# COURSE STRUCTURE

**FOR**

**S. Y. B. Sc. (SEMESTER – 4) CHEMISTRY**

<table>
<thead>
<tr>
<th>Principal Subject</th>
<th>Course Code</th>
<th>Paper Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEMISTRY</td>
<td>US04CCHE01</td>
<td>INORGANIC CHEMISTRY</td>
<td>03 Credits</td>
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<tr>
<td></td>
<td>US04CCHE02</td>
<td>APPLIED CHEMISTRY</td>
<td>03 Credits</td>
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<tr>
<td></td>
<td>US04CCHE03</td>
<td>PRACTICAL</td>
<td>03 Credits</td>
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<tr>
<td></td>
<td>US04CPHY01</td>
<td>ELECTROMAGNETIC THEORY AND SPECTROSCOPY</td>
<td>03 Credits</td>
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<tr>
<td></td>
<td>US04CPHY02</td>
<td>SOLID STATE PHYSICS</td>
<td>03 Credits</td>
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<tr>
<td></td>
<td>US04CPHY03</td>
<td>PRACTICAL</td>
<td>03 Credits</td>
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<tr>
<td></td>
<td>US04EICH02</td>
<td>INSTRUMENTAL METHODS OF ANALYSIS</td>
<td>02 Credits</td>
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<td></td>
<td>US04EMTH05</td>
<td>CALCULUS &amp; ALGEBRA-II</td>
<td>02 Credits</td>
</tr>
<tr>
<td></td>
<td>US04FENG01</td>
<td>FUNCTIONAL ENGLISH</td>
<td>02 Credits</td>
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</tbody>
</table>
UNIT: I CHEMISTRY OF d-BLOCK ELEMENTS [11 Hrs.]


UNIT: II COORDINATION CHEMISTRY AND ISOMERISM IN COORDINATION COMPOUNDS [11 Hrs.]
Postulates of Werner's coordination theory, Explanation of the structure of Co(III) ammines and Pt(IV) complexes on the basis of Werner's coordination theory, Experimental evidences in favour of Werner's theory, Sidgwick's electronic concept of coordinate bond and its limitations, Sidgwick's effective atomic number rule, Structural isomerism: Conformation isomerism, Ionization isomerism, Hydrate isomerism, Coordination isomerism, Linkage isomerism, Coordination position isomerism, Ligand isomerism and Polymerization isomerism, Stereoisomerism: Geometrical isomerism, Geometrical isomerism in 4-coordinated complex compounds, Optical isomerism in 6-coordinated complex compounds, To distinguish between cis and trans isomers, Optical isomerism: Definitions, Conditions for a molecule to show optical isomerism, Optical isomerism in 4-coordinated complex compounds, Optical isomerism in 6-coordinated complex compounds.


UNIT: III LANTHANIDES AND ACTINIDES [11 Hrs.]
(A) LANTHANIDES: Definition, Position of lanthanides in periodic table, General properties-electronic configuration, oxidation state and oxidation potential, chemistry of +2, +3 and +4 state, chemistry of +2, +3 and +4 state, Atomic and ionic radii, lanthanide contraction, cause of lanthanide contraction, consequences of lanthanide contraction, Color and absorption spectra of Ln³⁺ ion, magnetic properties and complex formation, Extraction of lanthanides from monazite mineral, Separation of individual rare earth elements by modern methods- ion exchange method, solvent extraction method, uses of lanthanide compounds.

(B) ACTINIDES: Definition, Position of actinides in periodic table, General properties and their comparison with lanthanides like - electronic configuration, oxidation state and oxidation potential, chemistry of +2, +3, +4, +5, +6 and +7 oxidation state, Atomic and ionic radii, actinide contraction, color and absorption spectra, magnetic properties and complex formation, Separation of actinide elements by- ion exchange method and solvent extraction method.

Reference Book: Selected Topics in Inorganic Chemistry by Wahid U. Malik, G. D. Tuli and R. D. Madan

UNIT-IV CHEMISTRY OF METALLIC CARBONYLS AND NITROSYLS [12 Hrs.]
[A] METALLIC CARBONYLS: General methods of preparation, general properties, Structure and nature of M-CO bonding in carbynls, Effective atomic number (EAN) rule as applied to metallic carbynls, 18-electron rule as applied to metallic carbynls, Some carbynls
[B] METALLIC NITROSYLS: Some metallic nitrosyls, Effective atomic number (EAN) rule as applied to metallic nitrosyls.

Reference Book: Selected Topics in Inorganic Chemistry by Wahid U. Malik, G. D. Tuli and R. D. Madan
UNIT: I ELECTROMAGNETIC SPECTRUM: ABSORPTION SPECTRA [11 Hrs.]

Introduction of U. V. Absorption Spectroscopy

Visible and UV spectroscopy Presentation (Sketching) of UV spectra of Benzene, 2,5-dimethyl-2,4-hexadiene and aniline.

Woodward-Fischer rules and application for calculating absorption maxima for the following molecules:
1. Myrcene, 2. 1,3-pentadiene, 3. Carvone, 4. Vitamin-A: S. Crotonaldehyde, 6. 2,4-hexadiene

I R Absorption spectroscopy

Molecular Vibration, Application of I R Spectroscopy, (Absorption of common functional groups) to Aniline, Benzoic acid, nitrobenzene, benzamide, acetamide, acetone, benzaldehyde, phenyl acetylene, cynobenzene, acetone, styrene, phenol, ethanol, acetic acid and acrolein.

Reference Books:
2. Introduction to organic chemistry by Gurdeep R. Chatwal.

UNIT: II VITAMINS [11 Hrs.]

Introduction, history and nomenclature, classification, synthesis of vitamins by intestinal bacteria, Fat and water soluble vitamins.

Vitamin-A and its chemistry, absorption, transport and metabolization, colour vision, other biological functions and deficiency of Vitamin-A.

Vitamin-D: chemistry and biochemical functions of Vitamin-D, Vitamin-D is a hormone and not a vitamin, dietary sources and deficiency symptoms.

Vitamin-E: chemistry and biochemical functions of Vitamin-E, dietary sources and deficiency symptoms.

Vitamin-C: chemistry and biochemical functions of Vitamin-C, dietary sources and deficiency symptoms, biomedical/clinical concepts.

Reference Books:
1. Biochemistry by U. Satyanarayan and U. Chakrapani
2. Fundamentals of biochemistry by Dr. A.C. Deb.

UNIT: III FERTILIZERS [11 Hrs.]

UNIT: IV CEMENT INDUSTRY  
[12 Hrs.]

Reference Books:
1. **BINARY ORGANIC MIXTURE**: [Solid + Solid or Solid + liquid i.e. (acetone, methyl acetate, ethanol, benzene, CCl₄)].

2. **VOLUMETRIC TITRATION (By self preparation of solution of titrant):**
   (1) Determination of equivalent weight of carboxylic acid by alkali solution.
   (2) Determination of glucose.
   (3) Determination of formaldehyde by sodium hypoiodide.

3. **GRAVIMETRIC ANALYSIS**
   (1) ZnCO₃
   (2) BaCl₂·2 H₂O

4. **PREPARATION OF STANDARD SOLUTIONS**

**Reference Books:**
2. Vogel’s Testbook Of Qualitative Inorganic Analysis By G.Svehla
3. Practical Chemistry By O.P.Pandey, D.N.Bajpai & S.Giri
4. An Advanced Course In Practical Chemistry By Ghoshal, Mahapatra & Nad
Subject: Physics  
Course: US04CPHY01  
Electromagnetic Theory and Spectroscopy  
(Three Credit Course –3 Hours per week)  
(Effective from June-2012)

UNIT - I Electrostatics

UNIT - II Magnetostatics

UNIT - III Atomic Spectra
Investigation of Spectra, Production of Spectra, Types of Spectra, Wave Number, The Spinning Electron, Space Quantization, Quantum Numbers and their Physical Interpretation, L-S Coupling, J-J Coupling, Experimental study of Zeeman Effect, Classical Interpretation of Normal Zeeman Effect, Anomalous Zeeman Effect, Stark Effect

UNIT - IV X-ray Spectra

Books Recommended:
1. Introduction to Electrodynamics  
   David J Griffiths, Prentice-Hall of India Private Ltd.  
2. Electricity and Magnetism  
   A S Mahajan and A A Rangwala  
   Tata McGraw Hill Publishing Company Ltd  
3. Elements of Electromagnetics  
   Sadiku, Oxford University Press  
4. Elements of Spectroscopy  
   S L Gupta, V Kumar, R C Sharma  
   Pragati Prakashan  
5. Molecular structure and Spectroscopy  
   G Aruldhas, Prentice-Hall of India Private Limited
UNIT-I  Basic Elements of Crystallography
Introduction, Lattice points and space lattice, The basics and crystal structure, Unit Cell, Unit Cell versus Primitive Cell, Unit Cell and lattice parameters, Crystal types, Two dimensional crystal lattice, Seven crystal system, Symmetry Operations (Translational, Point, & Hybrid), Metallic crystal structures, Relation between the density of crystal materials and lattice constants, Directions planes and Miller Indices of crystal planes, Important features of Miller indices in a cubic crystal, Separation between lattice planes in cubic crystal

UNIT-II  Atomic Cohesion, Crystal Binding, Atomic Size
Introduction, Force between atoms, Cohesion of atoms and cohesive energy, Calculation of cohesive energy, Calculation of lattice energy of ionic crystals, Calculation of Madelung constant of ionic crystals, The Born–Haber cycle, Bonding in solids, Primary Bonds (Covalent, Metallic, Ionic and Mixed), Secondary bonds (van der Waals and Hydrogen Bond), Properties of primary and secondary bonds, Wave mechanical concept of atom, Atomic size, Ionic radii, Empirical ionic radii, variation of ionic radii, Covalent radii, Metallic radii, van der Waals radii

UNIT- III  Thermal & Dielectric Properties of Solids

UNIT-IV  Structure of Polymers and its Applications
Introduction, Hydrocarbon molecules, Polymer molecules, The chemistry of polymer molecules, Molecular weight, Molecular shape, Molecular structure, Molecular Configurations, Thermoplastic and thermosetting polymers, Copolymers, Mechanical Behavior of polymers (Stress-Strain behavior, Macroscopic deformation, Viscoelastic deformation, Fracture of polymers, Miscellaneous mechanical characteristics), Mechanisms of deformation for strengthening of polymers (deformation of semi-crystalline polymers, factors that influence the mechanical properties of semi-crystalline polymers, deformation of elastomers), Polymer Types (Plastics, Elastomers, Fibers)

Books Recommended:
1. Solid State Physics
   M A Wahab, Narosa Publishing House.
2. Solid State Physics
   S O Pillai, , New Age International Publisher
3. Material Science and Engineering
   W D Callister Jr. Wiley India (P) Ltd.
4. Introduction to Solid State Physics
5. Elements of Solid State Physics
   J P Srivastava, Prentice-Hall of India
Subject: Physics (Practical)  
Course No. US04CPHY03  
(Three Credit Course –6 Hours per week)  
(Effective from June-2012)

List of Practicals:
1. Characteristics of FET  
3. De-Broglie Relation using electron diffraction pattern.  
4. Wave length of a monochromatic light \( \lambda \) using Double Slit method.  
5. Study of a Hartley Oscillator  
6. Study of a Colpitts Oscillator  
7. Thermal Conductivity (K) by Lee’s method  
8. Frequency Response of RC Coupled amplifier (with negative feedback).  
9. Study of L-C-R Parallel Resonance  
10. Wave length of a monochromatic light \( \lambda \) using Lloyd’s mirror  
11. Study of a Thermocouple  
12. Cauchy’s Constants  
13. Find the Stefan’s Index  
14. Numerical Integration  
15. Propagation of errors in observation.

Note: To provide flexibility up to the maximum of 20% of total experiments can be replaced/ added to the list by the board of studies.

Books Recommended:

1. Advanced Practical Physics for students  
   B L Wosnop and H T Flint  
   Methuen and Co. Ltd., London  
2. B.Sc. Practical Physics  
   C L Arora  
   S.Chand & Co. Ltd., New Delhi  
3. Advanced Practical Physics  
   M S Chauhan and S P Singh  
   Pragati Prakashan, Meerut  
4. Advanced Practical Physics  
   S L Gupta and V Kumar  
   Pragati Prakashan, Meerut
Unit-1:

Unit-2:
Chromatography: Introduction, Classification and application
Paper chromatography: Experimental details for qualitative analysis, Experimental details for quantitative analysis. Thin layer chromatography: Superiority of TLC over the other techniques, Experimental techniques, Limitations, Scope.

Unit-3:
HPLC and GC: Introduction, Instruments involved, Sampling methods, Experimental details and applications.

Unit-4:

REFERENCE BOOKS
1. Instrumental methods of chemical analysis by Chatwal – Anand, Himalaya Publishing House.
UNIT-1.
Maxima and Minima for a function of two variables and its Examples and property.

UNIT-2.
Definitions of vector and scalar functions; Differentiation of scalar and vector fields;
Gradient of scalar field; Directional derivative of scalar field; Tangent and normal plane to a surface.

UNIT-3.
Divergence and Curl of vectors fields; Their Properties, relations and examples.

UNIT-4 . Dentition of Boolean algebra; Simplification of Boolean function; Application of Boolean
algebra to switching circuits.

Recommended Texts :
(2) M.S.Spiegel , Vector Analysis, Schaum's series .
(4) J.E.Whitesitt , Boolean Algebra .
Syllabus of B.Sc. (Fourth Semester)
Foundation Course in English
Subject: Functional English
Course Code: (US04FENG01)
2 credits (Practical)
Hours per week (2 hours/batch)
Internal 30 marks + External 70 marks
Total: 100 Marks

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<thead>
<tr>
<th>Unit 1  Listening for Specific Purposes</th>
<th>Marks</th>
</tr>
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<tbody>
<tr>
<td>1 Listening for information (Fill in the blanks) (46 to 60)</td>
<td>10</td>
</tr>
<tr>
<td>2 Listening for Gist of the audio/video. Writing the gist</td>
<td>03</td>
</tr>
<tr>
<td>3 Identify the language functions</td>
<td>02</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
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<table>
<thead>
<tr>
<th>Unit 2 Writing Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Letters for social occasions (Condolence, Invitations, encouragement and best wishes)</td>
</tr>
<tr>
<td>2 Words used in Newspaper Headlines (Match the meaning with words given in the headlines)</td>
</tr>
<tr>
<td>3 Notice Writing</td>
</tr>
<tr>
<td>4 Collocations</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<table>
<thead>
<tr>
<th>Unit 3 Oral Skills</th>
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</thead>
<tbody>
<tr>
<td>1 Mock Interviews(Introduction, talking about their field, interest and body language)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td><strong>15+05 journal</strong></td>
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<thead>
<tr>
<th>Unit 4 Grammar and Vocabulary</th>
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<tbody>
<tr>
<td>1 Prepositions of place, time and direction (fill in the blank)</td>
</tr>
<tr>
<td>2 Punctuation (In a paragraph)</td>
</tr>
<tr>
<td>3 Question tags (fill in the blank)</td>
</tr>
<tr>
<td>4 Articles and plural forms (fill in the blank)</td>
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<tr>
<td><strong>Total</strong></td>
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