

## **PROGRAM SPECIFIC OUTCOME**

- PSO1:** To become an outstanding graduate in the modern scientific world
- PSO2:** To pursue post graduation and research in a innovative field
- PSO3:** To secure a good job like lab chemist in leading chemistry oriented industries and manufacturers
- PSO4:** To be an entrepreneur to start a small industry with a support from sipco, sipcot etc.,
- PSO5:** To be a good teacher at elementary school level.
- PSO6:** To understand the fundamentals and basic concepts of all parts of chemistry in a detailed way.
- PSO7:** To familiarizes the mechanistic approach of various organic and inorganic reactions.
- PSO8:** To learn the principles behind important physical chemistry aspects.
- PSO9:** To learn and practice practical aspects of chemistry by means of qualitative, quantitative and instrumental methods.
- PSO10:** To be a good citizen by learning ethics of the society.

**Vels Institute of Science, Technology and Advanced Studies**  
**Pallavaram, Chennai 600 117**  
**School of Basic Sciences**  
**B.Sc. Chemistry**

**Board of Studies Members**

<b>Sl.No.</b>	<b>Name &amp; Address</b>	<b>Designation</b>
<b>1.</b>	<b>Ms.N. Malathy,</b> Associate Professor, Department of Chemistry, Govt. Arts College for Men, Nandanam, Chennai 600 035.	External Expert
<b>2.</b>	<b>Dr. S. Muniraj,</b> Associate Professor and Head, Department of Chemistry, RKM Vivekananda College, Mylapore, Chennai 600 004.	External Expert
<b>3.</b>	<b>Mr.D. Ganesh</b> Orchid Chemicals and Pharmaceutical OMR Road Sholinganallur 044/24501474 Chennai -600 119	Alumini Member
<b>4.</b>	<b>Dr . V. Mahalingam</b> Professor Department of Chemistry, School of Basic Chemistry Vels University, Pallavaram,Chennai - 600 117	Member
<b>5.</b>	<b>Dr. R. A. Kalaivani,</b> Director HOD, Department of Chemistry, School of Basic Sciences, Vels University, Pallavaram,Chennai - 600 117	Convener
<b>6.</b>	<b>Dr. A. Perumal</b> Professor Department of Chemistry, School of Basic Chemistry Vels University, Pallavaram,Chennai - 600 117	Member



## **B.Sc Chemistry**

**Curriculum and Syllabus  
(Based on Choice based credit system)  
Effective from the Academic Year  
2015 – 2016**

**Department of Chemistry  
School of Basic Sciences**

# B.Sc. Chemistry Curriculum

**Total No. of Credits: 140**

Category	Code	Course	Hours per week			Credits
			Lecture	Tutorial	Practical	
<b>SEMESTER I</b>						
AECC	15LTA001 15LHN001 15LFR001	Language – I (Tamil, Hindi & French)	5	0	-	4
AECC	15LEN001	English – I	5	0	-	4
CORE	15BCH001	Basic Chemistry – I	6	0	-	4
CORE	15BCH002	Analytical Techniques	6	0	-	4
CORE	15BCH003	Practical –I: Inorganic Qualitative Analysis and Preparations	-	0	6	3
SEC		Skill Enhancement Elective - I	2	0	-	2
			<b>24</b>	<b>0</b>	<b>6</b>	<b>21</b>
<b>SEMESTER II</b>						
AECC	15LTA002 15LHN002 15LFR002	Language – II (Tamil, Hindi & French)	5	0	-	4
AECC	15LEN002	English – II	5	0	-	4
CORE	15BCH004	Chemistry of Hydrocarbons	5	0	-	3
CORE	15BCH005	Chemistry of Metals & Non Metals	5	0	-	3
CORE	15BCH006	Practical –II: Physical Chemistry Practical	-	0	3	2
DSE		Discipline specific elective – I	4	0	-	2
DSE		Discipline Specific Elective – II Practical –I	-	0	3	2
			<b>24</b>	<b>0</b>	<b>6</b>	<b>20</b>
<b>SEMESTER III</b>						
AECC	15LTA003 15LHN003 15LFR003	Language – III (Tamil, Hindi & French)	5	0	-	4
AECC	15LEN003	English – III	5	0	-	4
CORE	15BCH007	Phase equilibria and Kinetics	5	0	-	4
CORE	15BCH008	Bio-inorganic Chemistry	5	0	-	4
CORE	15BCH009	Practical –III: Volumetric analysis	-	0	3	2
DSE		Discipline Specific Elective – III	5	0	-	3
GE		Generic Elective – I	2	0	-	3
			<b>27</b>	<b>0</b>	<b>3</b>	<b>24</b>

Category	Code No.	Course	Hours per week			Credits
			Lecture	Tutorial	Practical	
<b>SEMESTER IV</b>						
AECC	15LTA004 15LHN004 15LFR004	Language – IV (Tamil, Hindi & French)	5	0	-	4
AECC	15LEN004	English – IV	5	0	-	4
CORE	15BCH010	Quantum mechanics and Thermodynamics	5	0	-	4
CORE	15BCH011	Nuclear and solid state chemistry	5	0		4
CORE	15BCH012	Practical – IV: Gravimetric Analysis	-	-	3	2
DSE		Discipline Specific Elective – IV	3	0	-	2
AECC	15EVS201	Environmental Studies	2	0	-	2
GE		Generic Elective – II	2	1	-	3
			<b>27</b>	<b>1</b>	<b>3</b>	<b>25</b>
<b>SEMESTER V</b>						
CORE	15BCH013	Coordination Chemistry	5	0	-	4
CORE	15BCH014	Fundamentals of Spectroscopy	5	0	-	4
CORE	15BCH015	Electrochemistry and Surface Chemistry	5	0	-	4
CORE	15BCH016	Practical – V: Organic Analysis and Preparation	-	-	3	2
DSE		Discipline Specific Elective – V Practical – II	0	0	3	3
DSE		Discipline Specific Elective – VI	5	0	-	4
GE		Generic Elective – III	2	0	-	2
SEC		Skill Enhancement Elective - II	2	0	-	2
			<b>24</b>	<b>0</b>	<b>6</b>	<b>25</b>
<b>SEMESTER VI</b>						
CORE	15BCH017	Chemistry of Natural Products	5	0	-	4
CORE	15BCH018	Pharmaceutical Chemistry	5	0	-	4
CORE	15BCH019	Stereochemistry and Rearrangement	5	0	-	4
CORE	15BCH020	Practical – VI: Instrumental methods of chemical analysis	-	0	3	2
DSE		Discipline Specific Elective – VII	4	1	-	4
DSE		Discipline Specific Elective – VIII	4	0	-	3
GE		Generic Elective – IV	2	0	-	2
SEC		Skill Enhancement Elective - III	2	0	-	2

			<b>27</b>	<b>0</b>	<b>3</b>	<b>25</b>
			<b>153</b>	<b>2</b>	<b>27</b>	<b>140</b>

**LIST OF DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)**

<b>S. No.</b>	<b>Courses</b>
1.	Allied Biotechnology
2.	Allied Biotechnology Practical
3.	Allied Mathematics
4.	Computers in chemistry
5.	Computers in chemistry Practical
6.	Food Chemistry and Adulteration
7.	Dye Chemistry
8.	Agro Industrial Chemistry
9.	Chemistry of Materials
10.	Chemistry in everyday life
11.	Forensic Chemistry
12.	Green methods in Chemistry
13.	Industrial Chemicals and Environment
14.	Business skills for Chemicals

## LIST OF

### GENERIC ELECTIVE COURSES (GEC)

S. No.	Courses
1.	Soft skill – I
2.	Soft skill – II
3.	Green Chemistry
4.	Cheminformatics
5.	Introduction to Nano Science and Nano Technology
6.	Food Chemistry and Adulteration

**LIST OF****ABILITY**

<b>S. No.</b>	<b>code</b>	<b>Courses</b>	
1.	15LTA001	Tamil-I	Language -I
	15LHN001	Hindi-I	
	15LFR001	French-I	
2.	15LEN001	English – I	
3.	15LTA002	Tamil-II	Language -II
	15LHN002	Hindi-II	
	15LFR002	French-II	
4.	15LEN002	English – II	
5.	15LTA003	Tamil-III	Language -III
	15LHN003	Hindi-III	
	15LFR003	French-III	
6.	15LEN003	English – III	
7.	15LTA004	Tamil-IV	Language -IV
	15LHN004	Hindi-IV	
	15LFR004	French-IV	
8.	15LEN004	English – IV	
9.	15EVS201	Environmental Studies	

**ENHANCEMENT COMPULSORY COURSES (AECC)**



**LIST OF SKILL ENHANCEMENT ELECTIVE COURSES (SEC)**

<b>S. No.</b>	<b>code</b>	<b>Courses</b>
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1	15NSS255	National Service Scheme – I
2	15NSS256	National Service Scheme – II
3	15NSS257	National Service Scheme – III
4	15NSS258	National Service Scheme – IV
5	15NSS259	National Service Scheme – V
6	15NSS260	National Service Scheme – VI

**SYLLABUS  
CORE COURSES**

**15BCH001**

**BASIC CHEMISTRY**

**L T P C  
6 0 0 4**

**Objective:** To revive the fundamentals and basics of chemistry learned at school level with detailed explanation.

**Unit I Introduction and Field effect** **15**

Electron displacement effects: Inductive, mesomeric, resonance, hyperconjugation and steric effects. Tautomerism: Keto-enol tautomerism-Amido-imidol and nitro acinitro forms. Stability of reaction intermediates, carbocation, carbanion, and free radicals.

Aromaticity and resonance: Huckel's rule, Benzene, Naphthalene, Heterocyclic compounds

**Unit II Nomenclature, Classification and Basic Properties** **15**

Nomenclature of simple organic compounds. Isomerism- optical, geometric-basic concepts  
Mechanism: addition, elimination, substitution with specific examples. Hybridization and Geometry of simple molecules like CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>6</sub>H<sub>6</sub>

**Unit III Gaseous state** **15**

Gaseous state – Gas laws – postulates of kinetic theory – collisions – gas pressure – average kinetic energy of translational- Boltzmann constant. Calculation of most probable, average, and root mean square speeds of molecules. Real gases, compressibility factor, deviation from ideality – van der Waals' equation – Boyle temperature – critical phenomena – critical constants – law of corresponding states and reduced equation of state – intermolecular forces and liquefaction of gases.

**Unit IV Liquids and Solutions** **15**

Liquid state – Qualitative treatment of the structure of the liquid state – liquid crystals (elementary discussion on classification, structure and properties).

Solutions: Solutions of gases in liquids – Henry's law, Solution of liquids in liquids. Raoult's law, Binary liquid mixtures – Ideal solutions – vapour pressure – Clapeyron – Clausius equation- uses – elevation of boiling point and depression of freezing point, calculation of molecular weights.

**Unit V Weights, Mole Concepts and Chemical Bonding** **15**

Atomic weight – equivalent weight- molecular weight mole concept. Pauli's exclusion principle. Hund's rule. Aufbau principle –classification of elements viz., s,p,d and f –block elements.

Ionic bond-Lattice energy-Born, Haber cycle –covalent bond power and polarisability – Fajan's rules, VB theory and VSEPR theory –shapes of simple inorganic molecules and ions containing lone pairs and bond pairs. MO theory – bonding and antibonding orbitals-non bonding orbitals- MO configuration of simple diatomic molecules (H<sub>2</sub>, He<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, B<sub>2</sub>, F<sub>2</sub>, CO, NO and their ions,-comparison of V band MO theories.

**Total: 60 Hours**

**Outcome**

- To understand the nature and function of reaction intermediates
- To learn the stability and aromaticity of organic molecules
- To understand the geometry of simple organic compounds
- To know the basic mechanism of different reactions (addition, elimination & substitution)
- To understand the laws of gaseous behaviour
- To apply kinetic theory in various phenomenon
- To familiarize about basics of liquid state
- To learn the derivations and calculation related to liquids and solutions
- To understand the fundamentals of bonding and theory

- To study the basic concept of weights
- To write configuration of molecules

**Text Books:**

1. P. L. Soni, "Text Book of Organic Chemistry" Sultan Chand & sons. 32<sup>nd</sup> edition. **2013**
2. B. R. Puri, L. R. Sharma, Pathania, "principle of Physical Chemistry" Vishal Publishing & Co., 46<sup>th</sup> edition **2013**
3. P. L. Soni, "Text Book of Inorganic Chemistry" Sultan Chand & sons. 32<sup>nd</sup> edition. **2013**

**Reference Books:**

1. James E. Huheey, Ellen, A. Keiter, Richard, L. Keiter, "Inorganic Chemistry" Pearson education (Singapore Pvt Limited) 9<sup>th</sup> edition, **2013**
2. J. D. Lee, "Concise Inorganic chemistry" Blackwell Science Limited (France) 9<sup>th</sup> edition **2013**
3. Robert Thornton Morrison, Robert Neilson Boyd, "Organic Chemistry" Ashok K. Ghosh 10<sup>th</sup> edition, **2013**
4. Dr. Jagadamba singh, Dr. L. D. S. Yadav, "Advanced Organic Chemistry" Pragati Prakashan, 7<sup>th</sup> Edition, **2011**
5. Kundu and Jain, "Physical Chemistry" S. Chand, 6<sup>th</sup> edition, **2011**

**15BCH002**

**ANALYTICAL TECHNIQUES**

**L T P C  
6 0 0 4**

**Objective:** To understand the basic concepts about errors and their minimization. Various practical's in chemistry with their concepts, instruments and their utility.

**Unit-I Safety in the Chemistry Lab and Error in chemical analysis**

**18**

Storage and handling of chemicals, Handling of acids, ethers, toxic and poisonous chemicals. Antidotes, threshold vapour concentration and first aid procedure. MSDS, COSHH. Accuracy and precision, Absolute and relative errors. Methods of eliminating or minimizing errors. Precision: mean,

median, average deviation and coefficient of variation. Significant figure and its relevance. Normal error curve and its importance.

**Unit-II Titrimetric Methods of Analysis** **18**

Methods of expressing concentration of solutions. Types of titrations. Requirements for analysis. Primary and secondary standards. Limitation of volumetric analysis. pH of strong and weak acid solutions. Buffer solutions. Henderson equations. Preparation of acidic and basic buffers. Relative strength of acids and bases from  $K_a$  and  $K_b$  values. Neutralisation-titration curve, theory and choice of indicators. Stability of complexes. Titration involving EDTA. Metal ion indicators and their characteristics.

**Unit-III Precipitation titrations and Gravimetric methods of analysis** **18**

Concept of sparingly soluble salts. Relation between solubility and solubility products. Argentometric titrations, indicators for precipitation titrations involving silver nitrate. Determination of chloride by Volhard's method. Adsorption indicators. Separation by precipitation. Factors affecting solubility, gravimetric factor. Purity of precipitates, von Weiman ratio. Co-precipitation and post precipitation. Precipitation from homogeneous solution.

**Unit-IV Chromatographic techniques and applications** **18**

Principles of adsorption and partition chromatography: Column and Paper. TLC, ion-exchange chromatography – technique and applications. Gas chromatography, principle, detector and applications. Purification of solid organic compounds: recrystallisation, sublimation. Use of miscible solvents. Use of drying agents and their properties. Purification of liquids. Experimental techniques of distillation – fractional distillation – vacuum distillation – steam distillation.

**Unit-V Polarography and Thermal methods** **18**

Polarography – theory, apparatus, DME, Diffusion, Kinetic and catalytic currents, Current – voltage curves for reversible and irreversible system, qualitative and quantitative applications to inorganic systems. Amperometric titrations-theory, apparatus, types of titration curves, successive titrations and indicator electrodes – Applications. Principle of thermogravimetric analysis (TGA). Differential thermal analysis (DTA): Instrumentation and applications. Factors affecting TGA and DTA curves. TGA of  $AgNO_3$ ,  $CaC_2O_4 \cdot H_2O$  and DTA of sulphur.

**Total: 90 hours**

**Outcome:**

- To explain the theoretical principles and important applications of classical analytical methods within titration (acid/base titration, complexometric titration, redox titration), and various techniques within gravimetric and coulometric methods.
- To explain the theoretical principles of various separation techniques in chromatography, and typical applications of chromatographic techniques.

- To assess and suggest a suitable analytical method for a specific purpose, and evaluate sensitivity, important sources of interferences and errors, and also suggest alternative analytical methods for quality assurance.
- Performing risk assessment of chemical experiments and chemical analytical activity
- Performing classical analytical experiments, and make observations and assessments of important factors that could affect the analytical result.
- To understand basics and principles of chromatography.
- To know the different types of chromatography and its application.
- To get idea about the basics and Merits of electro analytical techniques.
- To learn the theory and working of polarography and its application in inorganic elements can be clearly known.
- To understand the Principles of DGA, DTA can be appreciably understood.

**Text Book:**

1. B. K. Sharma. "Instrumental method of chemical analysis" Goel publishing house, 27<sup>th</sup> edition, 2011.

**Reference Book:**

1. Grudeep R. Chatwal, Sham K. Anand. "Instrumental Methods of Chemical Analysis" Himalaya Publishing House, 5<sup>th</sup> edition, 2013.

**15BCH003      INORGANIC QUALITATIVE ANALYSIS AND PREPARATIONS      L T P C**  
**0 0 3 2**

**Objective:** To learn the technique to identify acid radicals and basic radicals of each two with to interfering radicals as well as to prepare simple coordination compounds.

**Inorganic Qualitative Analysis**

Reactions of mercury, lead, copper, bismuth, cadmium, antimony, tin, ferrous and ferric iron, aluminium, zinc, manganese, cobalt, nickel, calcium, strontium, barium, magnesium, and ammonium; sulphide, carbonate, nitrate, sulphate, chloride, bromide, iodide, fluoride, oxalate, arsenite, phosphate, chromate and borate radicals. Semimicro analysis of a mixture containing two cations and two anions of which one is an interfering ion.

### List of Experiments

1. Reaction of simple radicals.
2. Reaction of Interfering acid radicals
3. Reactions of groups I, II and III cations.
4. Reactions of groups IV, V and VI cations
5. Elimination of interfering acid radicals
6. Analysis of salt mixture – I.
7. Analysis of salt mixture – II.
8. Analysis of salt mixture – III.
9. Preparation of Ferrous ammonium sulphate.
10. Preparation of tetraamminecopper (II) sulphate.
11. Preparation of potassium trioxalatoaluminate.
12. Preparation of potassium trioxalatochromate.

### Outcome:

- To learn the important of bench reagents
- To familiarise with the reactions of basic radicals
- To understand the analysis of various inorganic mixtures
- To learn the elimination of interfering radicals
- To know the identification of various metals of group
- To know the reaction of simple radicals
- To know the reaction of Interfering acid radicals
- To know the reactions of groups I, II and III cations
- To know the reactions of groups IV, V and VI cations
- To know the elimination of interfering acid radicals

### Text Book:

1. Vogel's – "Textbook of qualitative Inorganic Analysis", Longmann, 12<sup>th</sup> edition, 2011

### Reference Books:

1. S. Sundaram and K. Raghavan "Practical Chemistry", S. Viswanathan.Co. 3<sup>rd</sup> edition 2011
2. J. N. Gurtu and R. Kapoor "Advanced experimental Chemistry", S. Chand and Co. 6<sup>th</sup> edition, 2010

15BCH004

CHEMISTRY OF HYDROCARBONS

L T P C  
5 0 0 3

**Objective:** To know about what are hydrocarbons and their classification, conformations, preparations, properties and about aromaticity.

- Unit I Classifications of hydrocarbons** **15**  
 Chemistry of alkanes and cycloalkanes petroleum source of alkanes-Methods of preparing alkanes and cycloalkanes – chemical properties –mechanism of free radical substitutions in alkanes –uses.
- Unit II Conformational Analysis** **15**  
 Conformational study of ethane and n-butane – Relative stability of cyclo alkanes from cyclopropane upto cyclooctane – Bayer’s straintheory – Limitations – cyclohexane and mono-and disubstituted cyclohexanes.
- Unit III Preparation methods of hydrocarbons** **15**  
 General methods of preparation and properties of Alkenes and alkynes-electrophilic and radical addition mechanisms- addition reactions with  $H_2, X_2, HX, HOX, H_2SO_4, H_2O$  , hydroboration Ozonolysis and peroxide effect. Hydroxylation of alkenes with  $Kmno_4$ - allylic substitution of alkenes by NBS –acidity of alkynes and formation of acetylides-test for alkenes and alkynes.
- Unit IV Types of Dienes and reactions** **15**  
 Dienes-types-stability-preparation of 1, 3 butadiene, isoprene and chloroprene-reactivity –1, 2 and 1, 4 additions in conjugated dienes,-Diels-Alder reaction. Types of polymerization-mechanisms of ionic and free radical addition polymerization.
- Unit V Aromaticity and preparation of aromatic compounds** **15**  
 Aromaticity-Huckel’s rule-resonance in benzene –electrophilic substitution in aromatic compounds-general nitration, sulphonation, Friedelcraft’s alkylation and acylation-Orientation and reactivity in monosubstituted benzenes polynuclear hydrocarbons –naphthalene, anthracene and phenanthrene – preparation, properties and uses.

**Total: 75 hours**

**Outcome:**

- To be well versed in Classifications of hydrocarbons
- To understand the chemical properties and mechanism of free radical substitutions in alkanes
- To understand the Conformational Analysis of saturated and unsaturated organic compounds
- To understand the relative stability of cyclo alkanes from cyclopropane upto cyclooctane
- To clearly explain the Preparation methods of hydrocarbons and formation of acetylides- test for alkenes and alkynes
- To understand the concept of hydroboration ozonolysis and peroxide effect
- To understand the types of polymerization-mechanisms of ionic and free radical addition polymerization
- To clearly explain the general methods of preparation and properties of Alkenes and alkynes
- To understand the concept of 1, 2 and 1, 4 additions in conjugated dienes



- To clearly explain the concept aromaticity-Huckel's rule-resonance in benzene
- To clearly understand electrophilic substitution in aromatic compounds-general nitration, sulphonation, Friedelcraft's alkylation

**Text Book:**

1. P. L. Soni, "Text Book of Organic Chemistry" Sultan Chand & sons. 32<sup>nd</sup> edition. **2013**

**Reference Books**

1. Robert Thornton Morrison, Robert Neilson Boyd, "Organic Chemistry" Ashok K. Ghosh 10<sup>th</sup> edition, **2013**
2. Dr. Jagadamba singh, Dr. L. D. S. Yadav, "Advanced Organic Chemistry" Pragati Prakashan, 7<sup>th</sup> Edition, **2011**

**15BCH005**

**CHEMISTRY OF METALS AND NON METALS**

**L T P C  
5 0 0 3**

**Objective:** To learn about the periodic table classification, properties and comparative studies

**Unit-I Chemistry of 'd' block elements**

**15**

Characteristics of 'd' block elements. Comparative study of Ti, V, Cr, Mn and Iron group metals- occurrence, oxidation states, magnetic properties, catalytic properties and color.

## **Unit II Metallurgy**

**15**

General principles of metallurgy –occurrence- concentration of the ores- extraction of the metals  
Extraction of following metals: Al, Ca, Ti, Cr, Mn, Ni, V, Sn and Pb.

## **Unit-III Chemistry of P block elements**

**15**

Carbon family – Comparison of properties of carbon and silicon valencies, oxides, halides, hydrides and oxyacids classification, properties and uses of carbides. Classification of silicates.

## **Unit-IV Nitrogen and Oxygen family**

**15**

Comparative study of N, P, As, Sb, and Bi – elements, oxides, oxyacids, halides and anhydrides, valency states – preparation, properties, structure and uses of hydrazine, hydroxylamine and hydrazoic acids, preparation and uses of  $\text{NaBiO}_3$ .

Comparative study of O, S, Se, and Te – elements, hydrides, oxides and oxyacids of sulphur including peroxy acids.

## **Unit-V Halogens and Nobel Gases**

**15**

Comparative study of F, Cl, Br, I and At – elements reactivities, hydrogen halides, oxides and oxyacids. Interhalogen compounds and pseudo halogens. Exceptional properties of Fluorine. Electronic onfiguration and position in the periodic table. Applications, clathrates and compounds of xenon, hybridization and geometries of  $\text{XeF}_2$ ,  $\text{XeF}_4$ ,  $\text{XeOF}_4$ .

**Total: 75hours**

### **Outcome:**

- To clearly explain the Characteristics of 'd' block elements
- To understand the comparative study of Ti, V, Cr, Mn and Iron group metals
- To clearly explain the general principles of metallurgy, occurrence and concentration of the ores
- To clearly explain the extraction of the selected metals
- To clearly explain the concept of comparison of properties of carbon family
- To understand the classification, properties and uses of carbides of silicates
- To clearly explain the comparative study of Nitrogen and Oxygen family
- To understand the structure and uses of hydrazine, hydroxylamine and hydrazoic acids
- To clearly explain the comparative study of Halogens and Nobel Gases
- To clearly understand the hybridization and geometries of xenon compounds

### **Text Books:**

1. P. L. Soni, "Text Book of Inorganic Chemistry" Sultan Chand & sons. 32<sup>nd</sup> edition. **2013**
2. R. D. Madhan, "Modern Inorgnaic Chemistry" S. Chand & Co., 6<sup>th</sup> edition **2012**

**Reference Books:**

1. James E. Huheey, Ellen, A. Keiter, Richard, L. Keiter, "Inorganic Chemistry" Pearson education (Singapore Pvt Limited) 9<sup>th</sup> edition, **2013**
2. J. D. Lee, Concise Inorganic chemistry" Blackwell Science Limited (France) 9<sup>th</sup> edition **2013**

**15BCH006****PHYSICAL CHEMISTRY PRACTICAL-II****L T P C  
0 0 3 2**

**Objective:** To know and practice the important experiments, in chemical kinetics, phase rule and electrochemistry.

**Determination of the order of the following reactions.**

1. Iodination of acetone
2. Soapanification of an ester (ethyl acetate)
3. Acid catalyzed hydrolysis of an ester (ethyl acetate)

#### **Distribution Law**

4. Iodination of acetone
5. Soapanification of an ester (ethyl acetate)
6. Acid catalyzed hydrolysis of an ester (ethyl acetate)

#### **Heterogeneous equilibria:**

7. Phenol-water system – CST
8. Effect of Impurity- 2% NaCl or succinic acid solutions on phenol-determination of the concentration of the given solution.
9. Determination of transition temperature of the given salt hydrate.  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ ,  $\text{CH}_3\text{COONa} \cdot 3\text{H}_2\text{O}$ ,  $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$ ,  $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$ .
10. Molecular weight of a solute-Rast's method using naphthalene, m-dinitrobenzene and diphenyl as solvents.
11. Determination of strength of a strong acid by conductometric titration (HCl vs NaOH).
12. Determination of the strength of Fe (II) by potentiometric redox titration.

#### **Outcome:**

- To develop expertise relevant to the professional practice of chemistry
- To developed an understanding of the breadth and concepts of physical chemistry
- To Know the role of physical chemistry in the chemical sciences and Engineering
- To develop an understanding to the role of the chemist and chemical engineer in tasks
- employing physical chemistry
- To understand the methods employed for problem solving in physical chemistry
- To get experience in some scientific methods employed in basic and applied physical Chemistry
- To develop the skills in procedures and instrumental methods applied in analytical and
- practical tasks of physical chemistry
- To develop skills in the scientific method of planning, developing, conducting,
- reviewing and reporting experiments
- To develop some understanding of the professional and safety responsibilities residing
- in working with chemical systems

#### **Text Books**

1. B. Viswanaathan, P.S. Raghavan "Practical Physical Chemistry", Viva Books private Ltd. ,2005
2. Slowiski, Wolsey-Indian, "General Chemistry A Lab Manual" Congage learning India Private Ltd.2010

#### **Reference Books:**

1. Williamson, Peck-Indian "Lab Manual Fox General Chemistry", Congage learning India Private Ltd.2009
2. R.K.P Singh, Jagadamba Singh, Jaya Singh " Advanced Practical Chemistry", Pragati Prakashan ,2011

3. V.K Abluwalia, Sunita Dhingra, Adarsh Gulati, "College Practical Chemistry", University Press(India) Private Ltd 2005

**L T P C**

**15BCH007**

**PHASE EQUILIBRIA AND KINETICS**

**5 0 0 4**

**Objective:** To know about chemical kinetics, catalysis rate determination, phases and its concepts: components, degrees of freedom, phase diagram.

**Unit-I Phase Equilibria-I**

**15**

Phase Rule: Concepts of phase, component and degrees of freedom, with examples. Gibb's phase rule phase diagram and application of phase rule: *One-component system*- Water and sulphur systems. *Two component system*- Simple eutectic: Lead-silver system.

**Unit-II Phase Equilibria-II**

**15**

Distribution law statement and limitations applications to simple systems involving association, dissociation and complex formation. Solid-liquid equilibria – Binary systems. Theory of fractional crystallization Binary systems forming salt hydrates  $\text{FeCl}_3$  – freezing mixtures  $\text{NaCl}$ ,  $\text{CaCl}_2$ .

**Unit-III Chemical Kinetics-I**

**15**

Rate of a reaction – Rate equation- Rate constant, Order and Molecularity – Methods of rate measurement. Derivation of kinetic equation for rate constants of I, II order reactions – Third and zero order reactions and examples (No derivation of rate constant). Rate determining step and mechanism of elemental process – Arrhenius law- activation energy.

**Unit IV Chemical Kinetics-II**

**15**

Collision theory of reaction rates, collision cross section, collision number. Effect of solvent and ionic strength on reaction rates. Unimolecular reactions steady state treatment Lindemann hypothesis Chain reaction.

**Unit V Chemical Kinetics-III**

**15**

Homogeneous and Heterogenous Catalysis – definition – examples and differences. Reactions in gases and in solutions (Acid, base and Wilkinson's catalysts). Enzyme catalysis elementary of the principle of the activated complex using steady state treatment Michaelis – Menten kinetics.

**Total: 75 hours**

**Outcome:**

- To identify and understand the principles of chemical equilibrium thermodynamics to solve multiphase equilibria and chemical reaction equilibria
- To write down the basic equations for vapor-liquid equilibrium using the gamma and phi
- Methods and find vapor-liquid equilibrium phase compositions
- Ability to construct phase diagrams for single and multi-component systems
- Able to derive Nernst Equation and distribution coefficient

- Formulate an operational definition of reaction rate
- Explain the concept of a reaction mechanism. Determine the rate law and order of a chemical reaction from experimental data. Include: zero-, first-, and second-order reactions and reaction rate versus concentration graphs
- Describe qualitatively the relationship between the factors that affect the rate of chemical reactions and the relative rate of a reaction, using the collision theory
- Able to derive mechanism for unimolecular reactions
- Explain how a catalyst works and types of catalytic reactions
- Understand the concept of mechanism and using rate law data predict whether or not a proposed mechanism is viable or not

**Text Books:**

1. P.L. Soni, “Text Book of Physical Chemistry” Sultan Chand & sons, 12<sup>th</sup> edition, **2010**
2. B. R. Puri, L. R. Sharma, Pathania, “principle of Physical Chemistry” Vishal Publishing & Co., 46<sup>th</sup> edition **2013**

**Reference Books:**

1. Kundu and Jain, “Physical Chemistry” S. Chand, 6<sup>th</sup> edition, **2011**
2. S. Glasstone, “Text Book of Physical Chemistry” –Macmillan. 7<sup>th</sup> edition **2012**

**15BCH008**

**BIO – INORGANIC CHEMISTRY**

**L T P C  
5 0 0 4**

**Objective:** To understand about human biochemistry, proteins, enzymes, vitamins. Chemistry involved in agriculture, nitrogen fixing and photosynthesis.

**Unit – I Introduction****15**

Essential and trace metal ions – membrane- structure, function, transport properties active transport – phosphate hydrolysis – Role of alkali and alkaline earth metal ions in biological systems- sodium pump

**Unit – II Oxygen Carriers****15**

Hemeproteins – Hemoglobin and myoglobin – structure – oxygenation mechanism Bohr effect cooperativity effect in hemoglobin

**Unit –III Metalloenzymes****15**

Enzymes- Definition, Nomenclature, Sources, Classification and Specificity – Factors affecting enzyme activity- substrate pH, temperature –Coenzyme- vitamin B<sub>12</sub> coenzymes- peroxidase and catalyses

**Unit – IV Nitrogen Fixation and Iron – Sulphur proteins****15**

Nitrogen fixing microorganisms (In VIVO nitrogen Fixation)-Nitrogenous) Reactivity of nitrogenous- postulated mechanisms for biological nitrogen fixation Rurbredoxin, Ferredoxins structure, and functions

**Unit – V Photosynthesis and Toxicity****15**

Chloroplast- light reactions – structure of chlorophyll- Photosynthesis – Reactions – Type I and Type II photosynthetic reactions – Role of Manganese complex in evolution of oxygen Toxicity – Hg, Cd, Zn, Pb, and As

**Total: 75 hours****Outcome:**

- To know the essentials of metal ions in human body
- To learn the importance of ATP cycle and sodium potassium pump
- To understand the structure and functions of hemoglobin and myoglobin
- To understand the process and basis of nitrogen fixation in organisms
- To realize the mechanism of biological nitrogen fixation
- To know the basics and process of photosynthesis
- To clearly understand the structure and functions of chlorophyll, chloroplast in photosynthesis process
- To gather knowledge about role of heavy metals in plant metabolism, its accumulation and its toxicity in oxygen evolution
- To Know about the hemeproteins structure and its functions
- To learn the effect of oxygen mechanism with Heme
- To study the source, classification and factors affecting enzymes
- To understand about Coenzymes and its reactions
- To know the structure and functions of Iron-Sulphur Proteins

**Text Book:**

1. Lippard and Berg, “Principle of Bioinorganic Chemistry” –University- Science Book 7<sup>th</sup> edition, 1994

**References Books:**

1. Bertini, Gray, Hippard and Valentire – “Bioinorganic Chemistry” –Viva Books Pvt Ltd. 3<sup>rd</sup> edition, 2011
2. David E. Fertion , “Bio-coordination Chemistry” Oxford chemistry Primer, 7<sup>th</sup> edition 1995

**L T P C****15BCH009****PRACTICAL – III VOLUMETRIC ANALYSIS****0 0 3 2**

**Objective:** To know about different types of filtration namely acid base, redox, iodometry, iodimetry and complexometric.

**Acid – Base Titrations**

- 1) Estimation of Hydrochloric acid using oxalic acid
- 2) Estimation of sodium Hydroxide using sodium carbonate
- 3) Estimation Borax

**Redox Titration**

- 4) Estimation of oxalic acid using Mohr’s salt
- 5) Estimation of Calcium
- 6) Estimation of Ferrous Sulphate using oxalic acid
- 7) Estimation of H<sub>2</sub>O<sub>2</sub>
- 8) Estimation of copper using Potassium Dichromate
- 9) Estimation of Ferric Iron using Potassium Dichromate

**Complexometric titration**

- 10) Estimation of Magnesium
- 11) Estimation of Calcium

**Argentometry Titration**

(Demonstration Experiment)

- 12) Estimation of Chloride using Silver Nitrate

**Outcome:**

- To learn about types of neutralization reaction and how neutralization reaction occurs
- The student is able to use stoichiometric calculations to predict the results of performing a reaction in the laboratory
- To learn what is called redox titration and types of redox titration and reagents used
- To learn how redox reaction occurs
- To learn about complexometric Titrations
- Feasibility of Complexometric Titrations and Applications of Complexometric Titrations
- To learn about precipitation method of analysis of the given ion
- To know the various methods of argentometry titrations applied in analysis of chloride

**Text Book:**

1. Vogel’s – “Textbook of quantitative Inorganic Analysis”, Longmann, 12<sup>th</sup> edition, 2011



**Reference Books:**

1. S. Sundaram and K. Raghavan "Practical Chemistry", S. Viswanathan. Co. 3<sup>rd</sup> edition **2011**
2. J. N. Gurtu and R. Kapoor "Advanced experimental Chemistry", S. Chand and Co. 6<sup>th</sup> edition, **2010**

**L T P C****15BCH010****QUANTUM MECHANICS AND THERMODYNAMICS****5 0 0 4**

**Objective:** To know and understand what is quantum mechanics, various fundamental concepts as well as about thermodynamics, different laws in thermodynamics, enthalpy, entropy, free energy various processes.

**Unit – I Quantum Mechanics I****15**

Electron and old quantum Theory, Rutherford scattering experiments Rutherford atomic models Quantum Theory of radiation, Photoelectric effect, Bohrs Theory of hydrogen atom alternative explanation for the emission of fine spectrum

**Unit – II Quantum Mechanics II****15**

Dual character of electron de Broglie's equation, the Davison Gerners experiment Heisenberg uncertainty principle Compton effect, Quantum Mechanics, Schrodinger wave equation (No Derivation) Zeeman effect, Pauli's exclusion principle

**Unit –III Thermodynamics –I****15**

Definitions of thermodynamic terms – intensive and extensive variables, isolated, closed and open systems. Thermodynamic processes, cyclic processes, reversible and irreversible processes, thermodynamic functions and their differentials, Zeroth law of thermodynamics. Concepts of heat and work.

**Unit – IV Thermodynamics –II****15**

First law of thermodynamics and internal energy (U), enthalpy (H), relation between Cp and Cv Calculations of w, q, d, U and dH for expansion of ideal gas under isothermal and adiabatic conditions, for reversible and irreversible processes including free expansion, Joule's law, Joule Thomson coefficient

**Unit – V Thermodynamics –III****15**

Application of first law of thermodynamics – Hess's law of constant heat summation, Enthalpy of solution, enthalpy of dilution, enthalpy of neutralization, enthalpy of ionization and enthalpy of formation of ions. Bond dissociations energy, Born-Haber cycle for calculation of lattice energy, Kirchoff's equation, relation between  $\Delta H$  and  $\Delta U$  of a reaction. Spontaneous processes, heat engine, Carnot cycle and its efficiency, statements of second law, Nernst heat theorem, third law of thermodynamic.

**Total: 75 hours****Outcome:**

- To explain the Basic principle of quantum chemistry
- To explain the concept of wavefunction
- To state about the postulates of quantum chemistry
- For solving the problems in quantum chemistry
- To explain operators and mathematical entities
- To explain different types of oscillators
- To explain the terms: system and surroundings



Crystalline and amorphous solids- Elements of symmetry of a crystal – unit cell – Bravais lattices – miller indices – Bragg's law – X- ray diffraction of crystals – structure of NaCl, CsCl diamond, Graphite zinc and Futile – radius ratio rule

**Unit – V Solid state II**

**15**

Defects in solids-Band Theory – Semiconductors – p-type and n- type semiconductors – applications – Solid state electrolytes- Types of magnetic, Dia, Para, Ferro, Antiferro and ferrimagnetism.

**Total: 75 hours**

**Outcome:**

- To define Atomic nucleus, Isotopes, Types of isotopes and Nuclear isomers
- To explain different types of Nuclear reactions, stability of Nucleus, Nuclear forces and Emission of alpha, beta and gamma rays
- To know about radioactivity, Nuclear fission, Nuclear fusion , Nuclear reactors and breedor reactors
- To learn about rate of radioactive decay, half life period and activity of Radioactive substance
- To describe general characteristics of solid state
- To distinguish between amorphous and crystalline soilds
- To classify crystalline solids on the basis of the nature of binding forces
- To define crystal lattice and unit cell
- To describe the imperfections in solids and their effect on properties
- To correlate the electrical and magnetic properties of solids and their structure

**Text Books:**

1. Antony R. West, “Solid State Chemistry” Wiley edition, 7<sup>th</sup> edition, **2011**
2. H. J Arnika: “Essentials of nuclear Chemistry” New Age International Pvt. Limited. 5<sup>th</sup> edition, **2014**

**Reference Books:**

1. R. Gopalan, “Elements of nuclear Chemistry” S. Viswanathan & Co., 7<sup>th</sup> edition, **2009**.
2. A. F. Wells “Structural Inorganic Chemistry” Oxford University Press, 11<sup>th</sup> edition, **2009**.
3. Phillips F. C. “An introduction to crystallography” Longmans Green, New York., 7<sup>th</sup> edition, **2012**

**15BCH012**

**PRACTICAL – IV GRAVIMETRIC ANALYSIS**

**L T P C**

**0 0 3 2**

**Objective:** To learn and practice the various quantitative estimations; Ba, Pb, Ca, Mg, Zn, Al, Cr and  $\text{SO}_4^{2-}$  by gravimetry

## Any Seven Estimations Only

(Use of Sintered Crucible is recommended wherever possible)

### List of Experiments

1. Estimation of Barium as Barium Sulphate
2. Estimation of Sulphate as Barium Sulphate
3. Estimation of lead as lead chromate
4. Estimation of Calcium as Calcium oxalate monohydrate
5. Estimation of Chloride as Silver Chloride
6. Estimation of nickel as Ni –DMG Complex
7. Estimation of Magnesium as magnesium Oxinate
8. Estimation of Zinc as Zinc Oxinate
9. Estimation of Aluminium as Aluminium Oxinate
10. Estimation of Chromium as lead Chromate
11. Estimation of Magnesium as Magnesium pyrophosphate
12. Estimation of Lead as Lead sulphate

### Outcome

- To estimate the amount of substance present in a given sample by determining the weight of the precipitate obtained from the solutions of different metal ions

### Text Book:

1. Vogel's "Textbook of quantitative Inorganic Analysis" Longmann, 4<sup>th</sup> edition, 2009

### Reference Book:

1. Dr. S. K. Agarwal and Dr. Keemti Lal "Advanced Inorganic Analysis, Pragati Prakashan, 7<sup>th</sup> edition, 2009

15BCH013

COORDINATION CHEMISTRY

L T P C

5 0 0 4

**Objective:** To learn about what is coordination chemistry, nomenclature and various theories: Werner theory, valence bond theory, crystal field theory and John-Teller theory.

Unit – I Introduction

15

Nomenclature- Werner Theory- EAN Rule – Chelation- Stability of complexes – factors affecting the stability – Stepwise and overall formation constant Isomerism: structural isomerism- stereoisomerism – geometrical and optical isomerism in 4 and 6 coordinated Complexes

**Unit – II Theories of Coordination – I** **15**

Valence bond theory – shortcomings of VB theory – crystal field theory –CFSE – Spectrochemical series- colour and magnetic properties of complexes– high spin and low spin complexes Defects of CFT, Comparison of VBT and CFT

**Unit –III Theories of Coordination – II** **15**

Evidences of covalent bonding in metal – legend bonding Molecular Orbital theory of 6 bonded complexes only Jahn Teller effect and electronic spectra of complexes comparison of CFT and MOT

**Unit – IV Metal Carbonyls** **15**

Metallic carbonyls – Preparation – Reaction – Classifications Structure and Bonding in Carbonyls – Back bonding – Evidences for  $\pi$ - bonding – Applications of carbonyls Ferrocene – preparation – properties – Aromatic character of ferrocene – Structure.

**Unit – V Coordination complexes reaction and mechanisms** **15**

Liability and inertness of complexes – mechanism of acid hydrolysis and base hydrolysis of octahedral complexes –  $SN^1$ ,  $SN^2$  and  $SN^1CB$  mechanisms – evidence for  $SN^1CB$  mechanism *trans*- effect – *trans* effect series – Theories of *trans* effect – applications of *trans* effect.

**Total:75hours**

**Outcome:**

- To appreciate the postulates of werners theory of coordination compounds
- To Know the meaning of the terms: coordination entity, central metal atom/ion, ligand, coordination number, coordination sphere
- To learn the rules of nomenclature of coordination compounds
- To define different types of isomerism in coordination compounds
- To understand the nature of bonding in coordination compounds in terms of the valence Bond and crystal Field theories
- To learn the stability of coordination compounds
- To know the Evidences of covalent bonding in metal
- To understand the Jahn Teller effect in octahedral complexes
- To know the meanings of Metallic carbonyls, Classifications , Structure and Bonding in Carbonyls as well as metallocenes
- To know the reactivity of organometallic compounds and synthesis of compounds using *trans* effect

**Text Book:**

1. Puri B. R, Sharma L. R. Kalia K. K “Principles of inorganic Chemistry” Milestone publishers, 31<sup>st</sup> edition, 2013.

**Reference Books:**

1. P. L. Soni, "Text Book of Inorganic Chemistry" Sultan Chand & sons. 32<sup>nd</sup> edition. **2013**
2. R. D. Madhan, "Modern Inorganic Chemistry" S. Chand & Co., 6<sup>th</sup> edition **2012**
3. James E. Huheey, Ellen, A. Keiter, Richard, L. Keiter, "Inorganic Chemistry" Pearson education (Singapore Pvt Limited) 9<sup>th</sup> edition, **2013**.
4. J. D. Lee, "Concise Inorganic chemistry" Blackwell Science Limited (France) 9<sup>th</sup> edition **2013**
5. F. A. Cotton, G. Wilkinson and P. L. G. G. "Basic Inorganic Chemistry" John Wiley, 11<sup>th</sup> edition, **2009**.

**L T P C**

**15BCH014**

**FUNDAMENTALS OF SPECTROSCOPY**

**5 0 0 4**

**Objective:** To understand what is spectroscopy, classification and fundamental concepts of IR, UV-Visible, NMR and Mass spectroscopy.

**Unit – I Introduction**

**15**

Type of Energy, types of radiation energy conversion. Electromagnetic radiation its interaction with matter Electromagnetic spectrum, Electrical Spectra Magnetic Spectra exchanged Energy types and regions of various spectra, Energy associated with each spectra.

**Unit – II Classification of Spectroscopy**

**15**

Concept of excitation ground state excited state. Absorption of emission spectra, line spectra band spectra Atomic spectra and molecule spectra interpretation methods

**Unit –III Microwave and IR Spectra**

**15**

Basic principle of M.W. concept of selection rule Instrumentation. Basic principle of IR Spectra Region of IR spectra plotting methods sampling and functional technique concept of groupings FTIR

**Unit – IV UV visible and Mass Spectra**

**15**

Lambert Beers law- Basic principle of UV visible Spectra and Woodward Fiesher rule Chromophores Auxo – chromes plotting methods of spectra-solvent effect. Basic principle of mass spectra and plotting methods fragmentation Pattern and methods base peak Molecular ion peak meta stable peak Nitrogen rule Mc lafferty rearrangement

**Unit V NMR Spectra**

**15**

Classification- atoms based on nuclear types nuclear moment principle of nuclear magnetic resonance – oscillating frequency larmour frequency-chemically and magnetic environments reference Nucleic plotting method chemical shift low resolution and high resolution spectra Spin-Spin coupling concept PMR  $C^{13}$ ,  $F^{15}$ ,  $P^{35}$  FTNMR

**Total: 75 hours**

**Outcome:**

- To understand agonist, anti agonist, partial agonist and inverse agonist
- To gain the knowledge of various receptor theories
- To understand the role of receptors and auto radiography
- To learn various receptors like GABA and familiar adriginic receptors
- To learn lead molecules choice and API modification

- To learn the complete structure of enzymes
- To know the importance of enzyme inhibitor as drugs
- To understand growth stimulation factors
- To know the complete fundamentals of pharmaceutical chemistry
- To learn lead molecules, their choice, API modification, structural changes

**Text Books:**

1. B. K. Sharma. "Instrumental method of chemical analysis" Goel publishing house, 27<sup>th</sup> edition, **2011**.
2. Grudeep R. Chatwal, Sham K. Anand. "Instrumental Methods of Chemical Analysis" Himalaya Publishing House, 5<sup>th</sup> edition, **2013**.

**Reference Books:**

1. Robert M. Silverstin, Clayton Bassler and Terence C. Morril, "Spectrophotometer Identification of organic compounds" John Wiley Sons. 6<sup>th</sup> edition, **2009**.
2. H. H. Willard, J. A. Dean, L.L. Merit "Instrumental method of chemical analysis" Words Worth, 7<sup>th</sup> edition, **1999**.

**L T P C**

**15BCH015 ELECTROCHEMISTRY AND SURFACE CHEMISTRY 5 0 0 4**

**Objective:** To have detailed knowledge about electrochemistry, theories of electrochemistry and surface chemistry.

**Unit I Electrochemistry-I**

**15**

Conductance – cell constant specific conductance and equivalent conductance measurement. Variations of equivalent conductance with concentration weak and strong electrolytes motilities of ions – transport number Kohlraush's law. Applications of Ostwald dilution law – conductance –titrations (acid-base, precipitation) solubility product dissociation constant.

**Unit II Electrochemistry-II**

**15**

Potentiometry – cells electromotive force – electrode potential – their thermodynamic significance. Nernst equation standard electrode potentials and its determination. Reference electrodes hydrogen electrode calomel, quinhydrone and glass electrodes. Types of cells – chemical and concentration cell – liquid junction potential salt bridges. Redox systems.

**Unit III Electrochemistry-III**

**15**

Theory of indicators- pH Henderson equation – determination of pH by Potentiometry. Electrolytes – strong and weak-ionic equilibria constant hydrolysis of salts-hydrolysis constant and its determination by potentiometry. Potentiometric titrations – acid-base, redox, precipitation.

**Unit IV Surface Chemistry-I**

**15**

Laws of photochemistry Grotthus Drapper law, Einstein's law of photochemical equivalence- quantum yield. Kinetics of photochemical reactions of  $\text{CH}_3\text{CHO}$  and  $\text{H}_2 - \text{Cl}_2$ . Photophysical processes fluorescence and phosphorescence chemiluminescence.

### Unit V Surface Chemistry-II

15

Physisorption and adsorption isotherms – Freundlich and its use in surface area determination. Colloids-types, stability and electrical double layer, and electro-osmosis –association colloids (micelles) and critical micelle concentration.

**Total: 75 hours**

#### Outcome

- To know the concept of specific conductance and equivalent conductance measurement
- To clearly explain the concept of applications of ostwald dilution law
- To understand the Nernst equation standard electrode potentials and its determinations
- To clearly explain the concept of various types of chemical and concentration cells
- To understand the ionisation constant hydrolysis of salts-hydrolysis constant and its determination by potentiometry
- To understand the laws of photochemistry Grotthus Drapper law and Einstein's law of photochemical equivalence
- To clearly explain the concept of photophysical processes, fluorescence and phosphorescence
- To clearly explain the differences between physisorption and chemisorption
- To know the concept of association colloids and critical micelle concentration
- To clearly understand the concept of adsorption isotherms

#### Text Books:

1. P.W. Atkins, "Physical Chemistry" Oxford publishers, 11<sup>th</sup> edition, **2009**
2. B. R. Puri, L. R. Sharma, Pathania, "principle of Physical Chemistry" Vishal Publishing & Co., 46<sup>th</sup> edition **2013**

#### Reference Books:

1. P.L. Soni, "Text Book of Physical Chemistry" Sultan Chand & sons. 12<sup>th</sup> edition, **2011**
2. Kundu and Jain, "Physical Chemistry" S. Chand, 6<sup>th</sup> edition, **2011**
1. S. Glasstone, "Text Book of Physical Chemistry" –Macmillan. 7<sup>th</sup> edition **2012**

**L T P C**

**15BCH016**

**PRACTICAL-IV ORGANIC ANALYSIS & PREPARATION**

**0 0 3 2**

**Objective:** To know the identification of various functional groups in a unknown compound and to know how to prepare various organic compound by a single stage preparation



## 1. Organic analysis:

Reaction of the following functional groups:

1. Aldehyde,
2. Ketone,
3. Carboxylic acid (mono and di),
4. Ester,
5. Carbohydrate (reducing and non reducing),
6. Phenol,
7. Aromatic primary amine,
8. Amide,
9. Nitro compound,
10. Diamide,
11. Anilide.

The given organic compound containing one functional group should be analyzed and to be reported with a characteristic derivative.

**Minimum six functional group should be given for analysis from the above**

## 2. Preparations.

1. Preparation of Parabromoacetanalide
2. Preparation of benzaldehyde from benzoic acid
3. Preparation of methyl salicylate
4. Preparation of metadinitro benzene
5. Preparation of methyl orange
6. Preparation of Picric acid
7. Preparation involving benzylation technique
8. Preparation involving Esterification method

## 3. Determination of boiling point and melting point (Demonstration only)

### Outcome:

- To understand how to identify the given organic substance is aliphatic or aromatic
- To learn how to find the given organic substance is saturated or unsaturated
- To learn the reaction mechanism of identification for special elements through lassigne's test
- To learn the preliminary test of identification for various functional groups like carbohydrate, carboxylic acid, aldehyde, phenolic compound, amines, ketones, nitro compounds
- To practice the various confirmatory tests for different functional groups
- To learn the technique of single stage organic substance preparation
- To do the preparation involving nitration and oxidation
- To learn the preparation involving bromination, hydrolysis
- To know how to find the melting point of the given substance
- To familiarize the complete quantitative analysis of the given organic substance

**Text Book:**

1. Gnanaprakasam, Ramamurthy, "Organic Chemistry Lab Manual" S. Viswanathan Pvt. Ltd. 3<sup>rd</sup> edition 2011

**Reference Book:**

1. Vogel's – "Textbook of qualitative organic Analysis", Longmann, 12<sup>th</sup> edition, 2011

**L T P C****5BCH017****CHEMISTRY OF NATURAL PRODUCTS****5 0 0 4**

**Objective:** To understand what are carbohydrates proteins amino acid, alkaloids, terpenoids their classification structure, elucidation and to know about dyes

**UNIT-I Carbohydrates****15**

Classification – Constitution of glucose and fructose. Reactions of glucose and fructose- osazone formation. Mutarotation and its mechanism. Cyclic structure. Pyranose and furanose forms. Determination of ring size. Haworth projection formula. D and L configuration of monosaccharides – chain lengthening and chain shortening of aldoses. Inter conversion of aldoses and ketoses.

**UNIT-II Amino Acids and Proteins****15**

Aminoacids and proteins – Classification of amino acids. Essential and nonessential amino acids, preparation of alpha aminoacids, properties and reactions. Zwitter ions, isoelectric points – Peptide synthesis – structure determination of polypeptides – end group analysis.

**UNIT-III Vitamins and Alkaloids****15**

Vitamins: - classification, biological importance of vitamins A, B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub> and C. General methods of isolation and general methods of structure determination of Conine, Piperine and Nicotine.

**UNIT-IV Terpenoids****15**

Isoprene rule, special isoprene rule, Structural elucidations of – Geraniol, menthol and alpha terpineol.

**UNIT-V Dyes and Pigments****15**

Theory of colour and constitution. Classification – according to structure and method of application. Preparation and uses of 1) Azo dye-methyl orange and Bismark brown 2) Triphenyl methane dye Malachite green. 3) Phthalein dye – phenolphthalein and fluroescein 4) Vat dye – indigo 5) Anthraquinone dye – alizarin.

**Total: 75 hours****Outcome:**

- To be well versed in Basic Structure and Reactions of Glucose and Fructose
- To clearly explain the Haworth projection formula and D & L configuration of carbohydrates
- To understand the classification, function and reactions of amino acids and proteins
- To demonstrate the concept of synthesis and structural determination of polypeptides

- To classify fat soluble and water soluble vitamins with suitable examples and the biological importance
- To write down the history of alkaloids and its classifications
- To Identify the appropriate isolation techniques and structural determination of conine, piperine and nicotine
- To clearly explain the isoprene and special isoprene rule and structural elucidations of terpenoids
- To understand the theories of color and its classification and related chemical structure of dyes
- To list some of the method of preparation and use of dyes and pigments

**Text Book:**

1. Ashutosh Kaur. "Chemistry of Natural Products" Vol. I & II. B. S. publishers. 2<sup>nd</sup> edition, **2012.**

**Reference Books:**

1. Jagadamba Singh. "Natural Products Chemistry" Pragati Prakashan, 2<sup>nd</sup> edition **2012.**
2. O. P. Aggarwal. "Chemistry of Natural Products" Vol. I & II. Goel publishers. 41<sup>st</sup> edition. **2009.**

**L T P C**

**15BCH018**

**PHARMACEUTICAL CHEMISTRY**

**5 0 0 4**

**Objective:** To know the terminology in pharmaceutical chemistry, and about antibiotics anaesthetics antibacterials as well as various hormones and their functions in human systems.

**UNIT- I Pharmaceutical Chemistry –I**

**15**

Definition of the following terms: Drug, pharmacophore, pharmacology, pharmacopeia, pharmacodynamics, bacteria, virus, and vaccine. Cause, systems, and drugs for anaemia, Jaundice, cholera, malaria and filaria. Indian medicinal plants and uses- Neem, tulasi, kizhanelli, mango, semparathi, adathodai and thoothuvalai. Blood: Grouping, composition, Rh- Factor, blood-pressure hypertension and hypotension.

**UNIT –II Pharmaceutical Chemistry – II**

**15**

Antibiotics: Definition and uses with examples (Structure not required). Antiseptics and disinfectants: Definition and uses with examples. Analgesics: Definition and uses of narcotics, non-narcotics, disadvantages.

**UNIT – III Pharmaceutical Chemistry-III**

**15**

Anaesthetics: Classification and uses. CNS Drugs: Definition, Classification and uses with examples. Drugs and treatments of (a) AIDS (anti-HIV) (b) Diabetes (c) Cancer

**UNIT –IV Pharmaceutical Chemistry – IV**

**15**

Antibacterials: Definition, Classification – Sulphadrupe, examples. Anti- Pyretic and anti- inflammatory agents. Cardiovascular drugs, anti-arrhythmic drugs antihypertensive antianginal agents, vasodilators: Definition, examples with uses

#### **UNIT –V Pharmaceutical Chemistry- V**

**15**

Physiological functions of hormones: Adrenalin, thyroxin, insulin, oxytocin, progesterone, estrone and testosterone. Micronutrients and their biological role in human systems.

**Total: 75 hours**

#### **Outcome:**

- To demonstrate the importance of chemistry in the development and application of therapeutic drugs
- To develop an understanding of the physico-chemical properties of drugs
- To Understand how current drugs were developed and how new scientific techniques will provide future drugs
- To clearly explain the classification, function and uses of antibiotics and antiseptic and disinfectants
- To describe the function and uses of narcotic and non narcotic analgesics
- To gain an appreciation about the importance of anaesthetics drugs on central nervous system (CNS) and peripheral nervous system (PNS)
  
- To understand about various drug classes and treatment of diseases such as AIDS, Diabetics, Cancer
- To clearly explain about the classification and uses of sulpha drugs, anti-inflammatory and antihypertensive agents
- To be well versed with physiological functions of hormones
- To summarize about the micronutrients and their biological role in human systems

#### **Text Books:**

1. Surendra N. Pandeya “Textbook of medicinal chemistry (Synthetic Bio chemical approach)” vol. I & II S. G. Publishers, 5<sup>th</sup> edition, **2011**.
2. Gurdeep R Chatwal. “Synthetic drugs” Himalaya publishing house, 2<sup>nd</sup> edition, **2013**.

#### **Reference book:**

1. K.D. Tripathi. “Essentials medical pharmacology” J. P. Brothers. 7<sup>th</sup> Edition, **2009**.

**15BCH019 STEREOCHEMISTRY AND MOLECULAR REARRANGEMENT**

**L T P C**

**5 0 0 4**

**Objective:** To understand about what is isomers their classification conformational analysis and the mechanism of important rearrangement.

**UNIT-I Stereoisomerism** **15**

Definition – classification into optical and geometrical isomerism. Optical isomerism: optical activity – conditions for optical activity – asymmetric center – chirality – methods of racemisation and resolution – asymmetric synthesis – (partial and absolute) – Walden inversion.

**UNIT-II Absolute Configuration** **15**

Cahn – Ingold – Prelog rules, R-S notations (Biphenyl, Allene, Spirane and Hexahelicene) for optical isomers with one and two asymmetric carbon atoms (configuration of Glyceraldehyde, Ioserin, Lactic acid and Tartaric acid).

**UNIT-III Geometrical Isomerism** **15**

Cis, *trans* and E, Z notations – geometrical isomerism in maleic, fumaric acid, disubstituted cyclopropane, disubstituted 1, 2-cyclobutane, 1,3-disubstituted cyclobutane, disubstituted cyclopentane and cyclohexane) physical and chemical methods of distinguishing geometrical isomers.

**UNIT-IV Conformational Analysis** **15**

Conformers-dihedral angle – conformational analysis of ethane and n-butane – energy diagram – conformers of cyclohexane – boat, twisted boat and chair forms. Conformation and stability of 1,2-,1,3-, 1,4-dimethylcyclohexane and conformation of decalin.

**UNIT-V Molecular Rearrangements** **15**

Mechanism, examples for Pinacol-Pinacolone, Wagner Meerwein, Wolff, Beckmann, Hofmann, Benzilic acid, Cope and Claisen rearrangements. Migration aptitude, Nighboring group participation and their role in rearrangements.

**Total: 75 hours**

**Outcome:**

- To recognize and comment on different synthetic strategies and methods for stereocontrol when faced with a synthetic scheme
- To predict the conformational preferences of common organic structures based on steric and electronic interactions and describe stereochemical and conformational structure on the chemical reactivity and on the mechanisms of organic reactions
- To discuss the significance of chirality of allenes, spiranes and biphenyls
- To draw mechanisms for reactions involving heterocycles as starting materials, intermediates and products, and to propose syntheses of heterocycles from the major classes
- To describe about aromaticity, nonaromaticity and antiaromaticity in carbocyclic and heterocyclic compounds
- To clearly explain the physical and chemical methods of distinguishing geometrical isomers

- To expand conformational analysis of ethane and n-butane and energy diagram
- To extend skills in conformational analysis for boat, twisted boat and chair forms
- To provide an understanding the concepts and mechanism of various rearrangements
- To extend skills in the neighboring group participation and their role in rearrangements

**Text books:**

1. I. L. Finar. "Organic chemistry: Stereochemistry and the Chemistry of Natural Products. Vols. II, Pearson education, London 5<sup>th</sup> edition, **1975**.
2. P. S. Kalsi, "Stereochemistry: Conformation and Mechanism" New age international Pvt ltd. 6<sup>th</sup> edition **2005**

**Reference Books:**

1. Robert Thornton Morrison, Robert Neilson Boyd, "Organic Chemistry" Ashok K. Ghosh 10<sup>th</sup> edition, **2013**
2. Dr. Jagadamba singh, Dr. L. D. S. Yadav, "Advanced Organic Chemistry" Pragati Prakashan, 7<sup>th</sup> Edition, **2011**

**L T P C**

**15BCH020**

**INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS**

**0 0 3 2**

**Objective:** To learn the operating procedure of different analytical instruments by means of simple experiments

**At least eight experiments to be performed**

1. Determination of the isoelectric pH of a protein.
2. Titration curve of an amino acid.
3. Determination of the void volume of a gel filtration column.
4. Determination of a Mixture of Cobalt and Nickel (UV/Vis spec.)
5. Study of Electronic Transitions in Organic Molecules (i.e., acetone in water)
6. IR Absorption Spectra (Study of Aldehydes and Ketones)
7. Determination of Calcium, Iron, and Copper in Food by Atomic Absorption Spectroscopy
8. Quantitative Analysis of Mixtures by Gas Chromatography (i.e., chloroform and carbon tetrachloride)
9. Separation of Carbohydrates by HPLC
10. Determination of Caffeine in Beverages by HPLC
11. Potentiometric Titration of a Chloride-Iodide Mixture
12. Cyclic Voltammetry of the Ferrocyanide/Ferricyanide Couple

**Outcome:**

- To develop expertise relevant to the professional practice of chemistry

- To develop an understanding of the range and theories of instrumental methods available in analytical chemistry
- To develop knowledge pertaining to the appropriate selection of instruments for the successful analysis of complex mixtures
- To develop an understanding of the role of the chemist in measurement and problem solving in chemical analysis
- To provide practical experience in selected instrumental methods of analysis
- To expand skills in the scientific method of planning, developing, conducting, reviewing and reporting experiments
- To understand spectrometry methods of chemical analysis
- To differentiate among molecular absorption, atomic absorption and atomic emission spectrometry
- To extend skills in procedures and instrumental methods applied in analytical tasks
- To extend understanding of the professional and safety responsibilities residing in working on environmental problems

**Text Book:**

1. Douglas A. Skoog, F. James Holler, and Stanley Crouch “Principles of Instrumental Analysis” Wardsworth New York, 9<sup>th</sup> edition, **2011**.

**Reference Books:**

1. B. K. Sharma. “Instrumental method of chemical analysis” Goel publishing house, 27<sup>th</sup> edition, **2011**.
2. Grudeep R. Chatwal, Sham K. Anand. “Instrumental Methods of Chemical Analysis” Himalaya Publishing House, 5<sup>th</sup> edition, **2013**.
3. Robert M. Silverstin, Clayton Bassler and Terence C. Morrill, “Spectrophotometer Identification of organic compounds” John Wiley Sons. 6<sup>th</sup> edition, **2009**.
4. H. H. Willard, J. A. Dean, L.L. Merit “Instrumental method of chemical analysis” Words Worth, 7<sup>th</sup> edition, **1999**.

**DISCIPLINE SPECIFIC ELECTIVE (DSE) COURSES  
SYLLABUS**

**ALLIED BIOTECHNOLOGY**

**L T P C  
4 0 0 2**

**Objective:** To provide overall knowledge about the basic and advances in biotechnology

**UNIT I Introduction**

**15**

The molecules of life, architecture of prokaryotic and eukaryotic cells. Structural organization and function of intracellular organelles: Cell wall, Cell membrane, Nucleus, Mitochondria, Golgi bodies, Lysosomes, Endoplasmic reticulum, Peroxisomes, Plastids, Vacuoles. Cell division and cell cycle: Mitosis and Meiosis

**UNIT II Structure and function DNA, RNA and Protein**

**15**

Structure and function of DNA, RNA and Protein. Molecular structure of genes, and chromosomes. Conjugation, Transformation, Transduction – Operon model – plasmids – Transposons. Introduction to genetic engineering and its importance. Fundamental principles of cloning vectors – Gene cloning and gene transfer technologies. Intellectual Property Rights (IPR) and patents.

**UNIT III Basic concepts in plant and animal biotechnology**

**15**

Basic concepts in plant and animal biotechnology. Plant tissue culture, micro propagation, protoplast culture and its applications. In vitro fertilization and embryo transfer in animals. Introduction to nanobiotechnology. Impact of nano biotechnology in different fields. Future perspectives of Nanobiotechnology. Introduction to Stem cell biology.

**UNIT IV Fermentation technology**

**15**

Introduction to Fermentation technology, Basic principles in Fermentation process – Media formulation, Sterilizations-Batch and continuous sterilization systems. Bioreactors: Design, function and their parts. Continuous and fed batch cultures, Different types of reactors- packed bed reactor, fluidized bed reactor, trickle bed reactor and bubble column reactor.

**UNIT V Microbiology**

**15**

Introduction to Microbiology – Industrial uses of microbes — fermented foods, production of food (Single cell protein) and alcoholic beverages –, Fuel (ethanol). Methanogenesis – methane production. Biofertilizers (BGA), Biopesticide (*Bacillus thuringiensis*), Biopolymers, Biosurfactants. Concept and scope of environmental biotechnology

**Total: 75 hours**

**Outcome:**

- To learn the difference between the structure and function of prokaryote and eukaryotic cell and learning about the shape, structure and function of different cell organelles.
- To learn the growth and reproduction of living beings - cell division, mitosis and meiosis
- To learn about the molecular structure of gene, genetic exchange, genetic engineering and principles
- To learn about the Intellectual Property Rights and Patent
- To develop knowledge on Plant tissue culture, stem cell biology and invitro fertilization
- To get introductory knowledge on Nanobiotechnology, their applications and future prospective
- To learn about fermentation technology, sterilization and media formulation
- To learn about different types of fermentors and fermentation process



- To learning about the application of microbes in industries like food and beverages, Biofuels, Biofertilizers and Biopesticides
- To get knowledge on application of microbes in environmental biotechnology, biopolymers and biosurfactants

#### **Text Books:**

1. Pelczar M.J, Chan ECS, King NR, McGraw – Hill, Inc.NY. 2001 Microbiology- Concepts and Applications. Tata Mac. Graw Hill.
2. Ananthanarayan, R and Paniker, C.K.J. 2005. A textbook of microbiology. 7<sup>th</sup> edition. Orient Longman Ltd.
3. Robert J. Brooker, 2014, Genetics: Analysis and Principles, 5<sup>th</sup> edition, McGrawHill.
4. Eldon John Gardner, Michael J. Simmons, D. Peter Snustad, 2012, Principles of Genetics, 8<sup>th</sup> edition, John Wiley and Sons.

#### **Reference Books:**

1. Lodish, H. Berk, A., Zipursky, S.L., Matsudaria, P., Baltimore, D., and Darnell, J. 2000. Molecular Cell 3.Biology. Media connected, W. H. Freeman and Company.
2. E.D. D. De Robertis, E.M.F. De Robertis, Jr. 2012. Cell and Molecular Biology, Wolters Kluwer India Pvt. Ltd.
3. P. S. Verma, V.K. Agarwal. 2014. Cytology, S. Chand and Company Pvt. Ltd.
4. K.K Jain. 2006. Nanobiotechnology in Molecular Diagnostics: Current techniques and application .Horizon Bioscience.
5. C.M. Mirkin, C.A. (Eds) . 2004. Nanobiotechnology Concepts, Application and Perspectives, Wiley – VCH, Weinheim.
6. P.F.Stanbury, A.Whitaker and S.J.Hall.2012.Principles of Fermentation Technology.2<sup>nd</sup> edition.Elseveir Science Limited.
7. Micheal J.Waites.Neil l. Morgan, John S.Rockey and gary Higton.2001.Industrial Microbiology.Blackwell Science Publisher.United Kingdom.

### **ALLIED BIOTECHNOLOGY PRACTICAL**

**L T P C**  
**0 0 3 2**

**Objective:** To provide overall knowledge about the basic and advances in biotechnology laboratory techniques.

1. Good laboratory Practices (GLP)

2. Sterilization Techniques
3. Handling of microscope
4. Observation of prokaryotic, eukaryotic cell under microscope.
5. Mitosis and Meiosis studies
6. Isolation of bacteria from soil
7. Isolation of DNA from Bacteria (Demo Practical)
8. Electrophoresis of DNA
9. Functioning of PCR
10. Inoculation of Leaf tissue in media
11. Preparation of animal cell culture
12. Functioning of Fermentor

**Outcome:**

- To learn to maintain good laboratory Practice in Biological laboratory
- To learn to maintain Primary Protective Equipment, Sterilization techniques and cleanliness of laboratory
- To learn to use and maintain the microscope; they can visualize the cells of prokaryotes and eukaryotes
- To Learn about cell growth and reproduction through mitosis and meiosis respectively
- To learn how to isolate the microbes from soil, air and water
- To learn to isolate DNA, separation and amplification of DNA using PCR
- To learn to propagate animal and plant cell in laboratory
- To learn about the operation of fermentors and its application in biotechnology

**Text Books:**

1. Ritu Mahajan, Jitendra Sharma, R.K. Maharajan, “Practical Manual of Biotechnology”, Vayu Education of India, 2010.
2. P.Gunasekar, 1995. Laboratory Manual in Microbiology. New Age International Private Ltd. Publishers, New Delhi, Chennai.

**Reference Books:**

1. James G. Cappucino Natalie Sherman 1999. Microbiology – A Laboratory Manual 4<sup>th</sup> Edition – Wesley California, England.1999.
2. Michael R. Green, Joseph Sambrook, Molecular Cloning: A Laboratory Manual (Fourth Edition), 2014.
3. Ian Freshney R. “Culture of Animal Cells: A Manual of Basic Technique”, Wiley-Liss, 2005.

**ALLIED MATHEMATICS**

**L T P C  
5 0 0 3**

**Objective:** To impart the knowledge of basic Mathematics to the students. This will be useful for studying various problems in the field of Chemistry.

## UNIT- I MATRICES

15

Matrix – Basic definition of matrix –Symmetric, Skew-symmetric, Orthogonal and Unitary matrices- Inverse of matrix-Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof) - Computation of inverse matrix using Cayley – Hamilton theorem-Solution of linear equations –Matrix Method, Cramer’s rule.

## UNIT- II THEORY OF EQUATIONS

15

Polynomial equations with real coefficients, irrational roots, complex roots, - Symmetric functions of roots-Transformation of equation by increasing or decreasing roots by a constant reciprocal equations- Newton’s method to find a root approximately – Simple problems.

## UNIT- III FINITE DIFFERENCES

15

Operators- difference tables- Newton’s forward and backward interpolation formulae- Lagrange’s interpolation formulae.

## UNIT- IV TRIGONOMETRY

15

Expansions of  $\sin^n \theta$  ,  $\cos^n \theta$  ,  $\tan^n \theta$  - expansions of powers of  $\sin^n \theta$  ,  $\cos^n \theta$  .

## UNIT –V ORDINARY DIFFERENTIAL EQUATIONS

15

Ordinary differential equations: First order of higher degree equations – Second order and non-homogenous linear differential equations with constant coefficient – Second order linear differential equations with variable coefficients.

**Total: 75 hours**

### Outcome:

- To apply mathematical concepts and principles to perform computations
- To apply mathematics to solve problems
- To create, use and analyze graphical representations of mathematical relationships
- To communicate mathematical knowledge and understanding
- To apply technology tools to solve problems
- To perform abstract mathematical reasoning
- To learn independently
- To demonstrate the effective use of mathematical skills to solve quantitative problems from a wide array of authentic contexts
- To demonstrate the ability to make rigorous mathematical arguments in axiomatic and non-axiomatic systems
- To demonstrate effective written communication of mathematical concepts

### Text Book:

1. P.R. Vittal, Allied Mathematics, Margham Publications, 4<sup>th</sup> Edition 2009.

### Reference Books:

1. A. Singaravelu, Allied Mathematics, Meenakshi Agency, 2007.

2. S. Arumugam, A. Thangapandi Isaac and A. Somsundaram, Numerical Methods, Scitech Publications India Pvt. Ltd.2001.

## COMPUTERS IN CHEMISTRY

L T P C  
4 0 0 3

**Objective:** To learn the basic operating techniques in computer, cheminformatics, databases, molecular modeling, QSAR and pattern recognition.

### Unit – I Introduction 12

Overview of computer, operating system and programming languages. Introduction to chemometric and cheminformatic methods and applications in solving chemical problems.

### Unit – II Representation of chemical structures 12

Fragment code, linear notation, SMILES and connection table

### Unit – III Databases in Chemistry & Molecular modeling 12

Chemical structure databases. Molecular similarity and structural searching. Molecular mechanic (force field) and molecular orbital (ab initio and semi-empirical) methods

### Unit – IV QSAR 12

Quantitative structure activity/property relationships, applications in predicting biological activities and physicochemical properties, drug design.

### Unit – V Pattern Recognition 12

Supervised and unsupervised methods, linear discriminant analysis (LDA), K-nearest neighbors (KNN), Principal Component's analysis (PCA) and Hierarchical Clustering.

**Total: 60 hours**

### Outcome:

- To understand the different types of tools in computers
- To apply the tools needed to programme much of the chemistry problems
- To establish on building of their own programmes to solve the challenging chemistry problems

### Text Books:

1. Computing Fundamentals & C Programming, E. Balagurusamy, Tata McGrawhill.
2. MS officice 2000 ,Sanjay Saxena, Vikas publication house pvt.ltd.
2. Microsoft Office Access 2007: The Complete Reference ,Virginia Andersen
3. E. Horowitz, S. Sahni and S. Rajasekaran, 1999, Computer Algorithms, Galgotia, New Delhi.

### Reference Book:

1. Microsoft Office 2003 : The Complete Reference ,Jennifer Ackerman Kettell , Guy Hart-Davis , Curt Simmons , McGraw-Hill Osborne; 2 edition (2003)

## COMPUTERS IN CHEMISTRY PRACTICAL

L T P C  
0 0 3 2

**Objective:** To learn about Ms-Word, Ms-Excel, Ms-Access, Ms-Powerpoint

### Ms-Word

1. Working with formatting Document using different styles and table.
2. Working with mail merge
3. Working with macros.

#### **Ms- Excel**

4. Working with formatting, protection, goal seek and scenarios in worksheet
5. Working with Import external data, sort &filter, functions in worksheet
6. Working with types of charts
7. Working with calculations in various applications

#### **Ms- Access**

8. Working with inventory system with report
9. Working with payroll system with report
10. Working with Student information system with report

#### **Ms- PowerPoint**

11. Create text and images with various effects
12. Create animation and sound effects

#### **Outcome:**

- Familiar to work with sof Ms-Word, Ms-Excel, Ms-Access, Ms-Powerpoint

#### **Text Books:**

1. Computing Fundamentals & C Programming, E.Balagurusamy, Tata McGrawhill.
2. MS officice 2000 ,Sanjay Saxena, Vikas publication house pvt.ltd.
3. Microsoft Office Access 2007: The Complete Reference, Virginia Andersen E. Horowitz, S. Sahni and S. Rajasekaran, 1999, Computer Algorithms, Galgotia, New Delhi.

#### **Reference Book:**

1. Microsoft Office 2003: The Complete Reference ,Jennifer Ackerman Kettell , Guy Hart-Davis , Curt Simmons , McGraw-Hill Osborne; 2 edition (2003)

**L T P C**

### **FOOD CHEMISTRY AND ADULTRATION**

**4 0 0 3**

**Objective:** To know about various constituents of food, their relations to health beverages food additives, modern food pesticides, fumigants, insect control, food adultration and hygene

#### **UNIT I Introduction**

**12**

**Food:** source, functions of food – food groups – food guide – basic five food groups, usage of the food guide – food in relation to health – objectives of cooking.

**Water:** Purification processes – Ion exchangers, reverse osmosis, activated charcoal treatment. Use of chlorination, ozone, and UV light disinfection. Specification of drinking water. Water bore diseases – microbiological examination. Sources and detection.

## **UNIT II Constituents of Foods**

**12**

**Carbohydrates:** Classification, structure and reactions of monosaccharides, glucose, fructose, structure of sucrose, maltose, lactose and starch. Artificial sweetening agents. Effect of cooking on the nutritive value of rice and of baking of wheat – bread and biscuit, processing and storage of carbohydrates. Principles involved in the analysis of carbohydrates – analysis of glucose, starch, Benedict method, Anthrone method, Neilson–Somoyogi method, analysis of crude fibers – estimation of carbohydrates in wheat flour

**Proteins:** Amino acids – peptides – proteins, modification of food products through heat processing. Effect of cooking – steaming or cooking under pressure of legumes. Detoxication. Analysis of proteins – principles in the determination of moisture content, ash content, nitrogen content – Kjeldahl’s method. Separation of amino acids by paper chromatography, separation of proteins by electrophoresis. Enzymes: Nomenclature, classification – Apo, holo and coenzymes. Enzymes used in food processing. Enzymic browning – mode of action, secondary reaction of o-quinones, prevention of enzymic browning – thermal inactivation, pH, antioxidants Non-enzymic browning-Maillard reaction, prevention of non-enzymic browning. Measurement of enzyme activity- principles, estimation of the activity of catalase in Chow-chow and radish (Titrimetry) – principles.

**Minerals and vitamins:** Sources, functions, bioavailability and deficiency of the following minerals (calcium, iron, iodine, fluorine, sodium and potassium (elementary treatment). Vitamins – classification, sources, functions and deficiencies of fat- soluble vitamins – A, D, E and K, water-soluble vitamins – C, thiamin, riboflavin, B complex, - B6, Folic acid and B12. Fortification with vitamins and minerals. Effect of cooking on vitamins and minerals – different methods of cooking of vegetables, fruits – dehydrated fruits, canned fruit, canned fruit juices. Estimation of thiamine and riboflavin (fluorimetry), Estimation of metals in tea dust – principles.

**Lipids:** Nomenclature and classification. Emulsions and emulsifiers, rancidity of fats –chemistry of fat and oil processing – function and storage of fats. Heat treatment on the nutritive value of oilseeds, nuts and oil-seedmeals. Role of MUFA and PUFA in preventing heart diseases. Analysis of oils and fats – analysis of crude fats and determination of iodine number, RM value, acid number and soapification values – principles.

## **UNIT III Food and Food Additives**

**12**

**Beverages:** Soft drinks, soda, fruit juices and alcoholic beverages (Types and content of alcohol). Examples, Carbonation. Addiction to alcohol. Cirrhosis of liver. Social problems. Composition of soft drinks. Excessive use leading to urinary bladder stones. Preservation of tetrapak. Nitrogen preservation and packing of fruit juices. Coconut water.

**Food additives:** Artificial sweeteners – saccharin, aspartame – food flavours – esters, aldehydes and heterocyclic compounds. Antioxidants. Food colours – changes in cooking. Restricted use. Spurious

colours. Emulsifying agents, preservatives – leavening agents. Baking powder –Yeast. Taste enhancers – MSG-vinegar

**Modern food:** Mushroom cultivation and types, spirulina composition. Snack foods. Production of bread, bun and biscuits. Raw materials, methods and machinery required. Candy manufacturing. Caramellisation. Fast foods. Instant foods. Dehydrated foods. Oleoresin of spices. Condiments.

#### **UNIT IV Pesticides, Fumigants and Insect control** **12**

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. Pesticide residues in grains, fruits and vegetables, meat, milk and milk products Pesticide cycles and their cumulative effects Fumigation techniques, various fumigants such as phosphene, ethylene dichloride, methylene chloride, etc. Estimation of pesticides and fumigants by GLC, TLC and Spectrophotometric methods.

#### **UNIT V Food Adultration and Hygiene** **12**

**Adulterants:** 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. Principles involved in the analysis of detection and prevention of food adulteration.

**Quality control:** Specifications and standards: PFA, FPO, FDA, drug license, WHO standards, ISI specifications, packing and label requirements, essential commodities act, consumer protection act. AGMARK.

**Food preservation and processing:** Food deterioration, methods of preservation and processing.

**Microbial growth:** growth curve of bacteria. Effect of environmental factors on growth of microorganisms. pH, water activity, oxygen availability temperature – beneficial effect of micro organisms Food borne illness – bacteria, virus, moulds and parasites. (Any two illness each).

**Total: 60 hours**

#### **Outcome:**

- To clearly explain about the basic food groups, sources, function, usage and objective of cooking
- Understanding about water purification processes such as Ion exchangers, reverse osmosis, activated charcoal treatment and also about water borne diseases
- To demonstrate the various constituents of food and principle involved in the analysis of glucose, starch by different methods such as Benedict method, Anthrone method, Neilson–Somoyogi method
- To describe the sources, classification, function and uses of lipids, minerals and vitamins in food industry
- To extend skills in beverages (soft drinks, fruit juices and alcoholic drinks), Addiction to alcohol: Social problem, Excessive use leading to urinary bladder stones and Cirrhosis of liver

- To understand about food additives, artificial sweeteners, food colours and modern foods such as snack foods, fast foods, Instant foods, dehydrated foods
- To be well versed in various pesticides used for food grain application
- Identify the appropriate estimation techniques for pesticides and pesticides and fumigants by GLC, TLC and Spectrophotometric method
- To understand about common adulterants in different foods and principles involved in the analysis of detection and prevention of food adulteration
- Gain knowledge about the specification and standards of quality control in food packaging and methods of food preservation and processing

### **Text Books**

1. Owen R Fennema, "Food Chemistry" Marcel Decker Inc., New York. 5<sup>th</sup> edition. **1996**.
2. Shakuntala Manay N. and Shadaksharaswamy M. "FOODS: Facts and Principles" New age International Pvt. Ltd. II ed. **2002**.

### **Reference Books:**

1. Srilakshmi B., Food Science, New age International Pvt. Ltd. Publishers, III ed. 2003.
2. Norman N. Potter , Food science, CBS publishers and distributors, New Delhi. 1994.
3. Swaminathan M. Advanced Text Book on Food and Nutrition , volume I and II Printing and Publishing CO., Ltd., Bangalore. 1993.
4. Swaminathan M. Text Book on Food chemistry, Printing and Publishing CO., Ltd.,Bangalore. 1993.
5. Lillian Hoagoland Meyer, Food Chemistry, CBS publishers and distributors, New Delhi. 1994.
6. Siva Sankar B., Food Processing and Preservation. Prentice – Hall of India Pvt. Ltd., New Delhi. 2002.
7. Ramakrishnan S., Prasannam K.G and Rajan R –Principles. Text book of medical biochemistry. Orient Longman Ltd. III ed. 2001.

## **DYE CHEMISTRY**

**L T P C**  
**4 0 0 3**

**Objective:** To understand what are dyes and pigments their classification, synthesis, reactions, applications in the field of textile, medicine, cosmetics, foods and beverage.

### **UNIT I Chromophores and Auxochromes**

**12**



Colour and constitution-Relationship of colour observed-to wave length of light absorbed-Terms used in colour chemistry-Chromophores, Auxochromes, Bathochromic shift, Hypsochromic shift. Colour of a substance-Quinonoid theory and molecular orbital approach.

## **UNIT II Classification of Dyes**

**12**

Classification of Dyes-chemical classification-classification according to their applications-Acid dyes-Basic dyes. Azoic dyes, mordant dyes, vat dyes, Sulphur dyes, Disperse dyes, Nitro dyes-and Nitroso dyes process of dyeing (simple treatment). Azo dyes-Principles governing azo coupling-mechanism of diazotization-Coupling with amines, coupling with phenols Classification according to the number of azo group & application-Tautomerism in azo dyes.

## **UNIT III Di and Triphenyl methane dyes and Phthalocyanines-Cyanine dyes**

**12**

Synthesis, reactions and applications of Di and Triphenyl methane dyes-phthalein dyes-Xanthen dyes-acridine dyes-sulphur dyes. Phthalocyanines-Cyanine dyes. Malachite green, Para-rosaniline, crystal violet.

## **UNIT IV Azine, Oxazine and Triazine Dyes**

**12**

Azine, Oxazine and Triazine Dyes. Synthesis and applications of quinonoid dyes including vat dyes based on anthraquinone.

## **UNIT V Pigments**

**12**

Pigments-requirements of a pigment: Typical Organic and Inorganic pigments- application and their uses in paints. Reaction of dyes with fibres and water-Fluorescent Brightening agents. Application of dyes in other areas-medicine, chemical analysis, cosmetics, colouring agents, food and beverages.

**Total: 60 hours**

### **Outcome:**

- To clearly explain about the basic concept of colour and constitution and relationship of colour observed-to wave length of light absorbed
- Understanding about Quinonoid theory and molecular orbital approach of a colour substance
- To extend skills about the classification of dyes such as Acid dyes, Basic dyes. Azoic dyes, Nitro dyes-and Nitroso dyes process of dyeing (simple treatment)
- Identify the classification according to the number of azo group & application
- Gain appreciation knowledge about the synthesis, reactions and applications of Di and Triphenyl methane dyes
- To understand the importance of different Phthalocyanines-Cyanine dyes, Malachite green, Para-rosaniline, crystal violet
- Combine dyeing processes and colorants, design dyeing-quality systems, develop manufacturing procedures

- Apply procedure and analyze structures for azine, oxazine, triazine dyes, quinonoid dyes including vat dyes
- Classify the types of organic and inorganic pigments and their uses in paints
- To be well versed in application of dyes in various fields such as medicine, chemical analysis, cosmetics, colouring agents, food and beverages

**Text books:**

1. S. K. Jain & S. K. Maikl “Modern paint pigment and Varnish” Industries Small business Publication, New Delhi. **2001**
2. I. L. Finar “Organic chemistry Vol. I & II, ELBS, 11<sup>th</sup> edition,2009

**Reference books:**

1. Dyes and their intermediates-E. N. Abraha, Bergamon Press, 1969.
2. The chemistry of synthetic dyes and pigments-H.A.Lubs, ACS Publication, Halner, 1970.
3. The chemistry of synthetic dyes Vol, I, II, III & IV-K.Venkataraman, Academic Press N.Y., 1949.
4. Physical and Chemistry applications of dyestuffs-F.P.Schafer, Springer-Veriag N.Y.1976.

**L T P C**

**AGRO INDUSTRIAL CHEMISTRY**

**4 0 0 3**

**Objective:** To know the various water sources, treatment analysis and its importance in agriculture, types of solid fertilizers, pesticides, sugar, oils, fats and waxes.

**UNIT I Water source for agriculture- Water Treatment & Water Analysis** **12**

Sources of water supply for agriculture. Hard and soft water. Water softening methods: lime soda process, phosphate conditioning, permutit and ion-exchange processes. Water analysis; determination of hardness of water, acidity, alkalinity, pH value, amount of free CO<sub>2</sub>, fluoride content, chloride content and their estimation. Biological oxygen demand (BOD), chemical oxygen demand (COD), chlorine demand and their determinations. Recycling of water.

**UNIT II Chemistry of soil-soil classification and soil analysis** **12**

Definition of soils. Classification of soils. Properties of soils-physical properties and mechanical analysis. Structure and Texture. Soil water, soils air and soil temperature. Chemical properties- soil mineral matter-soil colloids, ion-exchange reactions. Soil fertility and its evaluation. Soil organic matter and their influence on soil properties –N ratio effects. Soil reactions. Soil pH, acidity, alkalinity, buffering of soils and its effects on the availability of N, P, K, Ca, Mg, I, Al, Mn & sulphuric acid. Soils salinity, acid & alkaline soils- their formation and reclamation.

**UNIT III Fertilizers & Pesticides** **12**

Effect of N,P,K, secondary nutrients and micro nutrients on plant growth and development. Importance of nitrogenous fertilizers. Nitrogen cycle and fixation of atmospheric nitrogen. Principle and manufacture of ammonium nitrate, ammonium sulphate, and urea Phosphate fertilizers. Preparation and uses of mono and diammonium phosphates, super phosphate and triple super phosphate.

Potassium fertilizers-potassium nitrate, potassium chloride, potassium sulphate. Mixed fertilizers. Methods of compost in green manuring, concentrated organic manures and their chemical composition. Oil cakes, horn and hoof meal.

Pesticides Classification-Insecticides, fungicides and herbicides. General methods of preparation, application and toxicity. Insect attractants and repellants-fluorine compounds, boron compounds, arsenic compounds, organomercuric compounds, DDT, BHC, 2,4 -D compounds, pyridine compounds.

#### **UNIT IV Chemistry of sugar and fermentation**

**12**

Details of manufacture of sucrose from cane sugar-extraction of juice, purification, concentration, crystallization, separation and refining of crystals, recovery of sucrose from molasses. Manufacture of sucrose from beetroot. Estimation of sucrose and inversion sugar by polarimetry. Manufacture of alcohol from molasses and starch by fermentation process.

#### **UNIT V Oils, fats and Waxes**

**12**

Classification of oils fats and waxes: distinction between oil, fats and waxes hydrogenation of oils-principle and manufacturing details. Definition and determination of saponification value, acid value, iodine value RM value and Hehner value and their significance. Elaidin test for oils. Some common waxes like spermaceti, Bees wax, bayberry wax and their uses. Soap and its manufacture; toilet and transparent soaps. Cleansing action of soap. Detergent.

**Total: 60 hours**

#### **Outcome:**

- To explain about the basic concept of water source for agriculture and its classification and purification process
- To identify the appropriate water analysis method and learn about the recycling of water
- To extend skills about the classification of soils and its properties (physical and chemical)
- To gain appreciation knowledge about the soil analysis and understand the salinity, acid & alkaline soils- their formation and reclamation
- To understand the effect of nitrogenous fertilizers and their preparation and uses in agriculture
- To be well versed with preparation, application and toxicity of pesticides in agro industries
- To expand the knowledge in details about the manufacturing of sucrose from cane sugar and its extraction processes
- To identify the appropriate estimation techniques for sucrose, inverse sugar and alcohol
- To demonstrate the classification of oil, waxes and fats various and their principle and manufacturing details
- To list out the different determination methods of oils and also explain about Soap and its manufacture process

#### **Text Books:**

1. Applied Chemistry- Theory and Practise- O.P.Vermani & A.K.Narula
2. Industrial Chemistry-B. N. Chakrabarty

**Reference books:**

1. Nature and properties of soils-Harry, O Buckman N Yle C. Brandy
2. Soils Sceince-A.Sankara
3. Insecticides, Pesticides and Agro based Industries – R. C. Palful, K. Goel, R. K. Gupta
4. Industrial Chemistry-B. K. Sharma.

**L T P C****CHEMISTRY OF MATERIALS****4 0 0 3**

**Objective:** To know multiphase materials, liquid crystals, polymeric materials, organic solids and high Tc materials

**UNIT- I Multiphase Materials****12**

Ferrous alloys: Fe-C phase transformation in ferrous alloys: stainless steels, non-ferrous alloys, properties of ferrous and non-ferrous alloys and their applications.

**Thin films and Langmuir-Blodgett Films**

Preparation techniques; evaporation/sputtering. Chemical processes, MOCVD, sol-get etc. Langmuir-Blodgett (LB) film, growth techniques, photolithography, properties and applications of thin and LB films.

**UNIT- II Glasses and Ceramics Composites****12**

Glasses, Ceramics, Composites and nanomaterials, Glassy state, glass formers and glass modifiers, applications. Ceramic structures, mechanical properties, clay products. Refractories, characterizations, properties and application. Microscopic composites; dispersion-strengthened and particle-reinforced, fibre-reinforced composites, nanocrystalline phase, preparation procedures, special properties.

**UNIT- III Liquid Crystals****12**

Mesomorphic, liquid crystals, positional order, bond orientational order, nematic and smectic mesophases; smectic-nematic and clearing temperature-homeotropic, planar and schlieren textures, twisted nematics, chiral nematics, molecular arrangement in smectic A and smectic C phases, optical properties of liquid crystals. Dielectric susceptibility and dielectric constants. Lyotropic phases and their description of ordering in liquid crystals.

**Polymeric Materials:** Molecular shape, structure and configuration, crystallinity, and their applications. Conducting and ferroelectric polymers.

**UNIT- IV Ionic Conductors:****12**

Types of ionic conductors. Mechanism of ionic conduction, interstitial jumps (Frenkel), vacancy mechanism. Diffusion in superionic conductors. Phase transitions and mechanism of conduction in superionic conductors examples and applications of ionic conductors.

B- High Tc Materials: Defect perovskites, high Tc superconductivity in cuprates, preparation and characterization of 1-2-3 and 2-1-4 materials, normal state properties; anisotropy; anisotropy; temperature dependence of electrical resistance; optical phonon modes, superconducting state; heat

capacity; coherence length, elastic constants, position lifetimes, microwave absorption-pairing and multi gap structure· in high Tc materials applications of high Tc materials.

#### **UNIT- V Materials for solid State Devices:**

**12**

Rectifiers, transistors, capacitors-IV, V compounds, low- dimensional quantum structures; optical properties.

**Organic Solids.** Fullerenes. Molecular Devices: Conducting organics, organic superconductors, magnetism in organic materials. Fullerenes-doped, fullerenes as superconductors. Molecular rectifiers and artificial photosynthetic devices. Optical storage memory and sensors. Nonlinear optical materials: nonlinear optical effects. Second and third order-molecular hyperpolarisability and second order electric susceptibility-materials for second and third harmonic generation.

**Total: 60 hours**

#### **Outcome:**

- To clearly explain the phase transformation in ferrous alloys
- To know the concept of thin films and Langmuir-Blodgett Films
- To understand the concept of glasses, ceramics and composites
- To clearly explain the characterizations, properties and application nanomaterials
- To know the concept of polymeric materials and their applications
- To clearly explain the phase transitions and mechanism of conduction in superionic conductors and applications of ionic conductors
- To clearly explain the concept of molecular rectifiers and artificial photosynthetic devices
- To understand the materials for solid state devices

#### **Text Books:**

1. Solid State Physics, N.W. Ashcroft and N.D. Mermin Saunders College.
2. Material Science and Engineering. An Introduction. ·W.D. Callister. Wiley.

#### **Reference Books:**

1. Principles of the Solid State, H.v. Keer. Wiley Eastern.
2. Materials Science, J.e. Anderson, K.D. Leaver, J.M. Alexander and R.D. Rawlings, ELBS
3. Thermotropic Liquid Crystals Ed. G.W. Gray. John Wiley.
4. Handbook of Liquid Crystals. Kelker and Hafz. Chemie Verlag.

**L T P C**

#### **CHEMISTRY IN EVERYDAY LIFE**

**4 0 0 3**

**Objective:** To know about various compounds in nature, building materials, Food and nutrition, agriculture chemistry, color chemicals.

#### **Unit-I General survey of chemicals**

**12**

General survey of chemicals used in everyday life. Air- Components and their importance, Photosynthetic reaction, Green house effect and their impact on our life style. Water-sources of water, qualities of potable water, soft and hard water, methods of removal of hardness

**Unit – II Building materials** **12**

Building materials: - Cement, Ceramics, Glass and Refractories. Definition, composition and application only. Plastics: - Definition, Types with examples, uses, merits and demerits, environmental impact and awareness. Biodegradable polymers

**Unit –III Food and Nutrition** **12**

Food and Nutrition: Carbohydrates, proteins, Fats Definition source and their importance as food constituents balanced diet- Calorie, minerals and vitamins. Cosmetics: General formulation and possible hazards

**Unit – IV Agricultural chemistry** **12**

Agricultural chemistry: Fertilizers, Pesticides Classification and used Energy sources: Fuels classification –Solid, liquid and gaseous, nuclear fuel, propellants – utility and awareness

**Unit – V Color chemical** **12**

Color chemical: Pigments and Dyes: Example, uses. Explosives: Classification and examples. Chemistry in Technology: Uses, examples

**Total: 60 hours**

**Outcome:**

- To be well versed in general survey of chemicals
- To understand the concept of greenhouse effect and their impact on our life style
- To understand the composition and application of building materials
- To clearly explain the concept of food and nutrition
- To understand the importance of minerals and vitamins
- To understand the cache architecture and different cache mapping techniques
- To clearly explain the concept of various types of fertilizers, pesticides, classification and energy sources
- To understand the concept of pigments and dyes

**Text Book:**

1. A. K. De, Environmental Chemistry, Himalaya publishing house, 7th edition **2011**

**Reference Books:**

1. R. Norris Shreve “Chemical Process Industries” (4<sup>th</sup> Edition)

**Objective:** To know about history and development of forensic chemistry crime detection, forgery, counterfeit, misuse of drugs, cybercrime

**Unit I Introduction**

**12**

Definition, History, Development and Scope of Forensic Science. Divisions of Forensic Science and Laboratory Set up. Forensic Chemistry: Introduction, Conventional methods of chemical analysis, presumptive tests (colour & spot); Drugs of Abuse: Introduction and classification; Forensic Toxicology: Introduction and General Methods of chemical analysis for alcohol, Classification of Poisons.

**UNIT II Crime detection**

**12**

Accidental explosions during manufacture of matches and fire-works (as in Sivakasi). Human bombs, possible explosives (gelatin sticks, RDX). Metal detector devices and other security measures for VVIP. Composition of bullets and detection of powder burns. **Scene of crime:** finger prints and their matching using records. Smell tracks and police dogs. Analysis of blood and other body fluids in rape cases. Typing of blood. DNA finger printing for tissue identification in 55bodies. Blood stains on clothing. Cranial analysis (head and teeth).

**UNIT III Forgery and Counterfeiting**

**12**

Detecting forgery in bank cheques / drafts and educational records (mark lists, certificates), using UV-light. Alloy analysis using AAS to detect counterfeit coins. Checking silver line water mark in currency notes. Jewellery: detection of gold purity in 22 carat ornaments, detecting gold plated jewels, authenticity of diamonds (natural, synthetic, glassy).

**UNIT IV Medical Aspects: AIDS**

**12**

Cause and prevention. Misuse of scheduled drugs. Burns and their treatment by plastic surgery. Metabolite analysis, using mass spectrum – gas. Detecting steroid consumption among athletes and race horses.

**UNIT V Identification and Detection**

**12**

Identification and detection of biological fluids (Blood, Semen, Saliva and Urine) and their Medico-logical importance. Personal Identification through somatometry and Somatoscopy; Study and hair and fibers. Examination of skeletal remains-identification of bones, differentiation between human and non human, determination of age, sex and height from skeletal remains. Modern Developments and their concepts (Nacre analysis, Brain fingerprinting, DNA Profiling, voice identification, Cyber crime, Forensic Odontology and Bitemarks).

**Total: 60 hours**

**Outcome:**

- To be well versed in development and scope of forensic science
- To clearly explain the general methods of chemical analysis for alcohol and classification of poisons
- To understand the concept of crime detection
- To know the concept of DNA finger printing for tissue identification in bodies
- To clearly explain the forgery and counterfeiting
- To clearly understand burns and their treatment by plastic surgery
- To clearly explain the concept identification and detection of biological fluids and their Medico-logical importance
- To be well versed in modern developments and their concepts

#### **Text Books:**

1. B.R. Sharma: Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad (2003).
2. S. Nath: An Introduction to Forensic Anthropology, Gian Publishing House, N. Delhi (1989).

#### **Reference Books:**

1. K. S. Narayan Reddy, The Essentials of Forensic Medicine and Toxicology, 12<sup>th</sup> ed., Sri Lakshmi Art Printers, Hyderabad, 1990.
2. R. Saferstein: Criminalistics, Prentice Hall (1998).
3. W.G. Eckert: Introduction of Forensic Science, CRE Press, Bock Raton (1997).
4. I.P. Singh and M.K. Bhasin: A Laboratory Manual of Biological Anthropology, K.R. Enterprises, N. Delhi (2005).
5. S. Nath: Personal Identification through Fingerprints, Shree Publisher & Distributors, New Delhi (2006).

**GREEN METHODS IN CHEMISTRY**

**L T P C  
4 0 0 3**

**Objective:** To learn what is green chemistry twelve principles energy sources of a country and cases study



<b>Unit-I Introduction</b>	<b>12</b>
Definitions of Green Chemistry. Brief introduction of twelve principles of Green Chemistry, with examples, special emphasis on atom economy, reducing toxicity, green solvents,	
<b>Unit –II Alternative Sources of Energy</b>	<b>12</b>
Green Chemistry and catalysis and alternative sources of energy, Green energy and sustainability	
<b>Unit –III Surfactants</b>	<b>12</b>
Surfactants for Carbon Dioxide – replacing smog producing and ozone depleting solvents with CO <sub>2</sub> for precision cleaning and dry cleaning of garments.	
<b>Unit –IV Toxicity Replacement</b>	<b>12</b>
Designing of Environmentally safe marine antifoulant. Right fit pigment: synthetic azo-pigments to replace toxic organic and inorganic pigments.	
<b>Unit –V Green Synthesis</b>	<b>12</b>
An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn.	
<b>Total: 60 hours</b>	

**Outcome:**

- To understand the importance of Green methods and its need for future of the mankind
- To solve the problems of pollutions, degradation of environment
- To address the issues like degradation, global warming, the depletion of ozone layer and loss of biodiversity

**Text Books:**

1. Anastas, P.T. and Warner, J.K. Oxford Green Chemistry- Theory and Practical, University Press, 1998
2. Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker, 2001

**Reference Books:**

1. Cann, M.C. and Connely, M.E., Real-World Cases in Green Chemistry, American Chemical Society, Washington, 2000
2. Ryan, M.A. and Tinnesand, M., Introduction to Green Chemistry, American Chemical Society, Washington, 2002
3. Lancaster, Mike Green Chemistry: An Introductory Text 2<sup>nd</sup> Ed., RSC Publishing, ISBN 978-1-84755-873-2, 2010

**L T P C**  
**INDUSTRIAL CHEMICALS AND ENVIRONMENT 4 0 0 3**

**Objective:** To learn about various industrial gases chemicals and its impact on environment. Different type of pollution and its preventive measures

**Unit-I Industrial Gases and Inorganic Chemicals** **12**

*Industrial Gases:* Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene. *Inorganic Chemicals:* Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate.

**Unit-II Industrial Metallurgy** **12**

Preparation of metals (ferrous and nonferrous) and ultrapure metals for semiconductor technology.

**Unit-III Environment and its segments** **20**

Ecosystems. Air Pollution: Major regions of atmosphere. Air pollutants: types, sources, Photochemical smog: its constituents and photochemistry. Major sources of air pollution. Effects of air pollution on living organisms and vegetation. Greenhouse effect and Global warming, Ozone depletion. *Water Pollution:* Hydrological cycle, Sludge disposal. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange).

**Unit-IV Energy & Environment** **12**

Sources of energy: Coal, petrol and natural gas. Nuclear Fusion / Fission, Solar energy, Hydrogen, geothermal, Tidal and Hydel, etc. Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management.

**Unit-V Biocatalysis** **04**

Introduction to biocatalysis: Importance in – Green Chemistry and Chemical Industry.

**Total: 60 hours**

**Outcome:**

- To handle the chemicals safely in lab as well as industry
- To know the importance of isolations of metal and its different types of isolations and its various applications
- To address issues like degradation, global warming, the depletion of ozone layer and loss of biodiversity
- To understand the definition of energy, different sources of energy and various methods of its generation and its various bio- applications

**Text Books:**

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK. 7<sup>th</sup> edition **2011**
2. R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi. 4<sup>th</sup> edition **2007**

**Reference Books:**

1. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
2. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd

**Objective:** To understand business basics, project management. Financial aspects opportunities for chemistry in industry and intellectual properties

<b>Unit – I Business Basics</b>	<b>12</b>
Key business concepts: Business plans, market need, project management and routes to market.	
<b>Unit-II Chemistry in Industry</b>	<b>12</b>
Current challenges and opportunities for the chemistry-using industries, role of chemistry in India and global economies.	
<b>Unit –III Making money</b>	<b>12</b>
Various aspects of making profit profile and execution	
<b>Unit –IV Successful case – study</b>	<b>12</b>
Financial aspects of business with case studies	
<b>Unit –V Intellectual property</b>	<b>12</b>
Intellectual property, Concept of intellectual property, patents.	

**Total: 60 hrs**

**References:** [www.rsc.org](http://www.rsc.org)

**GENERIC ELECTIVE COURSES  
SYLLABUS**

**GENERIC ELECTIVE COURSES – SYLLABUS**

**SOFT SKILL I**

**Objective:**

- 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 08**

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 08**

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 08**

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 Counseling 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: 40 hours**

**Outcome:**

- 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:**

1. Barun K. Mitra, “Personality Development and Soft Skills”. Oxford University Press. New Delhi. 2011.
2. S.P. Sharma, “Personalilty Development”, Pustaq Mahal. New Delhi. 2010.

**Reference Books:**

1. Meenakshi Raman and Sangeetha Sharma, "Technical Communication", Oxford University Press. New Delhi, 2009.
2. A.S. Hornby: "Oxford Advanced Learner's Dictionary of Current English", Oxford University Press, 2007

**SOFT SKILL II****L T P C  
2 0 0 2****Objective:**

- 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****08**

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: 40 hours****Outcome:**

- 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:**

1. Barun K. Mitra, “Personality Development and Soft Skills”. Oxford University Press. New Delhi. 2011.
2. S.P. Sharma, “Personalilty Development”, Pustaq Mahal. New Delhi. 2010.

**Reference Books:**

1. Meenakshi Raman and Sangeetha Sharma, “Technical Communication”, Oxford University Press. New Delhi, 2009.
2. A.S. Hornby: “Oxford Advanced Learner’s Dictionary of Current English” Oxford University Press, 2007

**L T P C**

**GREEN CHEMISTRY**

**2 0 0 2**

**Objective:**

- 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**

**08**

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**

**08**

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**

**08**

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**

**08**

Introduction – How the green house effect is produced – Major sources of green house gases – Emissions of CO<sub>2</sub> – 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**

**08**

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**

#### **Outcome:**

- 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
- To know 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:**

1. M. Lancaster, “Green Chemistry: an Introductory Text”, RSC, 2002
2. Sheldon, Arends, Hanefeld, “Green Chemistry and Catalysis”, Wiley, New York, 2007

#### **Reference Books:**

1. Anastas & Warner, Green Chemistry : Theory & Practice ,Oxford Univ. Press,New York, 1998
2. S. E. Park, J. S. Chang, S. H. Jhung, “The Role of Catalyst for Green Chemistry”, Chemworld, Vol. 44 (8), 38, 2004

## **CHEMINFORMATICS**

**L T P C**  
**2 0 0 2**

#### **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 Cheminformatics** **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; Personalized medicine and gene-based diagnostics.

**Unit V Drug Design** **08**

Introduction to drugs, structure-based drug design. QSAR and 3D-QSAR Methods. Pharmacophore Design, Ligand-Based Design and *De Novo* Drug Design Virtual screening/docking of ligands. Protein structure, Drug action & enzymes. Drug action & receptors. Prediction of Binding Modes, Protein–Ligand binding free energies, Fragment-Based Drug Design, ADMET prediction.

**Total: 40 hours**

**Outcome:**

- To understand basis of group theory and its applications
- To know Logics, sets and functions can be studied
- To study the principles and theories of algorithms, induction Basics and process of photosynthesis
- To learn the Basics of stereochemistry and structure of proteins
- To study the history of science and chemical information could be well studied
- To discuss the biological database and Gene expression can well understand
- 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

**Text Books:**

1. P. Shanmughavel, “Principles of Bioinformatics”, Pointer publishers, 2005.
2. Arfken, “Mathematical Methods for Physicists” Academic Press, 1985

**Reference Books:**

1. P. Shanmughavel, “Trends in Bioinformatics”, Pointer publishers, 2006.



2. Francis A. Carey and Richard J. Sundberg, "Advanced Organic Chemistry-Part A & B" Third Edition, 1990.

## INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

L T P C  
2 0 0 2

**Objective:** 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 about 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 nanotechnology – 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**

### Outcome:

- 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:**

2. C. P. Poole and J.F. Owens, "Introduction to Nanotechnology", Wiley Interscience, 2003.
3. M. A. Ratner. And D. Ratner, "Nanotechnology: A Gentle Introduction to the Next Big Idea", Prentice Hall PTR, First Edition, 2002.
4. T. Pradeep, "Nano: The Essential Nanoscience and Nanotechnology", Tata McGraw hill, 2007.

#### **Reference Books:**

1. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications", Imperial College Press, 2004
2. C. N. R. Rao, A. Muller and A. K. Cheetham, "The Chemistry of nanomaterials: Synthesis, Properties and Applications", Wiley-VCH verlag GmbH & Co.KGA, 2004.

## **FOOD CHEMISTRY AND ADULTERATION**

**L T P C  
2 0 0 2**

**Objective:** 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**

Food: source, functions of food – food groups – food guide – basic five food groups, usage of the food guide – food in relation to health – objectives of cooking.

Water: Purification processes – Ion exchangers, reverse osmosis, activated charcoal treatment – Use of chlorination, ozone, and UV light disinfection. Specification of drinking water.

#### **Unit-II Constituents of Foods**

**08**

**Carbohydrates:** Classification, Principles involved in the analysis of carbohydrates – estimation of carbohydrates.

**Proteins:** amino acids – peptides – Analysis of proteins – Separation of amino acids by paper chromatography.

**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**

Artificial sweeteners – saccharin, aspartame – food flavours – esters, aldehydes and heterocyclic compounds. Antioxidants. Food colours – changes in cooking. Restricted use. Spurious colours. Emulsifying agents, preservatives – leavening agents. Baking powder – Yeast. Taste enhancers – MSG- vinegar

**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: 40 hours****Outcome:**

- To clearly explain about the basic food groups, sources, function, usage and objective of cooking
- To Understand about water purification processes such as Ion exchangers, reverse osmosis, activated charcoal treatment and also about water borne diseases
- Describe the sources, classification, function and uses of proteins, minerals and vitamins in food industry
- To understand about food additives, artificial sweeteners, food colours and modern foods such as snack foods, fast foods, Instant foods, dehydrated foods
- To be well versed in various pesticides used for food grain application
- To understand about common adulterants in different foods and principles involved in the analysis of detection and prevention of food adulteration

**Text Books:**

1. Owen R Fennema, “Food Chemistry”, Marcel Decker Inc., New York. 1996.
2. M. Swaminathan “Text Book on Food chemistry”, Printing and Publishing CO., Ltd. 1993.

**Reference Books:**

1. B. Siva Sankar, “Food Processing and Preservatio”, Prentice – Hall of India Pvt. Ltd., New Delhi. 2002.
2. S. Ramakrishnan, K. G. Prasannam, R. Rajan, ”Principles – Text book of medical biochemistry”, Orient Longman Ltd. Third Edition, 2001.

**SYLLABUS****ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)****L T P C****15LTA001****தமிழ் மொழி, இலக்கிய வரலாறு - அறிமுகம்-****5 004**

**நோக்கம்:** தமிழ்மொழி மற்றும் இலக்கியத்தின் வரலாற்றை அறிமுகம் செய்யும் நோக்கில் இப்பாடம் வடிவமைக்கப்பட்டுள்ளது. தமிழ்மொழியின் வரலாற்றை அறிவியல் கண்ணோட்டத்துடனும் மொழிக்குடும்பங்களின் அடிப்படையிலும் விளக்குகிறது. சங்க இலக்கியம் தொடங்கி, இக்கால இலக்கியம் வரையிலான தமிழிலக்கிய வரலாற்றை இலக்கிய வரலாறு அறிமுகப்படுத்துகின்றது. அரசு வேலை வாய்ப்பிற்கான போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையிலும் இப்பாடம் அமைந்துள்ளது.

அலகு 1 தமிழ் மொழி வரலாறு

13 மணி நேரம்

மொழிக்குடும்பம் - இந்திய மொழிக்குடும்பங்கள் - இந்திய ஆட்சி மொழிகள் - திராவிட மொழிக்குடும்பங்கள் - திராவிட மொழிகளின் வகைகள் - திராவிட மொழிகளின் சிறப்புகள் - திராவிட மொழிகளின் வழங்கிடங்கள் - திராவிட மொழிகளுள் தமிழின் இடம் - தமிழ்மொழியின் சிறப்புகள் - தமிழ் பிறமொழித் தொடர்புகள்.

அலகு 2 சங்க இலக்கியம்

12 மணி நேரம்

சங்க இலக்கியம் - எட்டுத்தொகை - நற்றிணை - குறுந்தொகை - ஐங்குறுநூறு - பதிற்றுப்பத்து - பரிபாடல் - கலித்தொகை - அகநானூறு - புறநானூறு - பத்துப்பாட்டு - திருமுருகாற்றுப்படை - சிறுபாணாற்றுப்படை - பெரும்பாணாற்றுப்படை - பொருநராற்றுப்படை - மலைபடுகடாம் - குறிஞ்சிப்பாட்டு, முல்லைப்பாட்டு, பட்டினப்பாலை - நெடுநல்வாடை - மதுரைக்காஞ்சி.

அலகு 3 அற இலக்கியங்களும் காப்பியங்களும்

11 மணி நேரம்

களப்பிரர் காலம் விளக்கம் - நீதி இலக்கியத்தின் சமூகத்தேவை - பதினெண்கீழ்க்கணக்கு நூல்கள் அறிமுகம் - திருக்குறள், நாலடியார்.

காப்பியங்கள் - ஐம்பெருங்காப்பியங்கள் மற்றும் ஐஞ்சிறுங்காப்பியங்கள் அறிமுகம் - காப்பிய இலக்கணம் - சிலப்பதிகாரம் - மணிமேகலை - சீவகசிந்தாமணி - வளையாபதி - குண்டலகேசி.

அலகு 4 பக்தி இலக்கியங்களும் சிற்றிலக்கியங்களும்

11 மணி நேரம்

தமிழகப் பக்தி இயக்கங்கள் - பக்தி இலக்கியங்கள் - சைவ இலக்கியம் - நாயன்மார்கள் அறுபத்து மூவர் - சமயக்குரவர் நால்வர் - வைணவ இலக்கியம் - பன்னிரு ஆழ்வார்கள் - முதல் மூன்று ஆழ்வார்கள்.

சிற்றிலக்கியக் காலம் - சிற்றிலக்கியங்கள் - வகைகள் - பரணி - கலிங்கத்துப்பரணி - குறவஞ்சி - குற்றாலக் குறவஞ்சி - பிள்ளைத்தமிழ் - மீனாட்சியம்மைப் பிள்ளைத்தமிழ் - தூது - தமிழ்விடு தூது - கலம்பகம் - நந்திக்கலம்பகம் - பள்ளு - முக்கூடற்பள்ளு.

அலகு 5 இக்கால இலக்கியங்கள்

13 மணி நேரம்

நவீன காலம் - நவீன இலக்கியம் - உள்ளடக்கம் - புதுக்கவிதை - தோற்றமும் வளர்ச்சியும் - நாவல் - முதல் மூன்று நாவல்கள் - நாவலின் வகைகள் - பொழுது போக்கு நாவல்கள் - வரலாற்று நாவல்கள் - சமூக நாவல்கள் - இக்கால நாவல்கள் - மொழிபெயர்ப்பு நாவல்கள் - சிறுகதை -வகைகளும் வளர்ச்சியும் - நாடகம் -காலந்தோறும் நாடகங்கள் - புராண இதிகாச நாடகங்கள் - சமூக நாடகங்கள் - வரலாற்று நாடகங்கள் - மொழிபெயர்ப்பு நாடகங்கள் - நகைச்சுவை நாடகங்கள்.

மொத்தம்: 60 மணி நேரம்

**கல்வித்திட்டப் பயன்கள்(Programme Outcome):** தமிழிலக்கிய வரலாற்றை முழுவதும் அறிமுக நிலையில் அறிந்துகொள்ளும் வகையில் இப்பாடத்திட்டம் பயனுடையதாக அமைகிறது. அரசுத் தேர்வுகள், பொது அறிவுப் போட்டிகள் போன்ற தமிழ் சார்ந்த இயங்குதளங்களில் இந்தப் பாடத்திட்டம் பயன்பாடுடையதாக அமையும்.

பார்வை நூல்கள்

1. அகத்தியலிங்கம். ச., "திராவிடமொழிகள் தொகுதி 1", மணிவாசகர் பதிப்பகம், முதற்பதிப்பு, 1978.
2. சக்திவேல். ச., "தமிழ்மொழி வரலாறு", மணிவாசகர் பதிப்பகம், முதற்பதிப்பு 1998.
3. பூவண்ணன், " தமிழ் இலக்கிய வரலாறு", சைவசித்தாந்த நூற்பதிப்புக் கழகம், முதற்பதிப்பு, 1998.
4. வரதராசன். மு., "இலக்கிய வரலாறு",சாகித்ய அகாதெமி, ஒன்பதாம் பதிப்பு, 1994.
5. விமலானந்தம். மது.ச., "இலக்கிய வரலாறு", பாரி நிலையம், மறுபதிப்பு, 2008.

**Objective:** To train the students in the use of Karyalayin Basha. To enable the students to develop the communication skill in Hindi language.

**Unit-I Gadya aur Karyalayin Basha** 12  
Mamata, -Yogyatha evam vyavasay kaa Chunaav Paribashik shabdavalil prashasanik  
vakyansh,padanam,

**Unit-II Gadya aur Sarkari Patra** 12  
Rajneethi kaa Bhantwara, , Samanya sarkari patra,gyapan,karyalay gyapan

**Unit-II Gadya aur Sarkari Patra** 12  
Computer nayi krantee kee dastak, , Karyalay aadesh,Ardha sarkari patra paripatra,Adhisoochana

**Unit-IV Gadya aur Samanya Patra** 12  
Raspriya, Samanya patra- chutti patra,sampadak ke naam patra, shikayati patra, pustak vikretha ke  
naam patra

**Unit-V Vyavasaayik patra** 12  
Bankon mein bach khaata kholne ke liye – chek buk ke liye, run lene hetu, chek buk gum ho jane  
hetu, kitaabon kaa krayadesh

**Total: 60 Hours**

**Outcome:**

- Through the story students will be familiar with the writing style of great writer “sri Jayashankar Prasad”,&can understand the situation of country during Mughal period .
- To make the children understand the importance of selecting a profession according to one’s own interest.
- To describe the present situation;politian’s behaviour& their selforiented activities.
- To explain the importance of computer in daily life in all the fields.
- This story helps the students to understand the Writing style of writer “Fanishwarnath renu”who Is wellknown for his village type Stories .
- Training them different types of letters& technical words will help the students to understand the
- official work in Hindi.

**Text Book:**

1. Gadya Aur Prayojanmulak Hindi ed by Dr. N. Lavanya Mayura Publishers, edition 2008

**Course objective:** To introduce French Language and enable the students to understand and to acquire the basic knowledge of French language with the elementary grammar.

**UNIT I INTRODUCTION****12**

Introduction - Alphabet – Comment prononcer, écrire et lire les mots- Base : Les prénoms personnel de 1<sup>er</sup>, 2<sup>ème</sup> et 3<sup>ème</sup> personnes – Conjugaisons les verbes être et avoir en forme affirmative, négative et interrogative

**UNIT II Leçons 1- 3****12**

Leçons 1.Premiers mots en français,- 2. Les hommes sont difficiles,- 3 Vive la liberté- Réponses aux questions tirés de la leçon - Grammaire : Les adjectives masculines ou féminines – Les articles définis et indéfinis – Singuliers et pluriels

**UNIT III Leçons 4- 6****12**

Leçons 4. L'heure, C'est 1 ; heure,- 5. Elle va revoir sa Normandie,- 6 .Mettez –vous d'accord groupe de nom - Réponses aux questions tirés de la leçon - Grammaire : A placer et accorder l'adjectif en groupe de nom- Préposition de lieu –A écrire les nombres et l'heure en français

**UNIT VI Leçons 7- 9****12**

Leçons 7. Trois visage de l'aventure,- 8. A moi, Auvergne,- 9. Recit de voyage – Réponses aux questions tirés de la leçon - Grammaire : Adjectif possessif – Les Phrases au Présent de l'indicatif - Les phrases avec les verbes pronominaux au présent

**UNIT V Composition****12**

A écrire une lettre à un ami l'invitant à une célébration différente ex : mariage – A faire le dialogue - A lire le passage et répondre aux questions

**TOTAL : 60 Hours****Text Book :**

1. Jacky GIRARDER & Jean Marie GRIDLIG, Méthode de Français PANORAMA, Clé International Goyal Publication, New Delhi., Edition 2004

**Reference Books:**

1. DONDO Mathurin , “ Modern French Course”, Oxford University Press., New Delhi., Edition 1997
2. Nitya Vijayakumar, “Get Ready French Grammar-Elementary”, Goyal Publications, New Delhi., Edition 2010

**Course objective:** To enable the students to develop their communication skills effectively. To make students familiar with the English Language. To enrich vocabulary in English. To develop communicative competent.

**UNIT I DETAILED POEMS I** **12**

1. On His Blindness - John Milton
2. The Village Schoolmaster - Oliver Goldsmith
3. The Daffodils - William Wordsworth

**UNIT II DETAILED POEMS II** **12**

1. Night and Death - Joseph Blanco White
2. The Ballad of Father Gilligan - W.B. Yeats

**UNIT III PROSE** **12**

1. Martin Luther King Jr. - Coretta s King
2. Albert Schweitzer - Norman Wymar
3. Stanley Finds Livingstone - Lawrence Wilson
4. Srinivasa Ramanujan - C.P. Snow
5. My Days - R.K. Narayan

**UNIT IV GRAMMAR** **12**

1. Articles
2. Prepositions
3. Tenses
4. Wh - Questions
5. Synonyms and Antonyms
6. One Word Substitution

**UNIT V COMPOSITION** **12**

1. Reading Comprehension
2. Filling up Forms
3. Railway Reservation/ Cancellation Forms
4. Bank-Chalan
5. Convocation Form
6. Money Order Form

**Total Hours: 60**

**Text Book:**

1. Mahadevan, Usha. *Empower with English, Sun Beams - I*. Emerald Pub: Chennai. 2012. Print.



15LTA002

தமிழிலக்கியம்

**நோக்கம்:** சங்க காலம் தொடங்கி தற்காலம் வரையிலும் தமிழில் உள்ள படைப்பிலக்கியங்களை இப்பாடம் அறிமுகம் செய்கின்றது. தமிழ் இலக்கியத்தில் தேர்ந்தெடுக்கப்பட்ட மிக முக்கியமான செய்யுட்கள், கவிதைகள், கதைகள், உரைநடை ஆகியவற்றைக்கொண்டு இப்பாடம் கட்டமைக்கப்பட்டுள்ளது. மாணாக்கரிடம் இலக்கியத் தேடலை உருவாக்குவதும், தற்சார்புடைய அறிவை மேம்படுத்துவதும் இப்பாடத்தின் நோக்கமாகும்.

அலகு 1 செவ்வியல் இலக்கியங்கள் 12 மணி நேரம்  
திருக்குறள்- அன்புடைமை, ஒழுக்கமுடைமை, பெரியாரைத்துணைக்கோடல் -மூன்று அதிகாரங்கள் முழுமையும்.

புறநானூறு- பாடல் எண்: 18, 55, 182, 183, 192 -ஐந்து பாடல்கள்.

குறுந்தொகை- பாடல் எண்: 2, 167, 27, 202, 184 - ஐந்து பாடல்கள்.

அலகு 2 காப்பியங்கள் 12 மணி நேரம்  
சிலப்பதிகாரம்- கனாத்திறம் உரைத்தக் காதை முழுவதும்.

மணிமேகலை- பவத்திறம் அறுக எனப் பாவை நோற்ற காதை முழுவதும்.

கம்பராமாயணம் - மந்தரைச் சூழ்ச்சிப்படலம் (தேர்ந்தெடுக்கப்பட்ட ஒன்பது பாடல்கள்).

அலகு 3 கவிதையும் புதுக்கவிதையும் 11 மணிநேரம்  
பாரதிதாசனின் 'தமிழியக்கம்' -(i) நெஞ்சு பதைக்கும் நிலை - (ii) இருப்பதைவிட இறப்பது நன்று - இரண்டு கவிதைகள்.

ஈரோடு தமிழன்பனின், "அந்த நந்தனை எரித்த நெருப்பின் மிச்சம்" என்னும் தொகுதியில் இடம்பெற்றுள்ள 'விடிகிறது' என்னும் புதுக்கவிதை.

அலகு 4 சிறுகதைகள் 12 மணி நேரம்  
தி. ஜானகிராமனின் 'சக்தி வைத்தியம்'

கி. ராஜநாராயணனின் 'கதவு' - இரண்டு கதைகள்

அலகு 5 உரைநடை 13 மணி நேரம்

வைரமுத்து எழுதிய 'சிற்பியே உன்னைச் செதுக்குகிறேன்' முழுவதும்

மொத்தம்: 60 மணி நேரம்

**கல்வித்திட்டப் பயன்கள் ) Programme Outcome):** சங்க இலக்கியம் தொடங்கி இக்கால இலக்கியம் வரையில் அமைந்த இலக்கியங்களின் அறிமுகமாக ஒருசில இலக்கியங்களில் இருந்து பாடப்பகுதிகள் தேர்வு செய்யப்பட்டு தமிழிலக்கியம் என்ற தலைப்பில் மாணவர்களுக்குக் கற்பிக்கப்படுகிறது. இவை இலக்கிய வெளிப்பாட்டுத் தன்மையை உணர்த்துவதாக அமைகிறது.

பாட நூல்கள்

1. இரவிச்சந்திரன். சு. (ப.ஆ), "செய்யுள் திரட்டு", வேல்ஸ் பல்கலைக்கழகம், முதற்பதிப்பு, 2008.
2. வைரமுத்து. இரா., "சிற்பியே உன்னைச் செதுக்குகிறேன்", திருமகள் நிலையம், பதினேழாம் பதிப்பு, 2007.

பார்வை நூல்கள்

1. பாலச்சந்திரன்.சு., "இலக்கியத் திறனாய்வு", நியூ செஞ்சுரி புக் ஹவுஸ், பத்தாம் பதிப்பு, 2007.
2. மாதையன்.பெ., "தமிழ்ச் செவ்வியல் படைப்புகள்", நியூ செஞ்சுரி புக் ஹவுஸ், முதல் பதிப்பு, 2009.
3. வரதராசன்.மு., "குறள் காட்டும் காதலர்", பாரி நிலையம், மறுபதிப்பு, 2005.

15LHN002

HINDI II

L T P C  
5 0 0 4

**Objective:** To enable the students to have the knowledge in contemporary literature of the modern era. It also provides an idea how translation to be effected.

<b>Unit-I Kahani Aur Ekanki</b> Poos Kee Raat., - <b>Duzhazar</b>	12
<b>Unit-II Ekanki aur Kahani</b> Vaapasi, Akeli, . Akbhari vigyapan	12
<b>Unit-III Kahani Aur Anuvad</b> Sharandatha - Anuvad anuched angreji se hindi me karne ke liye.	12
<b>Unit-IV Ekanki aur Anuvad</b> Raat ke Raahi Main Bhi Maanav hoon Anuvad anuched angreji se hindi me karne ke liye.	12
<b>Unit-V Kahani ,Ekanki Aur Anuvad</b>	12

Parda – Yeh Meri Janma Bhoomi Hai –anuvad anuched angreji se hindi me karne ke liye.

**Total: 60 Hours**

**OutCome:**

- This story explains the problems faced by the farmers ‘Upanyas samrat Premchand’ describes the life of a poor farmer who represents present day’s situation
- **‘Das hazar’(ekanki), Translation** Author ‘Uday Shankar bhatt’ criticized the rich&stingy person’s behaviour and explains the importance of human values in a humorous manner. By translating the English passage into Hindi, students learn the rules which should be followed while translation.
- Female writer ‘Usha priyamvada’ describes the mentality of a retired person in a beautiful manner
- **‘Akhbaari vijnapan’(ekanki), Translation** This humorous story written by ‘chiranchith’ points out the problems occur due to Carelessness&lack of communication.
- Writer ‘Mannu bhandari’ describes the condition of middle aged woman left lonely who longs only for love &affection&nothing else.
- **Raat ke raahi’, (ekanki), Translation** ‘Vrajabhushan’ shows the clear picture of cunning woman and creates Awareness
- Written by ‘Yashpal’, this story brings the clear picture of problems Faced by a poor muslim family.
- **‘Maim bhi maanav huum’(ekanki), Translation** Author ‘vishnu prabhakar’ describes the kalinga war&reasons behind samrat Ashok’s change of mind.
- This story written by ‘Ajneya explains the situation of Indian people who lived in Pakistan region after separation .
- **‘Yah meri janma bhumi hai’(ekanki), Translation** ‘Harikrishna premi’ points out the patriotism of a british girl who Was born in India &also the country’s condition at that time.

**Text Book:**

1. Sankalan Kahani evam Ekankied by Dr. N. Lavanya, Mayura Publishers, edition 2010

**15LFR002**

**FRENCH II**

**L T P C  
5 0 0 4**

**Course objective:** To fortify the grammar and vocabulary skills of the students. Enable the students have an idea of the French Culture and Civilization.

**UNIT I Leçons 10 – 11**

**12**

Leçons : 10. Les affaires marchent,- 11. Un après midi à problèmes- Réponses aux questions tirés de la leçon - Grammaire : Présent progressif, passé récent ou future proche – Complément d’objet directe – Complément d’objet indirecte.

**UNIT II Leçons 12 – 13**

**12**

Leçons : 12. Tout est bien qui fini bien,- 13. Aux armes citoyens – Réponses aux questions tirés de la leçon - Grammaire : Les pronoms « en ou y » rapporter des paroles - Les pronoms relatifs que, qui, ou où,

**UNIT III Leçons 14 – 15**

**12**

Leçons 14. Qui ne risqué rien n'a rien,- 15. La fortune sourit aux audacieux –Réponses aux questions tirés de la leçon – Grammaire : Comparaison – Les phrases au passé composé

**UNIT IV Leçons 16 – 18** **12**

Leçons16 La publicite et nos rêves 17 La France le monde 18 Campagne publicitaire Réponses aux questions tirés de la leçon - Grammaire :- Les phrases à l' Imparfait – Les phrases au Future

**UNIT V Composition** **12**

A écrire une lettre de regret// refus à un ami concernant l'invitation d'une célébration reçue- A écrire un essai sur un sujet générale - A lire le passage et répondre aux questions

**TOTAL : 60 Hours**

**Text Book :**

1. Jacky GIRARDER & Jean Marie GRIDLIG, « Méthode de Français PANORAMA », Clé Internationale , Goyal Publication, New Delhi., Edition 2004.

**Reference Books:**

1. DONDO Mathurin, “ Modern French Course”, Oxford University Press, New Delhi., Edition 1997.
2. Paul Chinnappane “ Grammaire Française Facile” , Saraswathi House Pvt.Ltd, New Delhi, Edition 2010

**15LEN002**

**English – II**

**L T P C**  
**5 0 0 4**

**Course Objective:** To enable the students to develop their communication skills effectively. To make students familiar with the English Language. To enrich vocabulary in English. To develop communicative competent

**UNIT I PROSE-I** **12**

1. On Saying 'Please' - A.G. Gardiner
2. Women, Not the Weaker Sex - M.K. Gandhi
3. The Sky is the Limit - Kalpana Chawla

**UNIT – II PROSE-II** **12**

1. Polluting the World - Edgar I. Baker
2. Dimensions of Creativity - Dr. A. P. J. Abdul Kalam
3. The Message of Visva – Bharati

**UNIT III SHORT STORIES** **12**

1. Open Window - H. H. Munro (Saki)
2. The Lion's Share - Arnold Bennett

3. The Sparrows - K.A. Abbas
4. The Cop and The Anthem - O- Henry
5. The Necklace - Guyde Maupassant

#### UNIT IV FUNDAMENTAL GRAMMAR SKILLS

12

1. Question Tags
2. Concord
3. Reported Speech
4. Idiom and Phrases

#### UNIT – V ADVANCED GRAMMAR SKILLS

12

1. Conditional Clauses
2. Cause and Effect
3. Simple, Complex, Compound
4. Framming Questions

**Total: 60 hours**

#### Text Book:

1. Rao, Shoba B. *Empower with English, Sun Beams - II*. Emerald Pub: Chennai. 2012. Print.

**L T P C**

**15LTA003**

**பயன்பாட்டுத் தமிழ்**

**5 0 0 4**

**நோக்கம்:** தற்கால அன்றாடத்தேவைக்குரிய வகையில் தமிழ்மொழியைச் செம்மையாகப் பயன்படுத்த வேண்டும் என்னும் நோக்கில் இப்பாடம் உருவாக்கப்பட்டுள்ளது. மாணாக்கரின் வேலைவாய்ப்பு நேர்காணல்கள் மற்றும் குழு உரையாடல்களை எதிர்கொள்வதற்கேற்ற பேச்சுத்திறன் மேம்பாடு, செய்தித்தாள்களை நுட்பமாக அணுகும்விதம், சிறந்த கடிதங்களை எழுதுவதற்கான பயிற்சி போன்ற பயன்பாடு சார்ந்த மொழிப்பயிற்சியை இப்பாடம் அளிக்கின்றது.

அலகு 1 மொழி

11 மணி நேரம்

பிழை நீக்கி எழுதுதல் - ஒற்றுப்பிழை நீக்கி எழுதுதல் - தொடர்பிழை நீக்கி எழுதுதல் - ஒற்று மிகும் இடங்கள் - ஒற்று மிகா இடங்கள் - பிற மொழிச் சொற்களை நீக்கி எழுதுதல் - பயிற்சிகள்.

அலகு 2 பேச்சு

13 மணி நேரம்

பேச்சுத்திறன் - விளக்கம் - பேச்சுத்திறனின் அடிப்படைகள் - வகைகள் - மேடைப்பேச்சு - உரையாடல் - குழுவாக உரையாடல் - பயிற்சிகள்.

தலைவர்களின் மேடைப் பேச்சுகள் - பெரியார் - அண்ணா - கலைஞர்.

அலகு 3 எழுதுதிறன்

12 மணி நேரம்

கலைச்சொல்லாக்கம் - தேவைகள் - கலைச்சொற்களின் பண்புகள் - கலைச்சொல்லாக்கத்தில் தவிர்க்க வேண்டியவை - அறிவியல் கலைச்சொற்கள்.

கடிதம் - வகைகள் - அலுவலகக் கடிதங்கள் - பயிற்சி - அறிஞர்களின் கடிதங்கள் - கடிதங்களின் வழி கற்பித்தல் - சில அறிஞர்களின் கடிதங்கள் - நேரு...,

அலகு 4 மொழிபெயர்ப்பு

13 மணி நேரம்

மொழிபெயர்ப்பு அடிப்படைக் கோட்பாடுகள் - மொழிபெயர்ப்பு முறைகள் - மொழிபெயர்ப்பாளரின் தகுதிகள்.

மொழிபெயர்ப்பு வகைகள் - சொல்லுக்குச் சொல் மொழிபெயர்த்தல் - தழுவல் - கட்டற்ற மொழிபெயர்ப்பு - மொழியாக்கப்படைப்பு - இயந்திர மொழிபெயர்ப்பு - கருத்துப்பெயர்ப்பு - மொழிபெயர்ப்பு நடை - மொழிபெயர்ப்பு சிக்கல்களும் தீர்வுகளும்.

பயிற்சி: அலுவலகக் கடிதங்களை மொழிபெயர்த்தல் (ஆங்கிலத்திலிருந்து தமிழுக்கு).

அலகு 5 இதழியல் பயிற்சி

11 மணி நேரம்

இதழ்களுக்குத் தலையங்கம் எழுதுதல் - நூல் மதிப்புரை எழுதுதல் - சாதனையாளரை நேர்காணல் - நிகழ்ச்சியைச் செய்தியாக மாற்றுதல்.

மொத்தம்: 60 மணி நேரம்

கல்வித்திட்டப் பயன்கள் ) Programme Outcome): நவீனக் காலத்திற்கும் தேவைக்கும் ஏற்றவாறு மொழியின் தேவையை மாணவர்கள் சரிவர அறிந்து கொள்ள வேண்டும் என்ற நோக்கில் பயன்பாட்டுத் தமிழ் என்ற பாடப்பகுதி அமைக்கப்பட்டுள்ளது. தவறின்றித் தமிழ் எழுதவும் அறிவியல் கலைச் சொற்களை உருவாக்கவும் பேச்சுத் திறனை வளர்ப்பதற்காகவும்

மொழிபெயர்ப்பு, இதழியல் சார்ந்த அறிவினைப் பெறுவதற்கும் அந்தந்த துறை சார்ந்த பணிகளில் வேலை வாய்ப்பு பெறுவதற்கும் இப்பாடத்திட்டம் பயன்படுகிறது.

பார்வை நூல்கள்

1. ஈஸ்வரன்.ச., சபாபதி.இரா., “இதழியல்”, பாவை பப்ளிகேஷன்ஸ், முதற்பதிப்பு, 2004.
2. ஈஸ்வரன்.ச., “மொழிபெயர்ப்பியல்”, பாவை பப்ளிகேஷன்ஸ், முதற்பதிப்பு, 2005.
3. எட்கர் தார்ப், ஷோவிக் தார்ப், “நேர்முகத் தேர்வில் வெற்றிபெற”, கிழக்குப் பதிப்பகம், இரண்டாம் பதிப்பு, 2009.
4. சுப்பிரமணியன்.பா.ரா., ஞானசுந்தரம்.வ., (ப.ஆ)“தமிழ்நடைக் கையேடு”, இந்தியமொழிகளின் நடுவண் நிறுவனம், மைசூர் மொழி அறக்கட்டளை மற்றும் தஞ்சைத்தமிழ்ப் பல்கலைக்கழகம் - வெளியீடு, நான்காம் மீள்பதிப்பு, 2010.
5. சுப்புரெட்டியார்.ந., “தமிழ் பயிற்றும் முறை”, மெய்யப்பன் பதிப்பகம், ஐந்தாம் பதிப்பு, 2006.

<b>15LHN003</b>	<b>HINDI III</b>	<b>LTPC 5004</b>
<b>Objective:</b> To help the students to have in depth knowledge of Literature. It makes the students to acquire more about the medieval period through the literary works.		
<b>Unit-I Prachin Kavya Hindi Sahitya ka Itihas</b>		<b>12</b>
Kabir- Hindi bash aka vikas – Hindi sahitya kaa aavirbahv		
<b>Unit-II Prachin Kavya Hindi Sahitya ka Itihas</b>		<b>12</b>
Surdaas, Tulsidass. Hindi sahitya kaa kaal vibhajan, aadikal, kaa Parichay		
<b>Unit-III Prachin Kavya Hindi Sahitya ka Itihas</b>		<b>12</b>
Rahim, aadikaal kaa namkran, paristhitiyan, racha evam rachnaakar		
<b>Unit-IV Bhakti Kaal, Reethi kaa</b>		<b>12</b>
Bhakti kal kaa vibhajan paristhitiyan- racha evam rachnaakar – Reethikal ke prakaar, rachna evam rachnakar		
<b>Unit-V Prachin Kavya evam rachnakaron kaa parichay</b>		<b>12</b>
Bihari - Chandbardayee, Ameerkhusaro, Kabir, Surdas, Tulsidas Jaayasi, Kesahv das Bhushan,		
		<b>Total : 60 Hours</b>

## Outcome

- To understand the writing style of Kabir & also learn valuable messages
- To learn the precious poems of Surdas & Sri Krishna Leela.
- To get the opportunity to learn the poems of Ram bhakthi poet Thulsi das .
- The poems of Rahim are different & valuable and students will get confidence & ideas to tackle the problems ahead.
- To understand the writing style of Bihari & the important messages

## Text Book:

1. Prachin evam Aadhunik Kavya Sankalan ed by Dr.N.Lavanya, Mayura Publishers, edition 2011

## Reference Book:

1. Hindi Sahitya kaa Itihas, By Dr.Nagendra, Raj kamal Prakashan, 1997

**15LFR003**

**FRENCH III**

**L T P C**  
**5 0 0 4**

**Course objective:** To strengthen the Grammar and Composition in French language. To train the students to enhance his skill in French language for communication

### UNIT I

**12**

Leçon 16 - La famille Vincent (Page 44) - Grammaire :Passé composé' Leçon 29 - Vers l'hôtel (page 80) Grammaire : Impératif, A mettre les phrases du singulier au pluriel

### UNIT II

**12**

Leçon 40 - L'épicerie, les légumes et les fruits (page 112) – Grammaire : Présent de l'indicatif  
Leçon 44 - La poste (page 124) – l Grammaire : A mettre les phrases à l'imparfait

### UNIT III

**12**

Leçon 51 - Le café et tabac (page 142) – Grammaire : A changer les phrases en Interrogatif  
Leçon 58 - La Chasse et la pêche (160) – Grammaire : Le plus que parfait

### UNIT IV

**12**

Leçon 61 Un mariage à la campagne (page 170) – Grammaire –A changer au participe présent

### UNIT V

**12**

Composition : A écrire une lettre à un ami l'invitant à une celebration differente ex : mariage –  
A faire un essaie sur un sujet générale - A lire le passage et répondre aux questions

**Total : 60 Hours**



**Text Book :**

1. Les leçons ont été choisis et tirés de I & II degré de G. MAUGER « Cours de Langue et de Civilisation Française » The Millennium, Publication Hachette, Edition 2002

**Reference Books :**

1. DONDO Mathurin, “Modern French Course”, Oxford University Press, New Delhi., Edition 1997.
2. Paul Chinnapan, « Saraswati Grammaire Française facile », Saraswathi House Pvt. Ltd., New Delhi., Edition 2010.
3. Larousse, “Larousse French Grammar”, Goyal Publication, New Delhi., Edition. 1995

**15LEN003****English – III****L T P C  
5 0 0 4**

**Course Objective:** To train the students in the use of the English language in varied literary and non literary context. To teach them soft skills and strengthen their foundation in grammar and composition. To elevate their comprehension skills

**UNIT I PROSE I****12**

1. Spoon Feeding – W. R. Inge
2. Reading for Pleasure – L. A. G. Strong
3. The Challenge of our Time – E. M. Forster

**UNIT II PROSE II****12**

1. Human Values in Education – V. K. Gokak
2. Human Rights – Sivagami Paramasivam

**UNIT III SHORT STORIES****12**

1. Comrades – Nanine Gordimer
2. Games at Twilight – Anita Desai
3. The Gateman’s Gift – R.K. Narayan

**UNIT IV PRIMARY COMPOSITION EXERCISES****12**

1. Letter Writing
2. Comprehension

**UNIT V ADVANCED COMPOSITION EXERCISES****12**

1. Precis-Writing
2. Resume Writing
3. Report Writing

**Text Books:**

1. Subramanian, S. Dr. *Words of Wisdom*. An Anthology of Modern Prose. Anu Chitra Pub., Chennai. 2003. P.
2. Subramanian, A, E. *Gifts to Posterity*. An Anthology of Modern Short Stories. Anu Chitra Pub., Chennai. 2003. P

L T P C

15LTA004

தமிழர் நாகரிகமும் பண்பாடும்

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**நோக்கம்:** பண்டைத் தமிழரின் வாழ்வியல் நெறிகள் இயல்பானதும் இயற்கையோடு இணங்கிச் செல்வதுமாகும்; மிகவும் பழமையானதும் பண்பட்டதுமாகும். அன்பான அக வாழ்க்கையைக்கூட செம்மையாகத் திட்டமிட்டுள்ளனர். பொழுதுபோக்கு, போர்முறைகள், கலை, சமயம், அரசியல், அறிவியல் என அனைத்திலும் தமிழர் சிறந்து விளங்குவதை விளக்கும் பாடமாக இது அமைந்துள்ளது. அரசு வேலை வாய்ப்பிற்கான போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையிலும் இப்பாடம் அமைந்துள்ளது.

அலகு 1 நாகரிகம், பண்பாடு

12 மணி நேரம்

சொற்பொருள் விளக்கம் - பண்டைத் தமிழர் வாழ்வியல் - அகம் - களவு - கற்பு - குடும்பம் - விருந்தோம்பல் - உறவு முறைகள் - சடங்குகள் - நம்பிக்கைகள் - பொழுதுபோக்கு - புறம் - போர் முறைகள் - நடுகல் வழிபாடு - கொடைப்பண்பு.

அலகு 2 கலைகள்

12 மணி நேரம்

சிற்பம் - ஓவியம் - இசை - கூத்து - ஒப்பனை - ஆடை அணிகலன்கள்.

அலகு 3 சமயம்

12 மணி நேரம்

சைவம் - வைணவம் - சமணம், பௌத்தம் வெளிப்படுத்தும் பண்பாடு.

அலகு 4 அரசியல்

12 மணி நேரம்

அரசு அமைப்பு - ஆட்சி முறை - உள்நாட்டு வணிகம் - வெளிநாட்டு வணிகம் - வரி வகைகள் - நாணயங்கள் - நீதி முறை.

அலகு 5 அறிவியல்

12 மணி நேரம்

கல்வி - வேளாண்மை - வானியல் அறிவு - மருத்துவம் - கட்டிடக்கலை.

மொத்தம்: 60 மணி நேரம்

**கல்வித்திட்டப் பயன்கள் (Programme Outcome):** தமிழர்களின் வாழ்வியல் முறைகள், தொன்மை, நாகரிகம், பண்பாட்டு முறைகளைப் பற்றி இலக்கியங்களின் வழித் தெரிந்துகொள்ளும் நோக்கில் இப்பாடத்திட்டம் உருவாக்கப்பட்டுள்ளது. அரசுப் பணி சார்ந்த தேர்வுகளுக்கும், போட்டித் தேர்வுகளுக்கும் இப்பாடப்பகுதி உறுதுணையாக அமையும்.

பார்வை நூல்கள்

1. கே.கே. பிள்ளை, “தமிழக வரலாறு: மக்களும் பண்பாடும்”, உலகத் தமிழாராய்ச்சி நிறுவனம், மீள்பதிப்பு, 2009.
2. பக்தவச்சல பாரதி, “தமிழர் மானிடவியல்”, அடையாளம், இரண்டாம் பதிப்பு, 2008.
3. தட்சிணாமூர்த்தி. அ., “தமிழர் நாகரிகமும் பண்பாடும்”, யாழ் வெளியீடு, மறுபதிப்பு, 2011.
4. தேவநேயப்பாவாணர். ஞா., “பழந்தமிழர் நாகரிகமும் பண்பாடும்”, தமிழ்மண் பதிப்பகம், சென்னை.
5. வானமாமலை.நா., “தமிழர் வரலாறும் பண்பாடும்”, நியூ செஞ்சுரி புக் ஹவுஸ், ஆறாம் பதிப்பு, 2007.

15LHN004

HINDI IV

L T P C  
5 0 0 4

**Objective:** To enable the students to acquire knowledge in journalism so as to enhance his skill in effective communication pertaining to Hindi language.

**Unit-I Aadhunika kavitha Aur Rachnaakar**

12

Mythili Sharan Gupt – Apna Sansar, Aadhunika Rachnakaar Hazaari 83rasad Diwedi, Mahaveer Prasad Diwedi,

**Unit-II Aadhunika kavitha Aur Rachnaakar**

12

Jayashankar Prasad Kamayani – Chinta, Aadhunika Hindi Rachanakaar Premchand, Jainendra

**Unit-III Aadhunika kavitha Aur Patrakaritha**

12

Mahadeviverma, Murjaya PhoolBhavani Prasad Mishra Patrakarita – paribhasha,, arth, prakar, swaroop

**Unit-IV Aadhunika kavitha , Patrakaritha aur Rachnakaar**

12

Mukthibodh Tum Logoan se door,Shamsher Bhadur Singh – Bharat kee aarathi, Vigyapan- sampadan kala,-Nirala, -Pant- Mohan Rakesh

## Unit-V Aadhunik kavitha , Patrakaritha aur Rachnakar

12

Prabhakar Machve Nimna Mdhya varg, **Patrabakaritha-** samachar sankalan – Peeth patrabakarita, Rachnakar – Fanishwaranath renu –Mannu bhandari, Bhagawaticharan Verma, Yashpal

**Total: 60 Hours**

### Outcome:

- Rashtra kavi'Maithili sharan gupta' dreams about his life in a beautiful manner & describes how is world should be. Journalism plays a great role in the development of a country .Through this students get an opportunity to know about Hindi journalism & the developments took place gradually
- Taken from 'Jayashankar prasad' 's Kamayani ,this poem explains the condition of human beings at different situations.
- 'Shri Gajanan madhav mukthi bodh' describes the present day's thought of a common man & expectations
- Poet 'Bhavani Prasad mishra ' points out the importance of love & affection and also the bad effects of enmity.
- 'Prabhakar machve' explains the condition of the middle class in 'Nimna Madhya varg 'Shamsher bahadur singh' 's poem 'Bharat ki aarthi' points out the importance of patriotism & our desires.

### Text Book:

1. Prachin evam Aadhunik Kavya Sankalan ed by Dr. N. Lavanya, Mayura Publishers, edition 2011

### Reference Book:

1. Patrabakaritha Ek Paricahy by Dr.Madhu Dhawan, Bodh Prakashan, edition 1997

**15LFR004**

**FRENCH IV**

**L T P C  
5 0 0 4**

**Course objective:** To enable the students to strengthen their knowledge of grammar/composition. To make the students to develop their skills of communication in French language

### UNIT I

12

Leçon 20 - Une grande Nouvelle (page 56) – Grammaire : A mettre les phrases au Future Leçon 46. – Le métro ; l'autobus (page 130) – Grammaire : A former ou à changer l'adjectif masculin ou féminin à l'adverbe – A trouver les noms qui correspondent aux verbes

### UNIT II

12

Leçon 48. – A la Préfecture de police (page 132) – Grammaire : Les Pronoms relatifs Leçon 63 - Les sports (page 174) Grammaire : Le conditionnel présent

### UNIT III

12

Leçon 56 - A Biarritz, la plage (page 156) - Grammaire : Le future antérieure Leçon 57 - Dans les Pyrénées (page 158) - Grammaire : Le future antérieure suite)

### UNIT IV

12

Leçons 65 - A fin des vacances (page 178) Grammaire : A changer les phrases du pluriel – au singulier – Le présent du subjonctif

**UNIT V****12**

Composition : A écrire une lettre de regret / refus à un ami concernant l'invitation d'une célébration reçue- A écrire un essai sur un sujet générale - A lire le passage et répondre aux questions

**Total : 60hours****Text Book :**

1. Les leçons ont été choisis et tirés de I & II degré de G. MAUGER « Cours de Langue et de Civilisation Française » The Millennium, Publication Hachette, Edition 2002

**Reference Books:**

1. DONDO Mathurin, "Modern French Course", Oxford University Press, New Delhi., Edition 1997.
2. Paul Chinnapan, « Saraswati Grammaire Française facile », Saraswathi House Pvt. Ltd., New Delhi., Edition 2010
3. Larousse, "Larousse French Grammar", Goyal Publication, New Delhi., Edition. 1995

**15LEN004****English – IV****L T P C  
5 0 0 4**

**Objective:** To train the students in the use of the English language in varied literary and non literary context. To teach them soft skills and strengthen their foundation in grammar and composition. To elevate their comprehension skills

**UNIT I PROSE I****12**

1. The Complete Man – Prince Philip
2. Try Prayer Power – Norman Vincent Peale
3. On Not Answering The Telephone – W. Plomer

**UNIT II PROSE II****12**

1. Science, humanities and religion – S. Radhakrishnan
2. The Reason – E. V. Lucas

**UNIT III SHORT STORIES****12**

1. The Ant and the Grasshopper – W. Somerset Maugham
2. How much land does a man need – Leo Tolstoy
3. The Dying Detective – Sir Arthur Conan Doyle

**UNIT IV PRIMARY COMPOSITION EXERCISES****12**

1. Business Letters
2. Hints Development

1. Paraphrasing
2. Writing Abstract
3. Dialogue Writing

**Total : 60hours**

**Text Books:**

1. Subramanian, S. Dr. *Words of Wisdom*. An Anthology of Modern Prose. Anu Chitra Pub., Chennai. 2003. P.
2. Subramanian, A, E. *Gifts to Posterity*. An Anthology of Modern Short Stories. Anu Chitra Pub., Chennai. 2003. P

**15EVS201**

**ENVIRONMENTAL STUDIES**

**L T P C**

**2 0 0 2**

**Objective:** To inculcate the importance of environmental pollution, preservation of nature and environmental management for human welfare.

**Unit-I Multidisciplinary nature of environmental studies**

**2**

Definition, scope and importance, need for public awareness.

**Unit-II Natural Resources**

**8**

Renewable and non-renewable resources - Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Role of an individual in conservation of natural resources- Equitable use of resources for sustainable lifestyles.

**Unit-III Ecosystems**

**6**

Concept of an ecosystem. - Structure and function of an ecosystem Producers, consumers and decomposers. -Energy flow in the ecosystem. Ecological succession. - Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Unit-IV Biodiversity and its conservation**

**8**

Introduction–Definition,genetic, species and ecosystem diversity. Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.

Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**Unit-V Environmental Pollution** **8**

Definition, Cause, effects and control measures of a) Air pollution b) Water pollution c) Soil pollution d) Marine pollution e) Noise pollution f) Thermal pollution g) Nuclear hazards. Solid waste Management. Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management- floods, earthquake, cyclone and landslides.

**Unit-VI Social Issues and the Environment** **7**

From Unsustainable to Sustainable development, Urban problems related to energy - Water conservation, rain water harvesting, watershed management- Resettlement and rehabilitation of people; its problems and concerns. Case Studies - Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act - Issues involved in enforcement of environmental legislation. Public awareness.

**Unit-VII Human Population and the Environment** **6**

Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

**Unit-VIII Field work** **5**

Visit to a local area to document environmental assetsriver/forest/grassland/hill/mountain, Visit to a local polluted site-Urban/Rural/Industrial/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hill slopes, etc.

**Total: 50 hours**

**OUTCOME**

- To understand the nature and facts about environment.
- To find and implement scientific, technological, economic solutions to environmental problems.
- To know about the interrelationship between living organisms and environment.
- To understand the integrated themes and biodiversity, natural resources, pollution control and waste management.
- To appreciate the importance of environment by assessing its impact on the human world.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To know about what is the role of an individual in Conservation of Natural Resources.
- To know about the various social issues.
- To understand the role of government in solving the environmental problems.
- To know about Population Growth and variation among Nations

**Text Books:**

1. De AK, Environmental Chemistry, Wiley Eastern Ltd.
2. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, India.

3. Brunner RC, 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480pgs.
4. Clark RS, Marine Pollution, Clanderson Press, Oxofrd (TB).

**Reference Books:**

1. Agarwal KC, 2001. Environmental Biology, Nidi Publishers Ltd. Bikaner.
2. Gleick HP, 1993. Water in Crisis, Pacific Institute for Studies in Development, Environment and Security. Stockholm Environmental Institute, Oxford University Press, 473pgs.
3. Heywood VH, and Watson RT, 1995. global Biodiversity Assessment. Cambridge University Press 1140pgs.
4. Jadhav H and Bhosale VM, 1995. Environmental Protection and Laws. Himalaya Publishing House, Delhi 284pgs.
5. Mckinney ML and Schoch RM, 1996. Environmental Science Systems and Solutions. Web enhanced edition, 639pgs.
6. Miller TG, Jr. Environmental Science, Wadsworth Publishing CO. (TB)

**SKILL ENHANCEMENT ELECTIVE COURSES (SEC)  
SYLLABUS**

**15NSS255**

**NSS PAPER – I**

<b>Unit -I Introduction and Basic Concepts of NSS</b>	<b>04</b>
<ul style="list-style-type: none"> <li>a) History, philosophy ,aims &amp; objectives of NSS</li> <li>b) Emblem, flag motto, song, badge etc.,</li> <li>c) Organizational structure, roles and responsibilities of various NSS Functionaries</li> </ul>	
<b>Unit-II NSS Programmes and Activities</b>	<b>10</b>
<ul style="list-style-type: none"> <li>a) Concept of regular activities, special camping, Day Camps</li> <li>b) Basis of adoption of village/slums, Methodology of conducting Survey</li> <li>c) Financial pattern of the scheme</li> <li>d) Other youth prog./schemes of GOI</li> <li>e) Coordination with different agencies</li> <li>f) Maintenance of Diary</li> </ul>	
<b>Unit-III Understanding Youth</b>	<b>05</b>
<ul style="list-style-type: none"> <li>a) Definition, profile of youth, categories of youth</li> <li>b) Issues, challenges and opportunities for youth</li> <li>c) Youth as an agent of social change</li> </ul>	
<b>Unit-IV Community Mobilization</b>	<b>09</b>
<ul style="list-style-type: none"> <li>a) Mapping of community stakeholders</li> <li>b) Designing the message in the context of the problem and culture of the community</li> <li>c) Identifying methods of mobilization</li> <li>d) Youth – adult partnership</li> </ul>	



**Unit -V Volunteerism and Shramdan****07**

- a) Indian Tradition of volunteerism
- b) Needs & Importance of volunteerism
- c) Motivation and Constraints of Volunteerism
- d) Shramdan as a part of volunteerism

**Total: 35 hours****Outcome:**

- To learn the psychology of the youth, their issues, challenges, social responsibilities and opportunities
- To learn the basic concepts of NSS, its history, philosophy, aim, growth, emblem, flag motto, batch and form.
- To understand what is volunteerism and selfless service.
- To know various activities under NSS.
- To learn different programs that could be conducted under NSS.
- To understand what is community mobilization.
- To learn various youth programs and activities.

**15NSS256****NSS PAPER – II****Unit-I Importance and Role of Youth Leadership****06**

- a) Meaning and types of leadership
- b) Qualities of good leaders; traits of leadership
- c) Importance and role of youth leadership

**Unit-II Life Competencies****11**

- a) Definition and importance of life competencies
- b) Communication
- c) Inter Personal
- d) Problem – solving and decision-making

**Unit-III Social Harmony and National Intergration****09**

- a) Indian history and culture
- b) Role of youth in peace-building and conflict resolution
- c) Role of youth in Nation building

**Unit-IV Youth Development Programmes in India****09**

- a) National Youth Policy
- b) Youth development Programmes at the National level, State Level and Voluntary sector
- c) Youth-focused and Youth –led organizations

**Total: 35 hours****Project work /Practical**

Conducting Surveys on special theme and preparing a report thereof.

**Outcome:**

- To know what is national youth policy.
- To practice the approach of problem solving and decision making in a critical situation for an issue.
- To understand the importance of social harmony and nation integration.

- To practice about youth leadership.
- To learn the importance of life competencies.
- To learn to organize various youth development programs.
- To go for a project and to conduct survey on special theme and preparing projects reports.

**15NSS257**

**NSS PAPER – III**

**Unit – I Citizenship 07**

- Basic Features of constitution of India
- Fundamental Rights and Duties
- Human Rights
- Consumer awareness and the legal rights of the consumer RTI

**Unit – II Family and Society 06**

- Concept of family, community,(PRIs and other community-based Organizations and society
- Growing up in the family – dynamics and impact
- Human Values
- IV Gender justice

**Unit – III Health, Hygiene & sanitation 07**

- Definition, needs and scope of health education
- Food and Nutrition
- Safe drinking water, waterborne diseases and sanitation (swatch Bharat Abhiyan)
- National Health Programme
- Reproductive Health

**Unit – IV Youth Health 06**

- Healthy lifestyles
- HIV AIDS, Drugs and substance abuse
- Home Nursing
- First Aid

**Unit – V Youth and Yoga 09**

- History, Philosophy and concept of yoga
- Myths and misconceptions about yoga
- Different yoga traditions and their Impacts
- Yoga as a preventive, Primitive and curative method
- Yoga as a tool for healthy; lifestyle

**Total: 35 hours**

**Project work / practical**

**40 marks**

Preparation of research project report.

**Outcome:**

- To learn the basic definitions of components of health, hygiene and sanitation.
- To know about HIV, AIDS and their cause, treatment.

- To learn the basic rights of citizen and consumer awareness.
- To understand human values and about gender justice.
- To learn what is yoga and its support for healthy life.
- To learn preventive, primitive and curative methods in health aspects.
- To familiarize about citizenship, family life, social issues and health awareness.
- To practice, to execute an effective project and to prepare a report.

**15NSS258**

**NSS PAPER – IV**

<b>Unit -I Environment Issues</b>	<b>11</b>
<ul style="list-style-type: none"> <li>a) Environment conservation, enrichment and Sustainability</li> <li>b) Climate change</li> <li>c) Waste management</li> <li>d) Natural resource management(Rain water harvesting, energy conservation, waste land development, soil conservations and afforestation)</li> </ul>	
<b>Unit-II Disaster Management</b>	<b>07</b>
<ul style="list-style-type: none"> <li>a) Introduction to Disaster Management, classification of disasters</li> <li>b) Role of youth in Disaster management</li> </ul>	
<b>Unit-III Project Cycle Management</b>	<b>10</b>
<ul style="list-style-type: none"> <li>a) Project planning</li> <li>b) Project implementation</li> <li>c) Project monitoring</li> <li>d) Project evaluation: impact assessment</li> </ul>	
<b>Unit-IV Documentation and Reporting</b>	<b>07</b>
<ul style="list-style-type: none"> <li>a) Collection and analysis of data</li> <li>b) Preparation of documentation/reports</li> <li>c) Dissemination of documents/reports</li> </ul>	

**Total: 35 hours**

**Project work /Practical**

**40 Marks**

Workshops/seminars on personality development and improvement of communication

- To learn the environmental ethics.
- To learn about environmental protection from various sources by different methods.
- To learn about the various aspects of projects, namely planning, implementation, monitoring, evaluation and impact.
- To learn about various disasters and its preventive measures and as well the role of the youth in disaster management.
- To practice of documentation and reporting.
- To execute workshops, street plays, seminars, video shows among community about personality development.

- To learn rainwater harvesting, increased utility of renewable resources, afforestation and soil conservation.

**15NSS259**

**NSS PAPER – V**

**Unit -I Vocational Skill Development**

**20**

This unit will aim to enhance the employment potential of the NSS volunteers or, alternately, to help them to set up small business enterprises. For this purpose, a list of 12 to 15 vocational skills will be drawn up, based on the local conditions and opportunities. Each volunteer will have the option to select two skill areas out of this list- one such skill in each Semester. The education institution (or the university) will make a arrangements for developing these skills in collaboration with establishment agencies that possess the necessary expertise in the related vocational skills

**Unit-II Entrepreneurship Development**

**08**

- a) Definition & Meaning
- b) Qualities of good entrepreneur
- c) Steps / ways in opening an enterprise
- d) Role of financial and support service Institutions

**Unit-II Youth and Crime**

**07**

- a) Sociological and Psychological Factors influencing Youth Crime
- b) Peer Mentoring in preventing crimes
- c) Awareness about anti -Ragging
- d) Cyber Crime and its Prevention
- e) Juvenile Justice

**Total: 35 hours**

**Project work /Practical**

**40 Marks**

- To learn the definition and meaning of entrepreneurship.
- To know the qualities and role of a good entrepreneur.
- To understand the procedure of business service and management.
- To practice condition oriented vocational skill training in atleast 12 to 15 objectives.
- To learn how to establish various vocational skills.
- To know what is youth crime and various factors influencing them.
- To know the role of cyber crime in prevention of youth crime
- To learn juvenially justice.

**Unit -I Vocational Skill Development****20**

This unit will aim to enhance the employment potential of the NSS volunteers or, alternately, to help them to set up small business enterprises. For this purpose, a list of 12 to 15 vocational skill will be drawn up, based on the local conditions and opportunities. Each volunteer will have the option to select two skill areas out of this list- one such skill in each Semester. The education institution (or the university) will make a arrangements for developing these skills in collaboration with established agencies that possess the necessary expertise in the related vocational skills

**Unit-II Civil /Self Defense****05**

- a) Civil defense services, aims and Objectives of civil defense
- b) Needs for Self defense training

**Unit-III Resource Mobilization****03**

- a) Writing a Project Proposal
- b) Establishment of SFUs

**Unit-IV Additional life Skills****07**

- a) Positive Thinking
- b) Self Confidence and Self Esteem
- c) Setting life Goals and working to achieve them
- d) Management of Stress including time management

**Total: 35 hrs****Project work /Practical****40 Marks**

- To learn the definition and meaning of entrepreneurship.
- To know the qualities and role of a good entrepreneur.
- To understand the procedure of business service and management.
- To practice condition oriented vocational skill training in atleast 12 to 15 objectives.
- To learn how to establish various vocational skills.
- To know what is youth crime and various factors influencing them.
- To know the role of cyber crime in prevention of youth crime
- To learn juvenially justice.