GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3133609
Semester – III
Subject Name: Chemistry & Technology of Polymers

Type of course: Professional Core Course

Prerequisite: Basic Knowledge of Chemistry is required

Rationale: The main objective of this subject is to deliver the knowledge of basics of polymer technology and raw materials used in polymer and rubber industries.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	0	4	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	History and development in polymeric materials, Properties and its applications.	4
2	Petroleum refining & raw materials for polymer & rubber industry.	4
3	Synthesis of monomers & solvents: ethylene, propylene, butadiene, vinyl chloride, styrene, acrylic acid, methyl methacrylate, caprolactum, ethylene glycol, terephthalic acid, phenol, formaldehyde, urea, melamine, etc.	8
4	Polymer formation: Covalent bonds. Double bonds & functionality of monomers. Physical behavior of polymers in comparison to small molecular compounds in terms of molecular weight & distribution, glass transition temperature, solubility etc. Behavior of polymer solutions, LCST & UCST. Crystallinity& crystallization. Different methods of measuring molecular weight & distribution	14
5	Basic concepts of thermodynamics of chemical reactions: Rate of reaction. Kinetics of polymerization & its relevance to engineering aspects. Bulk, solution, suspension & emulsion, polymerization processes & engineering problems associated with these techniques.	10
6	Basic characteristics of addition & condensation polymerization, ionic polymerization, copolymerization.	5

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Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**15**	**10**	**15**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Raw Materials for Industrial Polymers , H Ulrich, Hanser Publication ,1989
2. Principles of Polymer Science, Bahadur&Sastry, Narosa Publishing Houses, 2002
3. Polymer Science , Gowarikar,John Wiley & Sons ,1986
4. Encyclopedia of Polymer Science & Engineering, John Wiley & Sons, Inc, 1988
5. Textbook of Polymer Science, Billmeyer,John Wiley & Sons, 1984
6. Textbook of Polymer Science, P Nayak and S Lenka, Kalyani Publishers, 1986
7. Polymer Chemistry, Seymour and Carraher, Marcel Dekker, 2003
8. Plastic Material, Brydson

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	To identify various history of polymeric material.	10
CO-2	To explain petroleum refining study involve in polymer and rubber materials.	20
CO-3	To apply this knowledge for the synthesis of polymers in the laboratory	25
CO-4	To analyse various methods of molecular weight determination for polymers.	10
CO-5	To evaluate polymer and rubber properties based on their properties.	25
CO-6	To create a bridge between theory and practical knowledge especially in polymer and rubber industries.	10

List of Open Source Software/learning website:

1) www.iri.net.in
2) www.ipiindia.org
3) Delnet