



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3143615**

**Semester – IV**

## **Polymer & Rubber Synthesis and Analysis**

**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 C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

### **Content:**

Sr. No.	Content	Total Hrs
1	Chemistry of Natural rubber and its intermediates, latex collection & purification, Chemistry of Neoprene, Butyl rubber, Nitrile rubber, Synthetic rubbers, & elastomers. Introduction to Vulcanization Techniques.	4
2	NR Grade – Pale crepe, Ribbed Smoked Sheets, Technically classified rubbers, Technically specified rubbers – SMR, ISNR, ( Guvayule, Gutta Percha, Balata )	10
3	Chemistry of natural polymers such as cellulose, starch, lignin, Chitin, Chitosan, proteins and biopolymers.	4
4	Polymers and resins such as polyesters, polyamides, polyester amides, polylactic acid etc.	8
5	Chemistry of epoxy resin, alkyd resin, unsaturated and saturated Polyester resin, amino resins etc.	14
6	Specialty Rubbers: Polyacrylic Rubber, Fluorinated Rubber, Chlorinated PE, Chlorosulphonated PE, Polyurethanes, EVA.	5

### **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
15	15	15	10	5	10



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**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 know about the natural polymers and rubber materials.	22
CO-2	To be able to utilize this knowledge for the processing of materials.	22
CO-3	To be able to apply this knowledge for the characterization of polymers and rubber	21
CO-4	To build a bridge between theoretical and practical concept used in industry.	14
CO-5	To be able to understand the detail chemical structure of polymer and rubber.	7
CO-6	To be able to modified a polymer and rubber structure.	14



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## **Practicals:**

1. Molecular weight determination of polymers
2. Techniques of ensuring end capping polymerization
3. Softening point and temperature stability testing of polymers.

## **List of Open Source Software/learning website:**

- 1) [www.iri.net.in](http://www.iri.net.in)
- 2) [www.ipiindia.org](http://www.ipiindia.org)
- 3) Delnet