

# GUJARAT TECHNOLOGICAL UNIVERSITY

## CHEMICAL ENGINEERING MATERIALS

**SUBJECT CODE:** 2130506

B.E. 3<sup>RD</sup> SEMESTER

**Type of course:** Engineering Science

**Prerequisite:** None

**Rationale:** Chemical Engineering Materials play an important role in solving the problems of material selection. It is a vital tool for the design of equipment/machines for chemical manufacturing processes. The study of basic concepts of chemical engineering material will help the students to understand the importance of these materials in the design, manufacturing and safety aspects.

### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
				PA	ALA	ESE	OEP			
3	0	0	3	70	20	10	0	0	0	100

### Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Structure of atom-present concept of atom-Rutherford's and Bhor's model, Bonding in solids, Types of solids-crystalline and amorphous solids-crystal systems.	7	35%
2	Coordination number-crystal defects-determination of crystal structure-X-ray diffraction-electron diffraction methods, properties of engineering materials, mechanical properties ,isotropy and anisotropy, elasticity, plasticity, toughness, resilience, tensile strength, ductility, malleability, brittleness, hardness, fatigue, creep, wear resistance	7	
3	Electrical and magnetic properties,resistivity ,conductivity-ionic and electrical conductivity, semiconductors, superconductivity, insulators, ferroelectricity	5	
4	Classification of fluid and powder materials. Oils, Types and properties. Designation methods as per BIS. Paints and varnishes-Definition and classifications. Powder metallurgy. Basic concept of powder metallurgy and its applications, merits and demerits	7	35
5	<b>Thermal processing of metal alloys:</b> Annealing; Thermal treatment of steels; Precipitation hardening	5	
6	<b>Ceramic:</b> Structure, application and processing; Clays; Refractories; Abrasives; Cement: Introduction to nano-materials and structure sensitive materials	7	
7	<b>Corrosion:</b> Different types, mechanism and factors influencing corrosion-corrosion prevention-inhibitors and their	8	

	applicationoxidation- aging of rubber-oxidation of metals		
8	<b>Introduction and classification of non metallic materials:</b> Classification of Polymers on basis of Thermal behaviour (Thermoplastics & Thermosetting). Properties and applications of polymers (like Polyethylene, Polypropylene, Polyvinyl chloride, Teflon, Polystyrene, Phenol formaldehyde, Acrylonitrile, Epoxy resin.) Composites, Introduction of composite, Characteristics of composites	8	

**Reference Books:**

1. “Chemical Engineering Materials”, Chaudhary H., Indian Book Distributing Company, Delhi, 2<sup>nd</sup> 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 Zebski

**Course Outcome:**

After learning the course the students should 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

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.