Course Syllabi: UCB008: Applied Chemistry (L : T : P :: 3 : 1 : 2)

1. **Course number and name**: UCB008: Applied Chemistry

2. **Credits and contact hours**: 4.5 and 6

3. **Text book, title, author, and year**

Text Books / Reference Books

- *Ramesh, S. and Vairam S. Engineering Chemistry, Wiley India (2012) 1st ed.*
- *Jain, P.C. and Jain, M. Engineering Chemistry, DhanpatRai Publishing Co. (2005) 15th ed.*
- *Puri, B.R., Sharma and L.R., Pathania, M.S. Principles of Physical Chemistry, Vishal Publishing Co. (2008).*
- *Brown, Holme, Chemistry for engineering students, Thompson, 1st ed.*
- *Shulz, M.J. Engineering Chemistry, Cengage Learnings, (2007) 1st ed.*

a. *Other supplemental materials*

- *Nil*

4. **Specific course information**

a. Brief description of the content of the course (catalog description)

Atomic Structure and Bonding: Chemical change; elements, compounds and mixtures, Atomic structure, dual nature of electron, concept of atomic orbitals, Pauli`s Exclusion principle, Concept of chemical bonding: covalent, ionic, metallic, hydrogen bond, Vander Waal`s, Hybridization and shapes of molecule, electronic structure and periodic table.

Chemical Equilibrium: Law of mass action, Factors that influence the position of equilibrium. Ionic equilibria: ionic equilibria in aqueous solutions; strong and weak acids and bases; buffer solution and indicators.

Electrochemistry: Migration of ions, Transference number, Specific, Equivalent and Molar Conductivity of electrolytic solutions, Conductometric titrations, Electrode potential and types of electrodes, Introduction to galvanic and concentration cells, Liquid junction potential.

Colligative Properties of Dilute Solutions: Depression of freezing point and elevation of boiling point.

Phase Rule: States of matter, Phase, Component and Degree of freedom, Gibbs phase rule, One component and two component systems.

Water Treatment and Analysis: Hardness and alkalinity of water: Units and determination, External and internal method of Softening of water: Lime-soda Process, Ion exchange process, Desalination of brackish water.

Fuels: Classification of fuels, Calorific value, Cetane and Octane number, fuel quality, Comparison of solid liquid and gaseous fuel, properties of fuel, alternative fuels: Biofuels, Power alcohol, Synthetic petrol.

Application of Atomic and Molecular Spectroscopic Methods: Structure determination of certain model compounds of industrial importance.

Assignments based on working and applications of advanced instruments will be given in the tutorial class.

Laboratory Work

Electrochemical measurements: Experiments involving use of pH meter, conductivity meter, potentiometer.

Acid and Bases: Determination of mixture of bases

Spectroscopic techniques: Colorimeter, UV-Vis spectrophotometer.
Kinetics: Kinetics of oxidation of iodine ion by peroxydisulphate ion.
Thermochemistry: Cloud point and pour point determination
Water and its treatment: Determination of hardness, alkalinity, chloride, chromium, iron and copper in aqueous medium.

5. **Specific goals for the course**

After the completion of the course, the students will be able to:

- Analyse trends in periodic table with electronic and atomic structure.
- Interpret phase diagrams of pure and binary substances.
- Demonstrate the working of electrodes and their applications.
- Calculate various parameters defining water and fuel quality.
- Identify the various functional groups through IR spectra.
- Carry out basic experimental procedure and to emphasize need for safety and safety procedure in laboratory.

6. **Brief list of topics to be covered**

- Atomic Structure and Bonding
- Chemical Equilibrium
- Electrochemistry
- Colligative Properties of Dilute Solutions
- Phase Rule
- Water Treatment and Analysis
- Fuels