

Subject Code: 01CH1101
Subject Name: Engineering Chemistry-I
B.Tech. Year: I

Objective: To acquire basic knowledge of chemical principles which form the foundation for understanding unit operations and unit processes and also get the knowledge of chemical analysis techniques.

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Compare the classical and modern methods of analysis.
2. Point out the various environmental problems.
3. Estimate the combustion parameters and calorific value.
4. Predict the various instrumental methods used in chemical industry.

Pre-requisite of course: Basic of Chemistry

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (I)	CSE (C)	Viva (V)	Term work (TW)	
3	0	2	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	<p>Introduction, Chemical Bonding, Chemical Equations</p> <p>Introduction: The Role of Chemistry in Engineering, Green Engineering, Classification of Matter, The Physical States of Matter, Separation of Mixtures</p> <p>Acids and Bases</p> <p>Defining Acids and Bases, Acids and Bases in Aqueous Solution, The pH Scale, Other “p” Functions, Buffer Solutions, The Titration</p> <p>Properties of Gases: Boyle’s Law, Charles’ Law, Gay-Lussac’s Law, The Ideal Gas Law, Non-ideal Gas Behavior, Partial Pressures, Chemical Reactions With Gases</p>	8
2	<p>Chemical Equations and Mass Balance: The Mole, The Empirical Formula, Chemical Equations, Stoichiometry, Limiting Reactant and Percent Yield, Concentrations in Aqueous Solution; Normality, molarity etc.</p> <p>Chemical Reactions: Reversible and Irreversible reaction, Kinetics and rate of reaction, Equilibrium constant.</p>	8
3	<p>Thermo chemistry: Enthalpy of reaction, Endothermic reaction, Exothermic reaction, Heat of reaction, heat of combustion, heat of neutralization, heat of transition, Hess’s Law of constant heat summation</p> <p>Electro Chemistry: Introduction, half reaction, electrode potential,</p>	10



	Nernst's equation, Electro chemical cell, type of electrodes, Reference electrodes, Faraday's Law of Electrolysis, buffer solution, buffer capacity, Henderson-Hassel batch equation for acidic and basic buffer.	
4	<p>Chemical Measurements and Instrumentation</p> <p>Spectroscopy: UV-Visible Absorption Spectroscopy, Infrared Spectroscopy, Luminescence Spectroscopy, Mass Spectrometry, Nuclear Magnetic Resonance.</p> <p>Chromatography: HPLC, GC, Paper Chromatography, TLC.</p>	10
	Total Hours	36

List of Experiments:

1. Determine the pH of different samples.
2. Find the normality and molarity of a given sample.
3. Determine the acidity and basicity of the sample.
4. To determine the strength of the given Hydrochloric acid by Sodium hydroxide.
5. Experimentally verify the stoichiometry of any reaction.
6. To study the effect of concentration of reactant on the rate of reaction between sodium thiosulphate and hydrochloric acid.
7. To study the effect of temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.
8. To study the rate constant of a reaction.
9. Determine the equilibrium constant of a reversible reaction.
10. Demonstration of UV spectroscopy.
11. Demonstration of any one chromatography instrument.

References:

1. Gaffney, J., & Marley, N. (2017). General chemistry for engineers. Elsevier.
2. Essential of Physical Chemistry by Bahl and Tuli., S Chand & Co. Ltd, New Delhi.
3. Inorganic Chemistry by P.L. Soni and Katyal., Sultan Chand & Sons, New Delhi
4. Engineering Chemistry Willey India Publisher

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	35%	20%	20%	-	-



Instructional Method:

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory