversion.
TEXT BOOKS:


REFERENCE BOOKS:


ORGANOMETALLIC CHEMISTRY
AND PHOTOCHEMISTRY

Objectives:

To know the bonding in some important organometallic compounds and their reactions.
To study some fundamental aspects of inorganic photochemistry.

UNIT – I    Alkyls and Arene complexes
            12
Alkyls and Arene complexes; metalation, bonding in metal carbonyls and nitrosyls, chain and cyclic donors, olefin, acetylene and allyl systems, synthesis, structure and bonding metallocenes.

UNIT – II   Organometallic reactions
            12
Organometallic reactions- Association, Carbonylation, decarbonylation, Insertion, Elimination and rearrangement.

UNIT – III  Organometallic Catalysis
            12
Hydrogenation of olefins (Wilkinson’s catalyst), hydroformylation of olefins using cobalt or rhodium catalysts (oxoprocess), oxidation of olefins to aldehydes and ketones (Wacker process).

UNIT-IV     Polymerization
            12
Polymerization (Zeigler-Natta catalyst); cyclo oligomerisation of acetylene using nickel catalyst (Reppes’ catalyst)-Synthetic Gasoline-Mobil reaction.

UNIT – V    Photo redox reactions and photo substitution reactions
            12
Photo redox reactions and photo substitution reactions in coordination chemistry - photovoltaic and photo galvanic cells. Photo electro chemistry, Aspects of solar energy conversion.

TOTAL: 60 hours
Outcomes:

- To learn the bonding in metal carbonyls and nitrosyls.
- To understand the synthesis, structure of metallocenes.
- To familiarize the various reactions of organometallic reactions.
- To know hydrogenation, hydroformylation and oxidation of olefins.
- To learn what is polymerization reactions.
- To understand synthetic gasoline.
- To know what is photovoltaic and photogalvanic cells.
- To learn the aspects of solar energy.

TEXT BOOKS:

3. 

REFERENCE BOOKS:

Objectives:

To learn about the basic concept of stereochemistry of organic compounds. To learn about coupling reactions, retro synthesis analysis, and green chemistry.

UNIT – I  Stereochemistry


UNIT – II  Coupling Reactions


UNIT – III  Retrosynthetic Analysis-I

Basic principles and terminology of retro synthesis, synthesis of aromatic compounds, one group an disconnections, one group C-C and two group C-C Disconnection.

UNIT – IV  Retrosynthetic Analysis-II

Amine and alkene synthesis, important strategies of ret rosy group transposition, important functional group interconversions.

UNIT – IV  Green Chemistry

Non-conventional techniques in organic synthesis-Green chemistry-Microwave assisted reaction-U.S Catalyzed reaction. Reaction in ionic organic liquids-Solid state melts reaction.

TOTAL: 60 hours

Outcome:

• To learn the molecular asymmetry and dissymmetry of stereochemistry.

• To know about the absolute and relative methods of determination.
To understand what is chiral auxiliaries, chiral reagents and catalysts.

To familiarize the various coupling reactions.

To know the basic principles and terminology of retro synthesis.

To learn the important strategies of retro group transposition.

To understand the important functional group interconversions

To know about the concept of green chemist

**TEXT BOOKS:**


**REFERENCE BOOKS:**


**NOVEL MATERIALS AND GREEN INDUSTRIAL CATALYSIS**

**L T P C**

4003

**Objectives:** To learn about some important functional materials and novel materials, properties of metallic clusters, characterization techniques, catalysts in chemical transformation of functional and novel materials.

**Unit 1 Introduction to Functional and Nanomaterials**

An overview of materials, molecular materials, functional materials, nanomaterials’ classification/properties and industrial applications.

**Unit II Properties of Metallic clusters**

Supported metallic clusters, Catalysts preparation method, physical and chemical properties. Catalysis mechanism uses and synthetic applications.

**Unit III Characterization**

Tools for Structural Characterization of novel materials by UV-Visible spectroscopy, Infrared spectroscopy, Nuclear magnetic resonance spectroscopy and mass spectrum.
Unit IV Metal Oxides
Various types of Metal oxides and basic concept of metal oxides, Supported metal oxides.

Unit V Catalysts in chemical transformation

Total: 60 hours

Outcomes:
- To overview the functional and nanomaterial
- To know about the classification and industrial applications of nanomaterial
- To familiarize the preparation and properties of metallic clusters
- To understand the tools used for structural characterization of novel materials
- To know the metal and supported metal oxides
- To learn the use of industrial catalysts
- To familiarize the catalysts in chemical transformation
- To know about the environmental catalysis

Text Book:

Reference Book:

ELECTROCHEMISTRY AND GROUP THEORY

Objective:
To understand the electrolytic conductance and the electrode and mechanism of electrode reaction.
To know about the general salient features of group theory.

UNIT-I Electro Chemistry-I
Mean ionic activity and mean ionic activity coefficient – concepts ionic strength. Nernst equation-
redox system- electrochemical cell- Electrolytic conductance- Kohlraush’s law and its applications,
ionic equilibria. Debye- Huckel theory of strong electrolytes – Determination of activity coefficient by
electrical method –Debye-Huckel limiting law qualitative and quantitative verification – Limitation of
Debye –Huckel theory at appreciable concentration – Huckel equation – Debye- Huckel –Bronsted
equation.
UNIT-II Electro Chemistry-II


UNIT-III Group Theory- I

Symmetry elements and symmetry operations – Mathematical rules for the formation of a group- Definition and classification of Point groups – Identification and determination – Matrix representations- Reducible and irreducible representations- Similarity transformation - Orthogonality theorem and its consequences.

UNIT-IV Group theory-II

Character table- Construction of Character table for C_{2v} and C_{3v} point group. Determination of symmetry of hybrid orbitals-Symmetry of hybrid orbitals in non linear molecules (H_{2}O, CH_{4}, XeF_{4}, BF_{3}, SF_{6} and NH_{3}).

UNIT-V Group theory-III


TOTAL: 60hours

Outcomes:

• To learn the electrochemical cell and electrolytic conductance.

• To determine the activity coefficient by electrical method.

• To understand the mechanism of electrode reaction.

• To know about the mechanism of hydrogen and oxygen evolution reactions.

• To define and classify the point groups.

• To identify and determine the matrix representations.

• To learn how to construct the character table for C2v and C3v point group.
To determine the IR and Raman activity of vibrationsl modes in non-lineae molecules.

**TEXT BOOKS:**


**REFERENCE BOOKS:**


**INORGANIC CHEMISTRY**

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**Objectives:**

To understand the bonding in polyacids, polymers and boronhydrides.
To study the complexes with references to bonding, stability and stereo chemistry.

**Course Outcome**

**UNIT -I Bonding In Inorganic Compounds –I**


**UNIT- II Bonding In Inorganic Compounds –II**

Boron hydrides: Polyhedral boranes, carboranes and metallo carboranes. Metal Clusters: binuclear compounds, multiple metal-metal bonds.
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 potentiometric methods.

UNIT- IV  Coordination Chemistry- II  

Stereochemical aspects; Stereoisomerism in inorganic complexes, isomerism arising out of ligand and ligand conformation; chirality and nomenclature of chiral complexes; optical rotatory dispersion and circular dichroism.

UNIT- V  Theories of Coordination  

Crystal field theory and its limitations, d-orbital splittings, LFSE, spectro chemical series, evidences for metal ligand orbital overlap, molecular orbital theory - octahedral complex with σ and π bonding, John-Teller distortion, charge-transfer spectroscopy.

TOTAL: 60hours

Outcomes:

- To know the structure and bonding in molecules / ions and predict the structure of molecules / ions.
- To learn the periodic properties of the different groups of compounds focusing on production methods and application of selected elements and compounds.
- To know the different definitions of acids / bases and predict the reactions between acids and bases.
- To learn the selected crystal structures and to explain what kind of parameters that affect the crystal structure of a compound.
- To be able to use Crystal Field Theory to understand the magnetic properties (and in simple terms the colour) of coordination compounds.
- To be able to describe the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them.
- To be able to recognize the types of isomers in coordination compounds.
- To be able to name coordination compounds and to be able to draw the structure based on it's name.
- To become familiar with some applications of coordination compounds.
- To be able to predict the geometries of simple molecules.

TEXT BOOKS:


REFERENCE BOOKS:

PHARMACEUTICAL FORMULATION TECHNOLOGY

Objectives:
To understand physicochemical principles, pharmaceutical operation and profile formulation.

UNIT-I Introduction
Need for formulation; History of formulation; Challenges in early formulations; Drug substance to Drug product with reference to formulating for the patient; Physical and chemical properties of Formulation.

UNIT-II Physicochemical Principles
Solutions; pH, EMF and redox potentials; physicochemical properties evolving into in vivo bioavailability; Absorption, Dissolution, Permeability, Distribution, Metabolism, Excretion; Complexation,; Modifies release dosage forms; profile of common formulations; colloidal systems, Rheology; Drug stability and ICH Guidelines for stability testing.

UNIT-III Pharmaceutical Operations-I
Extraction; Drying; Evaporation; Distillation; Filtration/Centrifugation; Size reduction and handling of solids in the powder form.

UNIT-IV Pharmaceutical Operations-II
Antisolvent and reactive crystallization; Melting approaches to particle size; Wet milling and dry milling; packaging.

UNIT-V Profile of Formulations
Tablets, capsules, solution and suspension formulation; Modified release formulation; Parenteral Formulation; Inhaled formulations/aerosols.

TOTAL: 60 hours

Outcomes:
- To learn the need, history and challenges in early formulations.
- To know what is drug substance to drug product with reference to formulating.
To familiarize the various physicochemical properties evolving in bioavailability.

To view the profile of common formulations.

To know the ICH guidelines for stability testing.

To understand the different types of pharmaceutical operations in powder form.

To familiarize the reactive crystallization, wet and dry milling.

To understand the modified, parenteral and inhaled formulations.

**TEXT BOOKS:**


**REFERENCE BOOKS:**


**STRATEGIC MANAGEMENT OF PHARMA INDUSTRY**

**Objectives:**

To know about pharma industry, technology opportunity for innovation, project evaluation, intellectual property protective and business strategy.

**UNIT I Introduction and Technology Evolution**

Pharma industry-Specifics, Importance and role in health sector; the Global scenario and Positioning of Indian Pharma industry; Specific challenges of the Pharma industry versus the general industrial matrix; Understanding technological change; Need for technology strategy as step towards innovation and competitive advantage; Defining technological innovation and benefits.
Technology S-curves and management; Number of firms in the industry, Process obsolescence and Reverse Engineering; Innovative synthetic routes and atom economy dovetailing aspects of Green chemistry; Technology adoption and diffusion; Forecasting demand and confronting substitution.

UNIT II **Opportunity for Innovation**

Technological, Political and Regulatory changes, Diversification, Demographic changes; Research and Development (R&D); Investment in R&D and return on investment – a profit centre; Linking of Research and Development for leverage; Cost reduction exercises.

UNIT III **Project evaluation**

Managing uncertainty, Analytical hierarchy process, Net Present Value (NPV), Internal Rate of Return (IRR), scenario analysis and decision tree; Portfolio Management, customer-friendly solutions; Product pricing; Market segmentation and market research.

UNIT IV **Intellectual Property Protection**

Role of IP protection in knowledge era; Patents- process and Product and the patenting process; Lead molecule development and cost; ANDA: Patent litigation; Non-disclosure agreement; Expiry of patents and generic drugs marketing and issues in IP.

UNIT V **Business strategy**

Networking; Joint venturing; Licensing; Contract manufacturing; Outsourcing; Human resource management of technical professionals- R&D personnel, Product Development team, Cross-Functional team, Internal communication, Organization structure- decentralizing R&D, acquisitions.

**TOTAL: 60 hours**

**Outcomes:**

- To know the various pharma industry and their role in health sector.
- To understand technological change, innovation and benefits.
- To learn the evolution in technology.
- To understand how to invest in R and D and its return on investment.
- To familiarize the evaluation of project.
- To know the role of IP protection in knowledge era.
- To understand the expiry of patents, generic drugs marketing and issues in IP.
• To know the strategy involved in business.

TEXT BOOKS:


REFERENCE BOOK:


Syllabus

Generic Elective Courses

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Objectives:

The ability to create an open environment for communication
An understanding of other people communication styles and needs
To create an environment for open discussion and ongoing dialogue is crucial for communication success.

UNIT–I: Reading Comprehension and Vocabulary

Definitions of reading - types of reading - oral reading – silent reading - reading process - classification of reading - nature of reading - Filling in the blanks - Close Exercises -Vocabulary building - Reading and answering question

UNIT-II: Listening and Answering Question

Listening process – speaker – hearer - types of listening - transitional listening -critical listening - recreational listening - listening for appreciation - selective listening - intensive listening- extensive listening - listening and sequencing sentences - filling in the blanks – listening and answering questions

UNIT-III: Group Discussion

Introduction - Why GD Part of a selection process - Structure of a GD-Strategies in GD - Team work – body language - Debating various points of views - interaction with peers.
UNIT-IV: Conversations  08

Introducing oneself and others, narrating events - making telephonic conversation - Giving instruction - Giving instruction- Expressing purposes and functions- obligation and preferences, Accepting offers and Counselling Face to face Conversations

UNIT-V: Self – Introduction and Role Play  08

Introduction self and greetings- asking for information- offerings- requisitions- inviting – vocabulary building- asking for description

Total : 40hours

Outcomes:

- Cloze exercises provide support to build vocabulary
- Sense of logic develops from sequencing sentences
- Group discussion infuses team spirit and sense of competition
- Face to face and telephone conversation builds up self confidence
- Self introduction and role play facilitate cultivation firmness of mind and empathy
- Comprehension enhances creative skills
- Listening regenerates transformation empathetically
- Implementation of assertive thoughts can be acquired through writing skills
- Body language enhances personality grooming
- Reading enhances stylish accent productivity

TEXT BOOKS:


REFERENCE BOOKS:

Objectives:

To provide basic information about presentation skill and train the students for letter writing, creation of resume and develop the interview skills.

To provide information about the Process, types and patterns of communication

UNIT I: Presentation Skills

General presentation methods and developing presentation skill

UNIT II: Soft skills (Time Management, Stress Management and Body Language) 08

Time management: Importance, Plan and Execution, Default reason and rectification methods

Stress Management: Stress Impacts over Efficiency and how to manage.

Body Language: Its importance and need

UNIT III: Resume / Report / Letter Writing 08

Resume: Basic components of a resume, Preparation of a resume, Types of resume

Report: How to prepare reports, reports components and structure

Letter writing: types of letters, framing letters, basic structure, how to draft a letter

UNIT IV: Frequently asked Questions 08

UNIT V: Interview Skills 08

Aims of Interview expectations and how to fulfill, developing skills

TOTAL: 40hours

Outcomes:

- Self introduction and role play facilitate cultivation firmness of mind and empathy
- Group discussion infuses team spirit and sense of competition
- Listening regenerates transformation empathetically
- Cloze exercises provide support to build vocabulary
- Implementation of assertive thoughts can be acquired through writing skills
- Body language enhances personality grooming
• Reading enhances stylish accent productivity
• Face to face and telephone conversation builds up self confidence
• Sense of logic develops from sequencing sentences
• Comprehension enhances creative skills

TEXT BOOKS:

REFERENCE BOOKS:

GREEN CHEMISTRY

Objectives:
To train the students to use eco-friendly approaches in synthesizing agro-based chemicals viz. insecticides, fungicides, herbicides, bactericides acaricides, weedicides
To emphasize green chemistry approach in crop protection which help to reduce global warming.

UNIT- I Introduction
Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollution-Pollution prevention

UNIT- II Green Chemistry
Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations

UNIT- III Green Chemistry using Bio Catalytic Reactions
Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation- Antibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Tends.

UNIT-IV Green House Effect and Global Warming
Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO₂ - Impact of green house effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points
UNIT-V    Future Trends in Green Chemistry

Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control.

Total: 40 hours

Outcomes:

- To understand the connection between common atoms and complex molecules
- To explain and analysing simple chemical reactions
- To distinguishing between recyclable and non-recyclable materials
- To assessing the potential impact of chemical reactions to environment and human health
- To understand the connection at the chemical level between all matter and will develop your inquiry based activities to explore best practices related to organic farming and resource management.
- To about the advance technology in green chemistry
- How they impact the human body, to develop your particular interests on the topic.
- To describe how Green chemistry and sustainability developments affect society, the environment, and economic development
- To explain how Green chemistry and sustainability relates to problems of societal concern

Text Books:

Reference Books:
CHEMINFORMATICS

Objective:

Students completing this paper should be able to understand concepts of molecular chemistry that are basic to cheminformatics.
This course will train the students to use QSAR, docking etc.

UNIT- I    Mathematics Process    08
Graph theory and molecular numerology; Logic, sets and functions; Algorithms, integers and matrices; Mathematical reasoning, induction and recursion; Counting; graphs, trees and sets, basic probability and statistics; Markov processes

UNIT- II    Basics of Stereochemistry    08
Basic Stereochemistry, Amino acids and Proteins and Properties; pKa, pH and ionization of acids and bases; Protein structure - Primary structure, Secondary structure - helix & sheet; Tertiary structure; Quaternary structure; covalent and non-covalent forces that maintain structures.

UNIT- III    Chem Information    08
History of scientific information communication-chemical literature-chemical information-chemical information search-chemical information sources-chemical name and formula searching-analytical chemistry-chemical history-biography-directories and industry sources

UNIT- IV    Biological Databases    08
Introduction; Experimental sources of biological data; Publicly available databases; Gene expression monitoring; Genomics and Proteomics; Metabolomics; Visualisation of sequence data; Visualization of structures using Rasmol or SPDB Viewer or CHIME; Genetic basis of disease; Personalised medicine and gene-based diagnostics.

UNIT- V    Drug Design    08

TOTAL: 40hours

Outcome:

- To understand basis of group theory and its applications
- To study Logics, sets and functions
- To get a clear idea on the principles and theories of algorithms, induction Basics and process of photosynthesis
• To understand the Basics of stereochemistry and structure of proteins
• To study History of science and chemical information
• To discuss the biological database and Gene expression
• To visualize the structure of different biological structures
• To understand the genetic basis of diseases
• To get a clear knowledge about drugs and their structure and functions
• To study drug actions and enzymes

TEXT BOOKS:
3. 

REFERENCE BOOKS:

INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

Objectives:
Impart the basic knowledge on nanoscience and technology.
Understand the various process techniques available for the processing of nanostructured materials.
Impart knowledge on the exotic properties of nanostructured materials at their nanoscale lengths.
Acquire the knowledge above the various nanoparticles process methods and their skills.
Study the reactive merits of various process techniques.

UNIT-I Introduction 08

Definition of a nano system – Basic concepts of nanoscience and technology - Scientific revolutions of nanotechnology - atomic & molecular size – Time and length at nanoscale - Scope of nanoscience and technology – Commercial Applications of Nanotechnology.
UNIT-II     Nanostructures and Dimensions 08

Definition of Nanostructure materials - Classification of nanostructures - zero, one, two and three dimensional nanostructures. Size Dependency in Nanostructures - quantum size effects in nanostructures.

UNIT-III     Nanomaterial Synthesis 08

Synthesis of nanomaterials - top down and bottom up approach - Method of nanomaterials preparation – Physical methods – Inert gas condensation and evaporation, chemical synthesis - sol-gel and chemical reduction – Biological methods – nanoparticles using plant extracts, bacteria, fungi etc.

UNIT-IV     Nanomaterial Properties 08

Surface properties of nanoparticles - Surface to volume ratio - mechanical - optical, - electronic – magnetic - thermal and chemical properties of nanomaterials. Size dependent properties - size dependent absorption spectra - self-assembly in nanotechnology - Types of SAMs, Methods of self-assembly, Applications of self assembled monolayers

UNIT-V     Applications of Nanomaterials 08

Applications of metal nanoparticles in technologically imperative fields like sensors, - - Nanomaterials for energy storage - Batteries and fuel cells - photovoltaic devices - solar cells - optical memory devices - Quantum nanoelectronic devices - quantum computing.

TOTAL: 40 hours

Outcomes:

- To learn about the definition of a nano system and the basic concepts of nanoscience and technology
- To understand the Scientific revolutions of nanotechnology.
- To know about the Scope of nanoscience and technology and commercial applications of Nanotechnology
- To familiarize the Classification of nanostructures, Size Dependency in Nanostructures and quantum size effects in nanostructures.
- To learn about the Synthesis of nanomaterials
- To learn the surface properties of nanoparticles
• To know about the Methods of self-assembly and applications of self assembled monolayers.

• To know the detail study of Applications of metal nanoparticles in technologically imperative fields

TEXT BOOKS:

REFERENCE BOOKS:

FOOD CHEMISTRY AND ADULTERATION 2 0 0 2

Objectives:
To understand the basic information of food chemistry and adulteration.
To appreciate the importance of food additives and pesticide control.
To provide an information about food preservatives

UNIT-I Introduction 08

UNIT-II Constituents of Foods 08
Minerals and vitamins: Sources, functions, deficiency of the following minerals (calcium, iron, iodine, fluorine, sodium and potassium (elementary treatment). Vitamins - classification, sources, Vitamins – A, D, E and K, C, B Complex, - B6 & B12.

UNIT-III Food Additives 08
UNIT-IV  Pesticides Control  08
Spoilage of foods by insects and pests, loss in food quantity and quality Various pesticides used in agriculture and post-harvest storage, uses of pesticides for food grain application.

UNIT-V  Food Adulteration  08
Common adulterants in different foods – milk and milk products, vegetable oils, and fats, spices and condiments, cereals, pulses, sweetening agents and beverages. Contamination with toxic chemicals – pesticides and insecticides.

TOTAL: 40hrs

Outcomes:

- To know about the basic criteria of food and water standards for consumption
- To get a basic idea about the chemical constituents of food
- To learn about the various food additives, their chemical composition and their permissible level of usage in foods.
- To know about the various organisms which spoil the crops pre and post harvest and their control using pesticides
- To know about the various food adulterants for different types of food and methods to detect those adulteration.

TEXT BOOKS:


REFERENCE BOOKS:

PROJECT WORK/REVIEW

Objectives:
To learn about the basic concept of project work. To know about designing new experiments and carry out the experiments. To know about the various characterization techniques used to characterize the synthesized compounds. To know about the necessities of literature survey and to learn about writing dissertation of project work.

NOTE

1. Review of Chemical literature and documentation.

2. During the fourth semester the project work may be carried out either in industries/National laboratories/R & D centers/in the university lab.

TOTAL: 22hrs

Outcomes:
- To identify the topic with the consideration feasibility.
- To learn the procedure of literature survey of the concerned topic.
- To derive a plan for executing the work in the stipulated time with maximum efficiency and success.
- The intensive exposure to industry as a first time experience.
- Understanding different sectors of an industry and the functionaries of each sector.
- The importance of R&D section and the key role
- Understanding and learning various technical and safety aspects of the concerned topic related work.
- To learn the difference between conventional department laboratory and its nature of work and R & D laboratory of research institute or industry.
- To learn, adapt, and practice the extensive bench work in a research laboratory or industry.
- To prepare a dissertation report with complete follow up of research methodology.