

<b>University of Mumbai</b>			
<b>CLASS: F.E (All Branches of Engineering)</b>		<b>Semester - I</b>	
<b>SUBJECT: Applied Chemistry I</b>			
Periods per week 01 Period of 60 min.	Lecture	3	
	Practical	1	
	Tutorial		
		Hours	Marks
Evaluation System	Theory Examination	2	75
	Practical	--	--
	Oral Examination	--	--
	Term Work	-	25
	Total		100

### Details of the Syllabus:-

Sr.No.	Details	Hrs
<b>01</b>	Polymers: <ul style="list-style-type: none"> <li>➤ Introduction, Classification, Hydrocarbon Molecules, Thermoplastic, Thermosetting Polymers.</li> <li>➤ Basic Concepts Molecular Weight, Molecular Shape, Polymer Crystallinity. Crystallization, Melting and Glass Transition Phenomena.</li> <li>➤ Viscoelasticity, Deformation Fracture, Defects in Polymers.</li> <li>➤ Polymerization, Addition, Polymerization, Copolymerization and Condensation Polymerization. Polymer Additives Plastics, Elastomers, Vulcanization.</li> <li>➤ Advanced Polymer Material, Conducting Polymers, Electrical Properties of Polymers . Liquid Crystal Properties. Molecular Electronics &amp; Polymers &amp; Supramolecular Chemistry.</li> <li>➤ Fabrication of Polymers                I) Compression Moulding ii) Injection Moulding iii) Transfer Moulding iv) Extrusion Moulding                Synthesis Properties &amp; Uses of PE, PMMA Formaldehyde resin,. Polymer Composite Materials .</li> </ul>	<b>10</b>
<b>02</b>	Water : <ul style="list-style-type: none"> <li>➤ Hardness of water, effect of hard water in the manufacture sector, types of hardness, determination of hardness by EDTA method and Problems.</li> <li>➤ Softening of water by i) lime soda method with equations in general. Hot-cold lime soda method and problems ii)</li> </ul>	<b>08</b>

	<p>zeolite process &amp; problems iii) Ion exchange method iv) reverse osmoses, ultrafiltration &amp; its industrial applications.</p> <ul style="list-style-type: none"> <li>➤ Methods to determine extent of water pollution i) BOD ii) COD.</li> <li>➤ Methods to control water pollution.</li> <li>➤ Industrialisation – materials cycle &amp; pollution. Recycling issues</li> </ul>	
<b>03</b>	<p>Lubricants</p> <ul style="list-style-type: none"> <li>➤ Definition, classification, characteristic properties, problems on acid value and saponification value. theories of lubrication.</li> <li>➤ Additives for lubricants, selection of lubricant.</li> </ul>	<b>05</b>
<b>04</b>	<p>Energy:</p> <ul style="list-style-type: none"> <li>➤ Classification. Solar energy, hydropower, wind power, Bio-mass energy using bio technology, Hydrogen as a fuel.</li> <li>➤ Solar energy, Production of electricity using solar energy Rechargeable alkaline storage batteries, Nickel Hydrogen Batteries. Rechargeable Lithium ion batteries</li> </ul>	<b>05</b>
<b>05</b>	<p>Phase Rule and steels:</p> <ul style="list-style-type: none"> <li>➤ Gibbs Phase Rule, One Component System Water. Two Component System Iron-Carbon Equilibrium Diagram with Microstructures.</li> <li>➤ Limitations &amp; Application of Phase Rule.</li> <li>➤ Plain Carbon Steel. Limitations.</li> <li>➤ Introduction to Alloy Steels, special steels.</li> <li>➤ Principles of shape memory effect &amp; its applications</li> </ul>	<b>06</b>
<b>06</b>	<p>Nano-materials:</p> <ul style="list-style-type: none"> <li>➤ Introduction to nano-materials.</li> <li>➤ Graphite, fullerenes, carbon nanotubes, nanowires, nanocones, Haeckelites. Their electronic and mechanical properties</li> <li>➤ Production methods for CNTS.</li> <li>➤ Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics &amp; related fields. V) Mechanics.</li> </ul>	<b>06</b>

**Term work:**

Each student is to appear for at least one written test during the term. Term work shall consist of graded answer paper of the test and at least five experiments from following:

Suggested Experiments	Applied Chemistry I:
	1) To determine total, temporary and permanent hardness of water sample.
	2) Removal of hardness using ion exchange column.
	3) To determine saponification value of a lubricating oil.
	4) To determine acid value of a lubricating oil.
	5) To determine COD of a effluent sample.
	6) To determine CO <sub>2</sub> content from air by Orsat's apparatus.
	7) To determine flash point and fire point of a lubricating oil
	8) To determine conductance of polymer.
	9) To determine melting point and/or glass transition temperature of a polymer.
	10) To prepare nano-oxide using combustion method.

The distribution of term work marks shall be as follows:

Written test (at least one):	10 marks
Lab Work:	10 marks
Attendance	05 marks

**Recommended Books:**

1. Engineering Chemistry – Jain & Jain, Dhanpat Rai
2. Engineering Chemistry – Dara & Dara, S Chand
3. Materials Science & Engg. – William Callister,
4. Chemistry of advanced materials – CNR Rao, RSC Pbl
5. Polymer Chemistry – Vasant Gowariker
6. Membrane Filtration - Gutman, Adam Hilger Bristol.
7. Nano scopic materials – Emil Roduner –RSC Publishing
8. Nano Chemistry – Ozin et. al – RSC publishing
9. Physical Metallurgy – B. K. Agarwal