

**Engineering Chemistry-I**  
**[KAS 102T]**

L	T	P			Theory		Sessional		Total(s)	75
02	01	0			50		25		Credit's: 02	

**Course Outcomes (Cos)**

*After the completion of the course, students are expected to have the ability to:*

1. *To develop a basic to advanced understanding of various chemical models that describe organic molecule bonding concepts*
2. *To develop a basic to advanced understanding of several chemical models that describe organic molecule bonding concepts*
3. *To develop a basic to advanced understanding of several chemical models that describe organic molecule bonding concepts*
4. *To acquire the fundamental concepts behind reaction mechanisms involving various intermediates and their effects on reaction outcomes and types.*
5. *Analyze the parameters of the water sample and detect the pollutants as well as their consequences. Capable of designing a water purification process and its quality concerns.*

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<b>UNIT I:</b>	<b>Atomic &amp; Molecular Structure</b>	<b>[08]</b>
	Molecular Orbital Theory (MOT)- Important Features, LCAO methods, Type and formation of Molecular Orbitals (bonding & antibonding), Sigma & Pi bonds, Molecular energy level diagram of Homonuclear Diatomic Molecules (i.e., H <sub>2</sub> , He <sub>2</sub> , Be <sub>2</sub> , B <sub>2</sub> , C <sub>2</sub> , N <sub>2</sub> , O <sub>2</sub> , F <sub>2</sub> , and Ne <sub>2</sub> ), Magnetic properties', Bond order, Bond Energy & Bond length, Concept of Hydrogen Bonding in Biological System.	
<b>UNIT II:</b>	<b>Chemical Kinetics</b>	<b>[08]</b>
	Introduction to the Chemical Kinetics, Rate of Chemical reaction, Factors affecting the rate of reaction (Concentration, Temperature, Pressure, and Catalyst), Order and Molecularity of reaction, rate law, rate constant and its Unit, Differential, and Integral rate constants for ZERO and First Order reaction, Half-life.	
<b>UNIT III:</b>	<b>Phase Rule</b>	<b>[08]</b>
	Definition of the term Phase, Component, Degree of Freedom, Gibbs Phase rule (thermodynamic derivation), Phase Equilibrium & Phase diagram of one component system (H <sub>2</sub> O, water).	
<b>UNIT IV:</b>	<b>Mechanistic concept of Organic reaction</b>	<b>[08]</b>
	Bond Fission, Attacking reagent, Reaction intermediates (i.e., Carbocation, Carbon anion, and Free radicals), Stability, Electronic effects (Inductive effect, Mesomeric Effects, Electrometric effects, and Hyper conjugative effects) Type of Nucleophilic Substitution Reaction, Mechanism of Nucleophilic substitution reaction (i.e., SN <sup>1</sup> & SN <sup>2</sup> ).	
<b>UNIT V:</b>	<b>Water Analysis</b>	<b>[08]</b>
	Hard & Soft Water (Temporary & Permanent Hardness) Quality aspect of water, Technique for water softening (i.e., Lime soda, Zeolite, and Ion Exchange Resin Methods).	