

<b>U18CHI1201</b>	<b>ENGINEERING CHEMISTRY</b> <b>(Common to All Branches)</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>J</b>	<b>C</b>		
<b>U18CHI2201</b>						<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>4</b>		
<b>Course Outcomes</b>												
After successful completion of this course, the students should be able to												
<b>CO1:</b> Apply the basic principles of chemistry at the atomic and molecular level.												
<b>CO2:</b> Analyze the impact of engineering solutions from the point of view of chemical principles												
<b>CO3:</b> Apply the chemical properties to categorize the engineering materials and their uses												
<b>CO4:</b> Integrate the chemical principles in the projects undertaken in field of engineering and technology												
<b>CO5:</b> Develop analytical proficiency through lab skill sets to demonstrate in professional practice.												
<b>Pre-requisites :</b>												
<b>Nil</b>												
<b>CO/PO Mapping</b> (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S		M		M							
CO3	S	M										
CO4	S			M					S		W	
CO5	S					M			S	W		
<b>Course Assessment methods</b>												
<b>Direct</b>												
<ol style="list-style-type: none"> <li>1. Continuous Assessment Test I, II</li> <li>2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group</li> <li>3. Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable)</li> <li>4. End Semester Examination</li> </ol>												
<b>Indirect</b>												
<ol style="list-style-type: none"> <li>1. Course-end survey</li> </ol>												
<b><u>Theory Component</u></b>												
<b>CHEMICAL BONDING</b>										<b>7 Hours</b>		
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, sp <sup>2</sup> , sp <sup>3</sup> ) - hydrogen bonding and its consequences.												
<b>THERMODYNAMICS</b>												
										<b>7 Hours</b>		
Introduction - Thermodynamic process – Internal energy – Enthalpy – limitations of First law of thermodynamics – Second law of thermodynamics - Entropy - Third law of thermodynamics – Free Energy and Work Function – Clausius-Clapeyron equation – Maxwell’s relations – Kirchoff’s equation.												

<b>ELECTROCHEMISTRY AND CORROSION</b>	<b>7 Hours</b>
<p>Electrodes - Electrode Potential – Nernst equation and problems - Galvanic cell - Electrochemical Series.</p> <p>Corrosion: Classification and mechanism of chemical and electrochemical corrosion - Factors influencing corrosion</p> <p>Corrosion control: Inhibitors – Cathodic protection (Sacrificial anodic protection, Impressed current cathodic protection) – Protective coating: Electroplating (Au) and Electroless plating (Ni).</p>	
<b>WATER TECHNOLOGY</b>	<b>6 Hours</b>
<p>Introduction - soft/hard water - Disadvantages of hard water in industries– scale, sludge, priming and foaming, caustic embrittlement.</p> <p>Treatment of hard water: External treatment (Ion exchange method) - Internal treatment (colloidal, carbonate, phosphate and calgon conditioning) - Desalination (Reverse osmosis, Electrodialysis)</p>	
<b>ENGINEERING MATERIALS</b>	<b>9 Hours</b>
<p>Polymer: Introduction – Preparation, Properties and Applications of PMMA, PET, PVC.</p> <p>Composites: Constituents of Composites – Polymer Composites - Metal Matrix Composites - Ceramic Matrix Composites – Applications</p> <p>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)</p>	
<b>SURFACE CHEMISTRY AND CATALYSIS</b>	<b>9 Hours</b>
<p>Adsorption: Types of adsorption – Adsorption isotherms: Freundlich’s adsorption isotherm – Langmuir’s adsorption isotherm – Applications of adsorption on pollution abatement.</p> <p>Catalysis: Catalyst – catalytic poisoning and catalytic promoters - autocatalysis – acid base catalysis – enzyme catalysis – Michaelis-Menten equation – applications.</p> <p>Chemical kinetics: Introduction – first order, pseudo first order, second order, zero order equations – parallel reactions – opposing reactions.</p>	
<p><b>Theory: 45    Tutorial: 0    Practical: 0    Project: 0                          Total: 45 Hours</b></p>	
<b>REFERENCES</b>	
<ol style="list-style-type: none"> <li>1. Jain P.C. and Jain. M., Engineering Chemistry, 16th Edition, Dhanpat Rai Publishing Company, New Delhi, Reprint 2017.</li> <li>2. Puri B.R., Sharma L.R., Pathania, M.S. Principles of physical chemistry, Vishal Publishing Co., 2017</li> <li>3. Atkins, P. and de Paula, J., Atkin’s Physical Chemistry, 9th ed., Oxford Univ. Press, 2009.</li> </ol>	

4. Glasstone S., An introduction to Electrochemistry, 10th Edition, Affiliated to East West Press Private Limited, 2007.
5. Samir Sarkar., Fuels and Combustion, 3rd Edition, Orient Longman, India, 2009.
6. Dara S.S. and Umare S.S., A text book of Engineering Chemistry, S.Chand and Company Limited, New Delhi, 2014.
7. Engineering Chemistry, Wiley India Editorial Team, Wiley, 2018.

## **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
8. Estimation of Alkalinity by Indicator 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**

1. Jeffery G.H., Bassett J., Mendham J. and Denny R.C., Vogel's Text Book of Quantitative Chemical Analysis, Oxford, ELBS, London,2012.
2. Shoemaker D.P. and C.W. Garland., Experiments in Physical Chemistry, Tata McGraw-Hill Pub. Co., Ltd., London,2003.