

## CHEMISTRY

<b>I Semester:</b> CSE / CSE (AI&ML) / CSE (DS) / CSE (CS) // CSIT / IT																										
<b>II Semester:</b> AE / ME / CE / ECE / EEE																										
Course Code	Category	Hours / Week			Credits	Maximum Marks																				
		L	T	P		C	CIA	SEE	Total																	
AHSC06	Foundation	2	-	-	2	30	70	100																		
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 0</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 45</b>																					
<b>Prerequisite:</b> There are no prerequisites to take this course.																										
<p><b>I. COURSE OVERVIEW:</b>            The concepts developed in this course involve elements and compounds and their applied industrial applications. It deals with topics such as batteries, corrosion and control of metallic materials, water and its treatment for different purposes, engineering materials such as plastics, elastomers and biodegradable polymers, their preparation, properties and applications, energy sources and environmental science. Sustainable chemistry that focuses on the design of the products and processes that minimize or eliminate the use and generation of hazardous substances is also included.</p>																										
<p><b>II. COURSE OBJECTIVES:</b>  <b>The students will try to learn:</b></p> <ol style="list-style-type: none"> <li>I. The concepts of electrochemical principles and causes of corrosion in the new developments and breakthroughs efficiently in engineering and technology.</li> <li>II. The different parameters to remove causes of hardness of water and their reactions towards complexometric method.</li> <li>III. The polymerization reactions with respect to mechanisms and its significance in industrial applications.</li> <li>IV. The Significance of Green chemistry to reduce pollution in environment by using natural resources.</li> </ol>																										
<p><b>III. COURSE OUTCOMES:</b>  <b>After successful completion of the course, students should be able to:</b></p> <table border="0"> <tr> <td>CO 1</td> <td>Explain the electrochemical principles, corrosion process in metals for protection of different metals from corrosion</td> <td>Understand</td> </tr> <tr> <td>CO 2</td> <td>Utilize electrochemical cell parameters, electrochemical active surface area, current and over potential under given condition for calculating the electromotive force and electrode potential.</td> <td>Apply</td> </tr> <tr> <td>CO 3</td> <td>Identify the hardness of water by different treatment methods for finding the hardness causing salts in water.</td> <td>Apply</td> </tr> <tr> <td>CO 4</td> <td>Compare different types of polymerization reactions, mechanism of lubrication for utilizing in industries.</td> <td>Understand</td> </tr> <tr> <td>CO 5</td> <td>Make use of green synthesis methods, different types of solid, liquid and gaseous fuels in terms of calorific value for utilizing in industries and automobiles.</td> <td>Apply</td> </tr> <tr> <td>CO 6</td> <td>Outline the different types of natural resources and their applicability for understanding the effect of pollutants on air, water and soil that cause the environmental pollution.</td> <td>Understand</td> </tr> </table>									CO 1	Explain the electrochemical principles, corrosion process in metals for protection of different metals from corrosion	Understand	CO 2	Utilize electrochemical cell parameters, electrochemical active surface area, current and over potential under given condition for calculating the electromotive force and electrode potential.	Apply	CO 3	Identify the hardness of water by different treatment methods for finding the hardness causing salts in water.	Apply	CO 4	Compare different types of polymerization reactions, mechanism of lubrication for utilizing in industries.	Understand	CO 5	Make use of green synthesis methods, different types of solid, liquid and gaseous fuels in terms of calorific value for utilizing in industries and automobiles.	Apply	CO 6	Outline the different types of natural resources and their applicability for understanding the effect of pollutants on air, water and soil that cause the environmental pollution.	Understand
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<p><b>IV. SYLLABUS:</b></p> <p><b>MODULE-I: ELECTROCHEMISTRY AND CORROSION (09)</b>            Electro chemical cells: Electrode potential, standard electrode potential, Calomel electrode and Nernst equation; Electrochemical series and its applications; Numerical problems; Batteries: Primary (Dry cell) and secondary batteries (Lead-acid storage battery, Li-ion battery). Corrosion: Causes and effects of corrosion: Theories of chemical and electrochemical corrosion, mechanism of electrochemical corrosion; Corrosion control methods: Cathodic protection, sacrificial anode and impressed current Cathodic protection; Surface coatings: Metallic coatings- Methods of coating- Hot dipping- galvanization and tinning, electroplating.</p> <p><b>MODULE –II: WATER TECHNOLOGY (09)</b>            Introduction: Hardness of water, causes of hardness; types of hardness: temporary and permanent hardness, expression and units of hardness; estimation of hardness of water by complexometric method; potable water and</p>																										

its specifications, Steps involved in the treatment of water, disinfection of water by chlorination and ozonization; External treatment of water; Ion-exchange process; Desalination of water: Reverse osmosis, numerical problems.

### **MODULE-III: ENGINEERING MATERIALS (09)**

Polymers-classification with examples, polymerization-addition, condensation and co-polymerization; Plastics: Thermoplastics and thermosetting plastics; Compounding of plastics; Preparation, properties and applications of polyvinyl chloride, Teflon, Bakelite and Nylon-6, 6; Elastomers: Natural rubber, processing of natural rubber, vulcanization; Buna-s and Thiokol rubber; Biodegradable polymers.

Lubricants: characteristics of lubricants, mechanism of lubrication – thick film, thin film, extreme pressure lubrication, properties – flash and fire point, cloud and pour point, viscosity and oiliness of lubricants.

### **MODULE –IV: GREEN CHEMISTRY AND FUELS (09)**

Introduction: Definition of green chemistry, methods of green synthesis: aqueous phase, microwave method, phase transfer catalyst and ultra sound method. Fuels: definition, classification of fuels ; Solid fuels: coal; analysis of coal: proximate and ultimate analysis; Liquid fuels: Petroleum and its refining; Gaseous fuels: Composition, characteristics and applications of LPG and CNG; Calorific value: Gross Calorific value(GCV) and Net Calorific value(NCV), numerical problems.

### **MODULE –V: NATURAL RESOURCES AND ENVIRONMENTAL POLLUTION (09)**

Natural resources: Classification of resources, living and nonliving resources; Water resources: Use and over utilization of surface and ground water, floods and droughts, dams, benefits and problems; Land resources; Energy resources: renewable and non-renewable energy sources, use of alternate energy source. Environmental pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution and noise pollution.

### **V. TEXT BOOKS:**

1. P. C. Jain and Monica Jain, “Engineering Chemistry”, DhanpatRai Publishing Company, 16<sup>th</sup> Edition, 2017.
2. ShashiChawla, “Text Book of Engineering Chemistry” DhanatRai and Company, 2017.
3. Prashanthrath, B.Rama Devi, Ch.VenkataRamana Reddy, Subhendu Chakroborty, Cengage Learning Publishers, 1<sup>st</sup> Edition, 2018.

### **VI. REFERENCE BOOKS:**

1. Bharathi Kumari, “Engineering Chemistry”, VGS Book Links, 10<sup>th</sup> Edition, 2018.
2. B. Siva Shankar, “Engineering Chemistry”, Tata McGraw Hill Publishing Limited, 3<sup>rd</sup> Edition, 2015.
3. S. S. Dara, Mukkanti, “Text of Engineering Chemistry”, S. Chand & Co, New Delhi, 12<sup>th</sup> Edition, 2006.

### **VII. WEB REFERENCES:**

1. Engineering chemistry (NPTEL Web-book), by B.L.Tembe, Kamaluddin and M.S.Krishnan.  
[http://www.cdeep.iitb.ac.in/webpage\\_data/nptel/Core%20Science/Engineering%20Chemistry%201/About-Faculty.html](http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/About-Faculty.html)
2. Polymer Science (NPTEL Web-book), by Prof. Dibakar Dhara  
[https://onlinecourses.nptel.ac.in/noc20\\_cy21/preview](https://onlinecourses.nptel.ac.in/noc20_cy21/preview)
3. Environmental Chemistry and Analysis(NPTEL Web-book), by Prof. M.S.Subramanian  
<https://nptel.ac.in/courses/122/106/122106030/>