### Course Outcomes

After successful completion of this course, the students should be able to

**CO1**: Apply the basic principles of chemistry at the atomic and molecular level.

**CO2**: Analyze the impact of engineering solutions from the point of view of chemical principles.

**CO3**: Apply the chemical properties to categorize the engineering materials and their uses.

**CO4**: Integrate the chemical principles in the projects undertaken in field of engineering and technology.

**CO5**: Develop analytical proficiency through lab skill sets to demonstrate in professional practice.

### Pre-requisites:

Nil

### CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

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### Course Assessment methods

#### Direct

1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group
3. Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable)
4. End Semester Examination

#### Indirect

1. Course-end survey

### Theory Component

#### CHEMICAL BONDING

7 Hours

Bonding: Introduction – Ionic bonding - Van der Waal’s forces (dipole - dipole, dipole - induced dipole, induced dipole - induced dipole interactions) - hydrophobic interaction. Bonding in organic molecules: covalent and co-ordinate bonds (overview only) - hybridization (sp, sp2, sp3) - hydrogen bonding and its consequences.

#### THERMODYNAMICS

7 Hours

### ELECTROCHEMISTRY AND CORROSION | 7 Hours
Corrosion: Classification and mechanism of chemical and electrochemical corrosion - Factors influencing corrosion
Corrosion control: Inhibitors – Cathodic protection (Sacrificial anodic protection, Impressed current cathodic protection) – Protective coating: Electroplating (Au) and Electroless plating (Ni).

### WATER TECHNOLOGY | 6 Hours
Treatment of hard water: External treatment (Ion exchange method) - Internal treatment (colloidal, carbonate, phosphate and calgon conditioning) - Desalination (Reverse osmosis, Electrodiagnosis)

### ENGINEERING MATERIALS | 9 Hours
Polymer: Introduction – Preparation, Properties and Applications of PMMA, PET, PVC.
Composites: Constituents of Composites – Polymer Composites - Metal Matrix Composites - Ceramic Matrix Composites – Applications
Lubricants: Classification - Functions - Properties (viscosity index, flash and fire point, oiliness, carbon residue, aniline point, cloud point and pour point) - Semi solid lubricant (greases with calcium based, sodium based, lithium based) - Solid lubricants (graphite, molybdenum disulphide)

### SURFACE CHEMISTRY AND CATALYSIS | 9 Hours

### Theory: 45  Tutorial: 0  Practical: 0  Project: 0  Total: 45 Hours

### REFERENCES
LABORATORY COMPONENT

LIST OF EXPERIMENTS
1. Preparation of Standard solutions
2. Conductometric estimation of mixture of acids vs strong base
3. Estimation of extent of corrosion of Iron pieces by Potentiometry
4. Estimation of the extent of dissolution of Copper / Ferrous ions by spectrophotometry.
5. Estimation of acids by pH metry.
6. Determination of total, temporary and permanent hardness by EDTA method.
7. Estimation of DO by Winkler’s method
9. Estimation of Chloride by Argentometric method
10. Estimation of Sodium and Potassium in water by Flame photometry.
11. Determination of Flash and Fire point of lubricating oil
12. Determination of Cloud and Pour point of lubricating oil
13. Determination of relative and kinematic viscosities of lubricating oil at different temperatures
14. Determination of corrosion rate on mild steel by Weight loss method
15. Morphological studies of corrosion on mild steel by microscopic techniques

Theory: 0  Tutorial: 0  Practical: 30  Project: 0  Total: 30 Hours

REFERENCES
Chemical engineering is the application of science, in particular physics and chemistry, along with mathematics and economics to the process of converting raw materials or chemicals into more useful or valuable forms. Chemical Engineering largely involves the design and maintenance of chemical processes for large-scale manufacture. Chemical engineers in this branch are usually employed under the title of process engineer. Following is an example that illustrates the process engineering part of The Visualizing Chemistry Problems that begin the exercises at the end of each chapter offer students an opportunity to see chemistry in a different way by visualizing molecules rather than by simply interpreting structural formulas. Copyright 2010 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves Hitachi chemical data sheet. Hitachi Anisotropic Conductive Film ANISOLM®. AC-7206U-18. Page 1. Standard Specification, Bonding and Storage Conditions, Reparability, and Characteristics . 1 2. Precautions in Bonding Â Head temperature: 305 TCP: Pl, 75 m; Cu, 18 m; Au plating Glass board: 1.1mm. Ratio of temperature reached 5 seconds later: 90% or more of the ultimate temperature( ). . . Measuring ANISOLM temperature.