

## CHEMISTRY

I B. TECH- II SEMESTER								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIE	SEE
A4BS11	BSC	4	-	-	4	30	70	100
<p><b>COURSE OBJECTIVES:</b>  <b>Student will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.</li> <li>2. To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.</li> <li>3. To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry?</li> <li>4. To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.</li> <li>5. To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways.</li> </ol> <p><b>COURSE OUTCOMES:</b>  <b>The basic concepts included in this course will help the student to gain:</b></p> <ol style="list-style-type: none"> <li>1. The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.</li> <li>2. The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.</li> <li>3. The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.</li> <li>4. The knowledge of configurationally and conformational analysis of molecules and reaction mechanisms</li> </ol>								
<b>UNIT-I</b>	<b>MOLECULAR STRUCTURE AND THEORIES OF BONDING</b>						<b>Classes: 10</b>	
<p>Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N<sub>2</sub>, O<sub>2</sub> and F<sub>2</sub> molecules. π molecular orbitals of butadiene and benzene.            Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance.</p>								
<b>UNIT-II</b>	<b>WATER AND ITS TREATMENT</b>						<b>Classes: 12</b>	
<p>Introduction – hardness of water – Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonation. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.</p>								
<b>UNIT-III</b>	<b>ELECTROCHEMISTRY AND CORROSION</b>						<b>Classes: 12</b>	
<p>Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery).  <b>Corrosion:</b> Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection– Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings –Hot dipping , metal cladding and electro plating(copper plating).</p>								
<b>UNIT-IV</b>	<b>STEREOCHEMISTRY, REACTION MECHANISM AND SYNTHESIS OF DRUG MOLECULES</b>						<b>Classes: 10</b>	
<p>Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation analysis of n- butane. Substitution reactions: Nucleophilic substitution reactions: Mechanism of SN<sub>1</sub>, SN<sub>2</sub> reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti</p>								

Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using KMnO <sub>4</sub> and chromic acid. Reduction reactions: reduction of carbonyl compounds using LiAlH <sub>4</sub> & NaBH <sub>4</sub> . Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Aspirin.		
<b>UNIT-V</b>	<b>SPECTROSCOPIC TECHNIQUES AND APPLICATIONS</b>	<b>Classes:8</b>
Principles of spectroscopy, selection rules and applications of electronic spectroscopy, vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging. Fluorescence and its applications in medicine.		
<b>TEXT BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. Engineering Chemistry 14<sup>th</sup> edition by P.C.Jain &amp; M.Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.</li> <li>2. Fundamentals of Molecular Spectroscopy 5<sup>th</sup> edition by C.N. Banwell Mc.Graw-Hills book company.</li> </ol>		
<b>REFERENCE BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. Organic Chemistry 7th Edition, Robert Thornton Morrison, Robert Neilson Boyd, Saibal Kanti Bhattacharjee Pearson Education Singapore Pvt.Ltd.</li> <li>2. Engineering Chemistry (NPTEL Web-book), 11<sup>th</sup>edition by B.L. Tembe, Kamaluddin and M.S. Krishnan.</li> <li>3. Physical Chemistry 11<sup>th</sup> edition by P.W. Atkins OUP Oxford.</li> </ol>		
<b>WEB REFERENCES:</b>		
<ol style="list-style-type: none"> <li>1. <a href="https://www.scribd.com/document/23180395/Engineering-Chemistry-Unit-I-Water-Treatment">https://www.scribd.com/document/23180395/Engineering-Chemistry-Unit-I-Water-Treatment</a></li> <li>2. <a href="https://chem.libretexts.org/Core/Inorganic_Chemistry/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Properties_of_the_Elements">https://chem.libretexts.org/Core/Inorganic_Chemistry/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Properties_of_the_Elements</a></li> <li>3. <a href="https://www.khanacademy.org/science/biology/chemistry--of-life/chemical-bonds-and-reactions/v/intermolecular-forces-and-molecular-bonds">https://www.khanacademy.org/science/biology/chemistry--of-life/chemical-bonds-and-reactions/v/intermolecular-forces-and-molecular-bonds</a></li> <li>4. <a href="https://study.com/academy/lesson/the-relationship-between-free-energy-and-the-equilibrium-constant.html">https://study.com/academy/lesson/the-relationship-between-free-energy-and-the-equilibrium-constant.html</a></li> </ol>		
<b>E-TEXT BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://www.freebookcentre.net/Chemistry/Chemistry-Books-Online.html">http://www.freebookcentre.net/Chemistry/Chemistry-Books-Online.html</a></li> <li>2. <a href="https://www.sdu.dk/en/om_sdu/institutter_centre/fysik_kemi_og_farmaci">https://www.sdu.dk/en/om_sdu/institutter_centre/fysik_kemi_og_farmaci</a></li> </ol>		
<b>MOOC COURSE</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://nptel.ac.in/courses/122101001/34">http://nptel.ac.in/courses/122101001/34</a></li> <li>2. <a href="https://ocw.mit.edu/courses/chemistry/">https://ocw.mit.edu/courses/chemistry/</a></li> </ol>		