

Subject Code: 01CH0101
Subject Name: Engineering Chemistry
B.Tech. Year – I (Semester I)

Objective: To provide students with knowledge of engineering chemistry for building technical competence in industries, research and development in the various fields of organic, inorganic and green chemistry.

Credits Earned: 4 Credits

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

- Explain the basic concepts of organic chemistry and recent trends in Green Chemistry.
- Demonstrate the knowledge of fundamentals of water technology and identify the various water treatment methods.
- Understand chemistry behind corrosion and identify the various types of corrosion and its effect.
- Identify as well as classify the properties of various types of cement, Refractory, Abrasives and Insulators, Polymers etc.

Pre-requisite of course: Understanding of basic chemistry.

Teaching and Examination Scheme:

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

Contents:

Unit	Topics	Contact Hours
1	Introduction to Chemistry: Introduction to Chemistry, History of Chemistry through ages and in relevant field of Engineering, Chemistry for Industries, Green Chemistry, Chemical Bonding, Lewis Representations of Simple Molecules and Ions, Types of Bonds, Importance of Organic Molecules, Structural Representation of Organic Molecules, Classification & Nomenclature of Organic molecules.	6
2	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

3	Corrosion: Introduction, electrochemical theory of corrosion, galvanic series. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium – pH, conductivity, and temperature. Types of corrosion- Differential metal, differential aeration (Pitting and water line) and stress. Corrosion control: Inorganic coatings Anodizing of Al and phosphating; Metal coatings- Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods).	8
4	Cements: Introduction, Classification of cement and properties, chemical composition of cement, Standards, Setting and hardening of cement, PCC & RCC.	6
5	Refractory, Abrasives and Insulators: Definitions of Refractory, Abrasives and Insulators. Properties of refractory. Classification of refractory. Classification, properties and uses of abrasives. Classification, properties and uses of Insulators.	6
6	Polymers Classification of polymers: Thermoplastics, thermosetting plastics - properties and industrial applications of important thermoplastic, thermosetting plastics. Conducting polymers: Properties and applications - biodegradable polymers	6
Total Hours		38

Suggested List of Experiments:

1. To draw the pH-titration curve of strong acid v/s strong base.
2. Gravimetric Analysis of decomposition of Na_2CO_3 & NaHCO_3 .
3. To study the wet corrosion losses of steel by weight loss method using Electrochemical theory.
4. To determine Alkalinity of a given Water Sample.
5. To determine the moisture content in coal.
6. Study of decomposition reaction of ZnCO_3 by Gravimetric analysis.
7. Discuss the ion-exchange process for water softening.
8. Determination of Concentration of Unknown Solution Spectrophotometrically.

References Books:

1. Engineering Chemistry by Jain and Jain Publisher, Dhanpat Rai Publishing Co.
2. Engineering Chemistry by Dr. O.P. Agrawal, Khanna Publishers Delhi.
3. Essential of Physical Chemistry by Bahl and Tuli., S Chand & Co. Ltd, New Delhi.
4. Engineering Chemistry by Marry Jane & Shult, Cengage Learning Publisher

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per 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
35%	35%	20%	10%	-	-

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, and virtual laboratories.