

Subject Code: 01CH0254**Subject Name: Engineering Chemistry-II****B.Tech. Year - II**

Objective: To understand the importance of various physical & chemical properties that governs the behaviour of the materials.

Credits Earned: 5 Credits

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

1. Learn about the fundamental information of chemical engineering materials.
2. Understand the importance of Qualitative and Quantitative analogue of different materials.
3. Understand the behaviour of materials under various conditions.

Pre-requisite of course: NA.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE	Internal (I)	Viva (V)	Term work (TW)	
4	0	2	5	50	20	30	25	25	150

Contents:

Unit	Topics	Contact Hours
1	Structure of Crystalline Solids Types of Solids: Amorphous & Crystalline, Atomic bonding in solids, Crystal structure & crystal system, reciprocal lattice, Bravais Lattice, Miller indices, closed packed structures, determination of crystal structures, coordination number, crystal defects & imperfections: Point defects in crystals; Dislocations; Twins, Grain boundary, Stacking faults.	4
2	Properties of Engineering Materials Mechanical Properties: Isotropy, Anisotropy, Plasticity, Elasticity, Toughness, Resilience, Tensile Strength, Malleability, Ductility, Brittleness, Hardness, Fatigue, Creep, Mechanism of creep, wear resistance. Electrical Properties: Resistivity, Conductivity (ionic & electrical), Semiconductors, Superconductivity, Insulators, Ferroelectricity, Energy Bands in solids, classification of materials based on band gap. Magnetic Properties: Magnetic moment, its origin, ferro and ferri-magnetism, dia- and para-magnetism, ferrites, use of magnetic materials.	10
3	Classification of Fluids & Powder Materials Oils: Types of oils & properties, Designation method as per BIS. Paints & Varnishes: Definition & classification. Powder Metallurgy: Basics of powder metallurgy & its applications, Advantages & Disadvantages.	8
4	Ceramics & Thermal processing of Metal Alloys Ceramics: Structure, application & Processing, Clays, Refractories, Cement. Metal Alloys: Annealing; Thermal treatment of steels; Precipitation hardening, Ferrous and non-ferrous alloys.	8
5	Corrosion Oxidation of Metals, Different Types of Corrosion, Mechanism, Factors influencing corrosion, prevention of corrosion, Corrosion inhibitors & their application, ageing of Rubber.	8
6	Introduction & Classification of non-metallic materials Classification of Polymers based on Thermal behaviour: Thermoplastics & Thermosetting, Properties and use of popular polymers: Polyethylene, Polypropylene, Polyvinyl chloride, Teflon, Polystyrene, Phenol formaldehyde, Acrylonitrile, Epoxy resin. Introduction to composite materials, Characteristics of composite materials.	8
	Total Hours	46

References:

1. “Chemical Engineering Materials”, Chaudhary H., Indian Book Distributing Company, Delhi, 2nd Edition, 1982.
2. “Materials Science and Engineering”, Raghavan, V., Prentice Hall of India, N. Delhi.
3. “Materials Science for Engineers”, VanVlack, L.H., Addison-Wesley Publishing Co.
4. “Physical Metallurgy”, Sidney Avner, Tata McGraw-Hill Education
5. “Nature and Properties of Engineering Materials”, D. Zaster Zebksi

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%	15%	5%	-

List of Experiments:

1. Measurement of Glucose concentration by Electrochemical Sensor.
2. Determination of viscosity coefficient of a given liquid/solution with Ostwald viscometer.
3. Determination of Hall coefficient for a semiconductor material.
4. Determination of dielectric constant for a given material.
5. Study of UV-VIS spectrophotometer.
6. Determination of hydrolysis constant of a salt with the help of a pH meter.



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