

U18CHI1202	ENGINEERING CHEMISTRY					L	T	P	J	C				
U18CHI2202	(Common to All Branches)					3	0	2	0	4				
Version 2 syllabus – 2019 batch onwards														
Course Outcomes														
After successful completion of this course, the students should be able to														
<p>CO1: Apply the basic principles of chemistry at the atomic and molecular level.</p> <p>CO2: Analyze the impact of engineering solutions from the point of view of chemical principles</p> <p>CO3: Apply the chemical properties to categorize the engineering materials and their uses</p> <p>CO4: Integrate the chemical principles in the projects undertaken in field of engineering and technology</p> <p>CO5: Develop analytical proficiency through lab skill sets to demonstrate in professional practice.</p>														
Pre-requisites :														
Nil														
CO/PO, PSO Mapping S-Strong; M-Medium; L-Low														
COs	Programme Outcomes(POs)												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M												
CO2	S	M		M										
CO3	S	M		S										
CO4	S	M		S										
CO5	M	S		S										
Course Assessment methods														
Direct														
<ol style="list-style-type: none"> Continuous Assessment Test I, II Open book test; Cooperative learning report, Assignment; Journal paper review, Group, Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) End Semester Examination 														
Indirect														
<ol style="list-style-type: none"> Course-end survey 														
<u>Theory Component</u>														
ELECTROCHEMISTRY AND CORROSION														
9 Hours														
<p>Electrodes - Calomel and Glass electrode (Construction and working principles) - Electrode Potential – Nernst equation and problems - Electrochemical Series and its applications.</p> <p>Corrosion: Mechanism of chemical and electrochemical corrosion - Types of corrosion (Microbiologically Influenced Corrosion, Mechanically Assisted Degradation and Environmentally Induced Cracking – overview) - Factors influencing corrosion.</p> <p>Corrosion control: Inhibitors – Cathodic protection (Sacrificial anodic protection, Impressed current cathodic protection) – Electroplating (Cu) and Electroless plating (Ni).</p>														
SURFACE CHEMISTRY AND CATALYSIS														
8 Hours														
<p>Adsorption: Types and factors affecting adsorption – Adsorption isotherms: Freundlich’s adsorption isotherm – Langmuir’s adsorption isotherm – Applications of adsorption on pollution abatement.</p>														

Surface catalysis: Power law and Eley Rideal model and Langmuir-Hinshelwood mechanism. Catalysis: Catalyst – catalytic poisoning and catalytic promoters - autocatalysis – acid base catalysis – enzyme catalysis. Applications of catalysis in industries.	
ENGINEERING MATERIALS	8 Hours
Polymers: Introduction – Degree of polymerisation – Functionality – Preparation, Properties and Applications of PET, PVC and conducting polymers (Polyacetylene and Polythiophene). Composites: Constituents of Composites and applications: Polymer Composites (PC) - Metal Matrix Composites (MMC) - Ceramic Matrix Composites (CMC) Lubricants: Classification (liquid, solid and semi solid) - Functions - Properties (viscosity index, flash and fire point, oiliness, carbon residue, aniline point, cloud point and pour point) – Synthetic lubricants.	
CHEMICAL BONDING	7 Hours
Introduction – Types of bonding: Ionic, covalent, co-ordinate and metallic bonds - Van der Waal's forces of attraction and its types (dipole - dipole, dipole - induced dipole, induced dipole - induced dipole) - hydrophobic interaction - hybridization in organic molecules (sp, sp ² , sp ³) - hydrogen bonding and its characteristics.	
THERMODYNAMICS	7 Hours
Introduction - Thermodynamic process – Internal energy – Enthalpy – First law of thermodynamics – Second law of thermodynamics - Entropy - Free Energy – Helmholtz Work Function - Gibbs Helmholtz equation - Problems – Clausius-Clapeyron equation – Maxwell's relations - Third law of thermodynamics – Zeroth law.	
WATER TECHNOLOGY	6 Hours
Introduction - Hardness of water - Disadvantages of hard water in boilers: scale and sludge, priming and foaming, caustic embrittlement and boiler corrosion - Softening of hard water: External treatment (Demineralisation process) - Internal treatment (colloidal, carbonate, phosphate and calgon conditioning) - Desalination (Reverse osmosis, Electrodialysis) – Domestic water treatment.	
Theory: 45 Tutorial: 0 Practical: 0 Project: 0	Total: 45 Hours
REFERENCES	
<ol style="list-style-type: none"> 1. Jain P.C. and Jain. M., Engineering Chemistry, 16th Edition, Dhanpat Rai Publishing Company, New Delhi, Reprint 2017. 2. Puri B.R., Sharma L.R., Pathania, M.S. Principles of physical chemistry, Vishal Publishing Co., 2017 3. Atkins, P. and de Paula, J., Atkin's Physical Chemistry, 9th ed., Oxford Univ. Press, 2009. 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. 	

LABORATORY COMPONENT

LIST OF EXPERIMENTS (Any 10 - Branch specific)

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.