

COURSE TITLE	ENGINEERING CHEMISTRY - I
COURSE CODE	01CH2101
COURSE CREDITS	4

Objective:

- 1 To provide students with knowledge of engineering chemistry for building technical competence in industries, research and development in the various fields of chemistry.

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

- 1 Explain the role of chemistry in engineering, classification of matter, chemical bonding, acid-base behavior and gas laws.
- 2 Apply concepts of stoichiometry, reaction kinetics and equilibrium
- 3 Evaluate thermochemical and electrochemical processes, water treatment methods, and corrosion prevention.
- 4 Assess the properties, composition, and applications of cement, polymers, refractories, abrasives, and insulators.

Pre-requisite of course:Basics of Chemistry

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Introduction The Role of Chemistry in Engineering, Green Engineering, Classification of Matter, The Physical States of Matter, Separation of Mixtures, Chemical Bonding, Lewis Representations of Simple Molecules and Ions, Types of Bonds, Importance of Organic Molecules, Classification & Nomenclature of Organic molecules, Acids and Bases: Acids and Bases in Aqueous Solution, The pH., Properties of Gases: Ideal Gas Law, Non-ideal Gas Behavior, Partial Pressures, Chemical Reactions With Gases	8
2	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, Reversible and Irreversible reaction, Kinetics and rate of reaction, Equilibrium constant	6

Contents : Unit	Topics	Contact Hours
3	Thermo and Electro chemistry Enthalpy of reaction, Endothermic reaction, Exothermic reaction, Heat of reaction, heat of combustion, heat of heat of neutralization, Heat of transition, Hess's Law of constant heat summation, : Introduction, half reaction, electrode potential, Nernst's equation, Electrochemical cell, Type of electrodes, reference electrodes, Faraday's Law of electrolysis, buffed solution, buffer capacity, Henderson-Hessel batch equation for acidic and basic buffer.	6
4	Water Technology Introduction, Sources of water Impurities, Hard and Soft Water, Degree of Hardness, Types of Hardness, Scale and Sludge Formation in boiler and its prevention. Caustic embrittlement, Softening of water, Properties of drinking water, Break-point chlorination, Desalination of Brackish water	6
5	Corrosion electrochemical theory of corrosion, galvanic series. Factors affecting the rate of corrosion: Types of corrosion, Corrosion control	3
6	Cement Classification, properties and chemical composition, Setting and hardening of cement, PCC & RCC	3
7	Polymers Classification, properties and industrial applications, Biodegradable Polymers	3
8	Refractory, Abrasives and Insulators Properties and classifications of refractory, abrasives and Insulators.	3
Total Hours		38

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment 1 Determine the pH of different samples.	2
2	Experiment 2 Find the normality and molarity of a given sample.	2
3	Experiment 3 Determine the acidity and basicity of the sample.	2
4	Experiment 4 To determine the strength of the given Hydrochloric acid by Sodium hydroxide.	2
5	Experiment 5 Experimentally verify the stoichiometry of any reaction.	2
6	Experiment 6 To study the effect of concentration of reactant on the rate of reaction between sodium thiosulphate and hydrochloric acid.	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
7	Experiment 7 To study the effect of temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.	2
8	Experiment 8 To study the rate constant of a reaction.	2
9	Experiment 9 Determine the equilibrium constant of a reversible reaction.	2
10	Experiment 10 Demonstration of Various Polymers.	2
11	Experiment 11 Demonstration of any one water related testing of parameters.	2
Total Hours		22

Textbook :

- 1 General chemistry for engineers. Elsevier., Gaffney, J., & Marley, N. , Elsevier., 2017
- 2 Essentials of physical chemistry. CRC Press., Shillady, D., CRC Press., 2011

References:

- 1 Essentials of physical chemistry., Essentials of physical chemistry., Bahl, A., S. Chand Publishing., 1963
- 2 Engineering Chemistry, Engineering Chemistry, Wiley Editorial., Wiley Publications, 2013

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					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
25.00	35.00	20.00	20.00	0.00	0.00

Instructional Method:

- 1 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.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- 1 https://onlinecourses.swayam2.ac.in/aic20_sp08/preview