<table>
<thead>
<tr>
<th>Principal Subject</th>
<th>Course Code</th>
<th>Paper Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDUSTRIAL CHEMISTRY</td>
<td>US04CICH01</td>
<td>ENGINEERING MATERIALS</td>
<td>3 credits</td>
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<tr>
<td></td>
<td>US04CICH02</td>
<td>CHEMICAL PLANT UTILITIES</td>
<td>3 credits</td>
</tr>
<tr>
<td></td>
<td>US04CICH03</td>
<td>PRACTICALS</td>
<td>3 credits</td>
</tr>
<tr>
<td></td>
<td>US04CPHY01</td>
<td>ELECTROMAGNETIC THEORY AND SPECTROSCOPY</td>
<td>3 credits</td>
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<tr>
<td></td>
<td>US04CPHY02</td>
<td>SOLID STATE PHYSICS</td>
<td>3 credits</td>
</tr>
<tr>
<td></td>
<td>US04CPHY03</td>
<td>PHYSICS PRACTICAL</td>
<td>3 credits</td>
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<tr>
<td></td>
<td>US04ECHE05</td>
<td>INDUSTRIAL POLLUTION, ITS CONTROL AND INDUSTRIAL SAFETY</td>
<td>2 credits</td>
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<tr>
<td></td>
<td>US04ECHE06</td>
<td>INSTRUMENTAL METHODS OF ANALYSIS</td>
<td>2 credits</td>
</tr>
<tr>
<td></td>
<td>US04FENG01</td>
<td>FUNCTIONAL ENGLISH</td>
<td>2 credits</td>
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</tbody>
</table>


Unit-3: Metals and Alloys: Need, preparation, Mechanical & chemical properties, Applications, Composition of important metals and alloys- iron, copper, aluminium, lead, nickel, titanium and their alloys

Unit-4: Corrosion: Theories of corrosion, Corrosion reactions, Special corrosions, Factors affecting corrosion rate, Protection against the corrosion, Protective coatings and surface preparation, Metallic, Inorganic and organic coatings, Paint manufacture, Characteristics of oil and pigment

REFERENCE BOOKS
Unit 1:
Water- Impurities and hardness of natural water, Water for steam making and industrial processes,
Boiler water treatments, Calculations on water treatments.

Unit 2:
Fuels-classification, advantages and disadvantages, Analysis of fuels, Heating media
Air- Specification for industrial uses of air. Industrial applications of CO₂, O₂, N₂ and H₂.

Unit 3:
Compression equipments, Reciprocating compressor, Work of single stage reciprocating compressor,
Effect of clearance, Volumetric efficiency, Multistage compression, Refrigeration, COP & refrigerating
effect, Industrial refrigerants, Carnot and other refrigeration cycles.

Unit 4:
Internal combustion engines and external combustion engine, Steam power plant, its working and
thermodynamic analysis, Otto engine and Diesel engine.
Steam boilers – Their classification, Steam generation, Conditions of steam, Steam table.

REFERENCE BOOKS:
1. Chemistry of Engineering Materials by C. V. Agrawal (Tara Publication)
2. Introduction to Chemical Engineering Thermodynamics (IV edition) by J. M. Smith & Vanness,
   (McGraw-Hill Co.)
3. Chemistry in Engineering and Technology,(volume I & II) JC Kuriacose & J.Rajarah (Tata McGarw
   Hill).
1. Cement Analysis, Inorganic Qualitative Analysis (Semi Micro)
2. Alloy Analysis
3. Analytical Instruments
4. Instrumental methods of Chemical Analysis.
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:
Atmosphere, Eco-System and Air Pollution, Sources and Effect of Air Pollutants, Green House Effect, Air Pollution control Technique.

Unit 2:
Water Pollution and its source, Types of water pollutants and their adverse effects, Waste water treatment, BOD and COD tests, Pesticide Pollution and sound pollution.

Unit 3:
Solid Waste Management, Collection and Disposal of solid waste, Radio activity and Radiation Pollution, Pollution Statutory limits.

Unit 4:
Industrial hazards, Safety consideration in chemical industries, Chemical, Electrical and mechanical hazards, Fire and explosion hazard, Health hazard, Laboratory Safety, Safety Practice, Factory acts.

REFERENCE BOOKS:
2. Environmental Pollution Control Engineering, C. S. Rao (Wiley Eastern Ltd., New Delhi)
3. Engineering Chemistry, Jain and Jain ( Dhanpat Rai and Sons)
4. Introduction to Environmental Engineering and Science, G. M. Masters
5. Environmental pollution, H.N.DIX (J.W & Sons).
Unit-1:

Unit-2:
\textbf{Chromatography:} Introduction, Classification and application

- \textbf{Paper chromatography:} Experimental details for qualitative analysis, Experimental details for quantitative analysis.
- \textbf{Thin layer chromatography:} Superiority of TLC over the other techniques, Experimental techniques, Limitations, Scope.
- \textbf{Column chromatography:} Introduction, Experimental details, Theory of development, factors affecting column efficiency.

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

Unit-4:

\textbf{REFERENCE BOOKS}
1. Instrumental methods of chemical analysis by Chatwal – Anand, Himalaya Publishing House.
**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

### Unit 1 Listening for Specific Purposes

<table>
<thead>
<tr>
<th></th>
<th>Marks</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Listening for information (Fill in the blanks) (46 to 60)</td>
</tr>
<tr>
<td>2</td>
<td>Listening for Gist of the audio/video Writing the gist</td>
</tr>
<tr>
<td>3</td>
<td>Identify the language functions</td>
</tr>
</tbody>
</table>

**Total= 15**

### Unit 2 Writing Skills

<table>
<thead>
<tr>
<th></th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Letters for social occasions (Condolence, Invitations, encouragement and best wishes)</td>
</tr>
<tr>
<td>2</td>
<td>Words used in Newspaper Headlines (Match the meaning with words given in the headlines)</td>
</tr>
<tr>
<td>3</td>
<td>Notice Writing</td>
</tr>
<tr>
<td>4</td>
<td>Collocations</td>
</tr>
</tbody>
</table>

**Total= 20**

### Unit 3 Oral Skills

<table>
<thead>
<tr>
<th></th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Mock Interviews(Introduction, talking about their field, interest and body language)</td>
</tr>
</tbody>
</table>

**Total= 15**

15+05 journal= 20

### Unit 4 Grammar and Vocabulary

<table>
<thead>
<tr>
<th></th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Prepositions of place, time and direction (fill in the blank)</td>
</tr>
<tr>
<td>2</td>
<td>Punctuation (In a paragraph)</td>
</tr>
<tr>
<td>3</td>
<td>Question tags (fill in the blank)</td>
</tr>
<tr>
<td>4</td>
<td>Articles and plural forms (fill in the blank)</td>
</tr>
</tbody>
</table>

**Total= 15**