GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36)

POLYMER CHEMISTRY

SUBJECT CODE: 2133602

B.E. 3RD SEMESTER

Type of Course: Chemical Technology

Prerequisite: 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)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	0	4	70	20	10	0	0	0	100

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	**Historical developments** in polymeric materials, end use sectors.	4	5
2.	**Petroleum refining** & raw materials for polymer & rubber industry	4	5
3	**Synthesis of some important monomers & solvents:** ethylene, propylene, butadiene,vinyl chloride, styrene, acrylic acid, methyl methacrylate, caprolactum, ethylene glycol, terephthalic acid, phenol, formaldehyde, urea, melamine, etc.	8	15
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	35
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	30
6.	Basic characteristics of addition & condensation polymerization, ionic polymerization, copolymerization.	5	10

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:

At the end of this course students will be able to:

1. To express the knowledge of polymer monomers and their chemistry
2. To be able to utilize this knowledge for the study of processing of polymers
3. To be able to apply this knowledge for the synthesis of polymers in the laboratory
4. To build a bridge between theoretical and practical concept used in industry.

List of Open Source Software/learning website:

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

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.