Engineering Chemistry-I
[KAS 102T]

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

Course Outcomes (COs) *(The designed chemistry syllabus for engineering graduates at entry level (B.Tech. I & II semesters, I year) focuses on the students' need to understand the basic concept of chemistry with special emphasis on atomic structure, kinetics, phase rule, the mechanistic concept of organic reactions and water analysis. The content of the curriculum corresponds in a broad aspect to the need for national and global perspectives. After completing their studies, students acquire a sufficient basic understanding of chemistry that will help them to seek employment in the chemical-pharmaceutical industry or a career in a university degree in interdisciplinary courses such as materials science, nanotechnology, bio-nanotechnology, and instrumentation. In addition, the course is supported by experimental concepts based on the need of the curriculum both from a national and global perspective to analytically conduct the experiments to determine the concentration of the sample, measure the viscosity and surface tension of the liquid sample, and rate determination of the basic reaction through their kinetics study).*

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

CO1	*Develop a basic to advanced understanding of various chemical models that describe organic molecule bonding concepts*	**K1, K3**
CO2	*Explain the fundamental concept of reaction kinetics, which is used to calculate the reaction rate constant and the order of chemical reactions.*	**K2**
CO3	*Estimate the concepts that describe components and the degree of freedom in the phase diagram of one component system*	**K1, K5**
CO4	*Examine the fundamental concepts behind reaction mechanisms involving various intermediates and their effects on reaction outcomes and types.*	**K4**
CO5	*Explain the water purification process and its quality concerns.*	**K1, K5**

UNIT I: Atomic& Molecular Structure [08]

Atomic orbitals, molecular orbital theory (MOT)-important features, LCAO methods, formation of molecular orbitals (bonding &*anti*-bonding), sigma (σ) & Pi (π) bonds, molecular energy level diagram of homonuclear and heteronuclear diatomic molecules (i.e., N_2, O_2, and NO), magnetic properties, bond order, bond energy &bond length, the concept of hydrogen bonding in a biological system.

UNIT II: Chemical Kinetics [08]

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, first, and second order reaction.

UNIT III: Phase Rule [08]

Definition of the term phase, component, degree of freedom, Gibbs phase rule (thermodynamic derivation), the phase diagram of one component system (H_2O).

UNIT IV: Mechanistic concept of Organic reaction [08]

Bond fission, reaction intermediates (i.e., carbocation, carbanion, and free radicals), stability, electronic effects (inductive effect, mesomeric effects, electrometric effects, and hyper conjugative effects), Nucleophilic substitution reactions, mechanism of SN^1& SN^2 reactions.

UNIT V: Water Analysis [08]

Hard &soft water (temporary &permanent hardness), quality aspect of water, a technique for water softening (i.e., zeolite, ion exchange resin method, reverse osmosis).

Reference Book:

1 University Chemistry by B.H. Mahan
2 University Chemistry by C.N. R. Rao
3 Organic Chemistry by I.L Finar
4 Physical Chemistry by S. Glasstone
5 Engineering Chemistry by S.S Dara
6 Engineering Chemistry by Satya Prakash