COURSE TITLE : ENGINEERING CHEMISTRY I
COURSE CODE : 1004
COURSE CATEGORY : F
PERIODS PER WEEK : 3
PERIODS /SEMESTER : 45
CREDITS : 3
TIME SCHEDULE

Module	Name of Module	Course Objective no.	Total periods per semester		
			Instructional	Test	Total
I	Atomic Structure-I, Nanochemistry and Catalysis	1.1 1.2 1.3	Theory : 13	1	14
			Practical		
II	Fundamental of analytical chemistry	2.1 2.2 2.3	Theory : 11	1	12
			Practical		
III	Water and its treatment.	1.1 1.2 1.3	Theory : 8	1	9
			Practical		
IV	Metals and Alloys	1.1 1.2 1.3	Theory : 9	1	10
			Practical		
TOTAL					**45**

Course Outcome

After the completion of the course, student will be able to

- Understand the concept of atom
- Prepare the students to learn the advanced level of Science and Technology like Nanotechnology.
- Relate the knowledge of basic chemistry in industrial applications like Catalysis
- Understand different concepts of acids and bases
- Analyse the physical concepts related to pH and develop the skill of solving problems
- Develop the ability to analyse, interpret and apply the fundamentals of analytical chemistry including the skill of solving problems
- Distinguish different types of water and hardness. Predict the methods of removal of hardness and apply the basic principles of chemistry behind it and apply the learned facts in real life situation.
- Differentiate between metals and alloys
- Apply the concept of metals and alloys in metallurgy.

Specific Outcome

MODULE - I:

1.1.0 ATOMIC STRUCTURES I, NANO CHEMISTRY AND CATALYSIS

1.1.1. Review the fundamental particles of atom

1.1.2. Explain the terms nano materials and nanotechnology.

1.1.3. Explain different methods of synthesis and applications of carbon nanotubes.

1.1.4. Introduce different terms used in catalysis.

MODULE - II :

1.2.0 FUNDAMENTALS OF ANALYTICAL CHEMISTRY

1.2.1. Recollect the ideas of acids and bases.

1.2.2 Narrate the different definitions of acids and bases and compute equivalent weights of acids and bases.

1.2.3 Explain the terms Ionic product of water, pH, pOH and Buffer Solution and illustrate Calculation of pH and pOH.

1.2.4 Explain the strength of solution using molarity and normality.

1.2.5 Solve problems based on normality and molarity.

1.2.6 Explain different terms used in Volumetric analysis.

1.2.7 Understand the principle of volumetric analysis and Solve problems based on $N_1V_1=N_2V_2$.

MODULE - III:

1.3..0 WATER AND ITS TREATMENT

1.3.1. Understand soft and hard water- definition and causes

1.3.2 Distinguish between soft and hard water

1.3.3 Mention types of hardness

1.3.4 Explain methods of removal of hardness

1.3.5 Explain reverse osmosis and desalination of sea water

MODULE - IV:

1.4.0 METALS AND ALLOYS

1.4.1 Distinguish the different varieties of Iron with their properties

1.4.2 Explain different methods of heat treatments of steel

1.4.3 Introduce alloys and explain composition of alloys like brass, bronze, Duralumin and Solder

1.4.4 Explain Powder Metallurgy with different steps, uses, advantages and limitations

CONTENT DETAILS

MODULE - I: Atomic Structure I, Nano Chemistry and Catalysis (13+1 = 14 hour)

Definition of atom and molecule - Fundamental particles - Electron, Proton and Neutron. Their charge and mass - Atomic number, mass number.

Definitions of nano materials and nano technology – Applications of nano materials – Carbon nano tubes – Types of Carbon nano tubes – SWCNT and MWCNT – Synthesis, Properties and any five applications of Carbon nano tubes.

Catalysis – Definition of Catalyst – Terms – Positive Catalyst, Negative Catalyst, Promotors and poisons with one example each - Types of Catalysis – Homogeneous Catalysis and Heterogeneous Catalysis – Two example each (No mechanism is required).

MODULE - II: Fundamentals of Analytical Chemistry (11+1 = 12 hour)

Definitions of Acids and Bases – Arrhenius, Bronsted & Lowry and Lewis definitions – Conjugate acid – base pair with two examples – Basicity of acid and Acidity of base – Equivalent weights of acids and bases.

Ionic Product of water – pH and pOH scale Definition – relation between pH and pOH – Simple problems based on pH. Applications of pH – Buffer solution – definition – classification of Buffers – Acidic and Basic Buffers – Buffer Capacity (definition only).

Molarity and Normality – Definition and mathematical formulae – Simple problems based on molarity and normality – Volumetric analysis – Titration – end point – indicators – pH range of indicators – choice of indicators in titration – Principle of Volumetric analysis (Normality equation only). Simple problems based on normality equation.

MODULE - III: Water and its Treatment (8+1=9 hour)

Water - Physical properties of water – Soft water and hard water – Reasons of hardness – Types of hardness – temporary hardness and permanent hardness – removal of temporary hardness – Boiling and Clark's Process – Removal of permanent harness – Ion exchange process using Cation and Anion exchangers - Potable water – Characteristics and treatment with block diagram - Desalination of sea water – reverse osmosis.

MODULE - IV: Metals and Alloys (9+1=10 hours)

Physical properties of metals – Properties of Industrial metals like Cast Iron, Pig Iron, Wrought Iron and Steel (Manufacture is not required) – Effect of Impurity in Steel – Heat Treatment of Steel – Tempering, Quenching and Nitriding – Alloys – Definition – Purpose of making alloys – Preparation of alloys by fusion method (figure is required) – Composition of alloys like Brass, Bronze, Duralumin and Solder – Powder Metallurgy (1. Preparation of Metal Alloy by Atomization and Reduction. 2. Chemical Mixing or Blending. 3. Compacting. 4. Pre-Sintering. 5. Sintering.) and its uses, advantages and limitations.

REFERENCE:

Sl. No.	Name of Author	Title of Book	Name of Publisher
1	Jain and Jain	Engineering Chemistry	Dhanpat Rai and Sons
2.	S. S. Dara	Engineering Chemistry	S. Chand Publication
3.	B. K Sharma	Industrial Chemistry	Geol Publication
4.	S. S. Dara	Environmental Chemistry and Pollution Control	S. Chand Publication
5.		Wiley "All in One"	Wiley India Pvt. Ltd 2012 Editon.