

## F.E. FIRST SEMESTER

Course Code – 210104

**Course Name: Applied Science – I (Chemistry)**

Credit Points	Teaching Hrs/Week	Practical Hrs/Week
	2Hrs/Week	02

Objective	To impart a sound knowledge on the principles of chemistry involving the different application oriented for all engineering branches.
Prerequisites	Basic knowledge of 12th std physical & inorganic chemistry

Unit	Topic Name	Details	Hrs
I	<u>Water</u>	Introduction, characteristic imparted by impurities in water, Analysis of water – alkalinity, hardness and its determination (EDTA method only), equivalents of calcium carbonates, Units of Hardness, Disadvantages of hard water Water softening processes: Ion exchange method, boiler feed water, boiler problems-scale, sludge, priming and foaming, caustic embitterment and corrosion, their causes and prevention Numerical problems on alkalinity, hardness, Ion exchange method, EDTA method.	06
	<u>Environmental Pollution and Control</u>	<b>Air Pollution:</b> Types of pollutants, source effects, sink and control of primary pollutants – CO, NO <sub>x</sub> , HC, SO <sub>x</sub> and particulates, effects of pollutants on man and environment – photochemical smog and acid rain. <b>Water Pollution:</b> Classification of pollutants, their sources, waste water treatment – domestic and industrial. <b>Soil Pollution:</b> Composition of soil, classification and effects of soil pollutants and their control. <b>Solid Waste Pollution:</b> Classification, waste treatment & Disposal methods (Composting, sanitary land filling, thermal processes, recycling and reuse). Hazardous Wastes: Classification – radioactive, biomedical and chemical, treatment and disposal – physical, chemical and biological processes.	04
II	<u>Fuels</u>	Classification, combustion and chemical principles involved in it, calorific value: gross and net calorific values and their determination by bomb calorimeter	07

		<p>and Boy's gas calorimeter. Numerical based on calorific value calculation.</p> <p><b>Solid Fuels:</b> Proximate and ultimate analysis of coal and their importance, High and low temperature carbonisation, Coke: Manufacture by Otto Hoffman oven.</p> <p><b>Liquid Fuels:</b> Conversion of coal into liquid fuels (Bergius process and Fisher-Tropsch Process) and mechanism, Petroleum: its chemical composition and fractional distillation, cracking of heavy oil residues – thermal and catalytic cracking, knocking and chemical structure, octane number and cetane number and their significance, power alcohol.</p> <p><b>Gaseous fuels:</b> Coal gas, oil gas, producer gas, water gas, Bio gas, Rocket propellents, Classification of propellents</p>	
<b>III</b>	<b><u>Polymers and Composites</u></b>	<p>Introduction, Definition, Degree of polymerization (<math>D_p</math>), concept of molecular weight (number average, weight average &amp; numerical based on them), Glass transition temperature.</p> <p><b>Classification of polymers:</b></p> <p>Polymerization mechanism: (step and chain polymers)  Polymerisation Reaction: (addition and condensation)  Thermal behaviour: Thermoplastic and thermosetting  Types of monomers: Linear, branched and cross-linked polymers, Homo and Copolymers.  Conducting Polymers: Properties and applications.</p> <p><b>Commercial Polymers:</b> Synthesis, properties and application, polyethylene (PE), Polypropylene (PP), Polyvinyl Chloride (PVC), Polystyrene (PS), m Phenol Formaldehyde (PF), Epoxy resin.</p> <p>Speciality polymers: Basic concept applications of conductive polymers, biodegradable polymers, recycling of polymers</p> <p><b>Composites:</b> Classification, Fibre and particle reinforced composites.</p>	<b>08</b>

<b>Lab/ Term Work</b>
<p><b>Water analysis</b></p> <ol style="list-style-type: none"> <li>1. To determine carbonate (<math>\text{CO}_3^{2-}</math>), bicarbonate (<math>\text{HCO}_3^-</math>).</li> <li>2. To determine the total hardness of water by EDTA method.</li> <li>3. To determine chloride from water sample.</li> <li>4. To determine dissolved oxygen of water sample by Winkler's method.</li> <li>5. To determine pH and electrical conductivity of water sample.</li> <li>6. Preparation of Urea-formaldehyde resin by condensation.</li> <li>7. Determination of molecular weight of high polymer using Ostwald's viscometer.</li> </ol>

Text Books	Engineering Chemistry, S.K. Singh , New Age Publications Engg. Chemistry, Jain & Jain (Dhanpat Rai Publishing Company) Engineering Chemistry, SS Dara, S Chand & Co. Engineering Chemistry, M M Uppal, Khanna Publishers
Reference Books	Solid State, H.V. Keer (New Age International Publisher) Engineering Material , Veneth G. Bundisky(Pentice Hall of India) Elements of Material Science and engineering, Lawrence H. Van Vlack (Addison Wesley Publication). Engineering chemistry by J.C. Kuriacose and J. Rajaram. Tata McGraw Hill Co.
Related Websites	

Examination Scheme	Internal Assessment = 40 marks	2 unit test , 1 numerical based assignment, conceptual assignment
	Term Work = 25 marks	Experiment based
	Final Theory Paper = 60 marks	Written