



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3152610**

**Semester – V**

**Subject Name: Polyurathene Technology**

**Type of course: Professional Elective Course**

**Prerequisite:**

**Rationale:**

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)	
3	0	2	4	70	30	30	20	150

**Content:**

Sr. No.	Content	Total Hrs
1	Introduction: The development of the Polyurethanes, The Market of the Polyurethanes	06
2	Chemical and Physical-Chemical Principles of Polyurethane Chemistry: Chemical Principles, Important Building blocks for Polyurethanes, Preparation methods for Polyurethanes, Recent developments, Perceptions on the physical chemistry of the structure of Polyurethanes	06
3	Raw Materials: Introduction, Polyols: Polyether & Polyester, Isocyanates, Conversation Products of Raw Materials, Additives and Auxiliary Materials, Industrial Hygiene of PU Raw Materials, Additives.	08
4	Polyurethane Processing: Basics, Design Principles for Polyurethane Processing Equipments, Steps of the Polyurethane Processing like Delivery and storage of the raw materials, Preparation of components, Metering, Mixing, Pouring, Process Controls.	08
5	Flexible Foams: Introduction, Slab stock Foams, Carpet Backing, Flexible Polyurethane Molded Foam, Semi-rigid Polyurethane Molded Foam	06
6	PU Rigid Foam: Introduction, Chemistry and Raw Materials, Manufacturing, Properties, Relationship between Production Methods and Properties, Applications, Consolidation of Foam and surrounding Strata	06
7	Determination of the Composition and Properties of Polyurethanes: Introduction, Determination of the Chemical Composition, Determination of Material Properties, Suitability Determination through End-Product Testing, Combustibility Testing and Rating.	08
8	Polyurethane and the Environment: Introduction, Industrial Hygiene in Manufacturing and Processing, Ecology of	06



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Polyurethanes, Polyurethanes as Foodstuffs-Commodities, Flammability and Flammability Risk etc
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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
12	12	16	10	10	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:

- Polyurethane Handbook By: Dr. Gunter Oertel
- Handbook of Thermoplastic Elastomer, Edited by Benjamin M. Walker
- Thermoplastic Elastomers: A Comprehensive Review, Edited by N. R. Legge, G. Holden, H. E. Schroeder
- Rubber Materials & Their Compounds, by J. A. Brydson

### Course Outcomes:

After learning this course students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Relate the Principles of Polyurethane Chemistry and processing	15
CO-2	Identify the different raw materials and its importance	15
CO-3	Differentiate the flexible and Rigid Polyurethane foam	15
CO-4	Analyze the raw materials and End product properties of Polyurethane	15
CO-5	Solve the problems related to compounding, mixing and environment	10

### List of Experiments:



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Tutorials/Presentation/Practicals based on above topics.

**Major Equipment:**

Pilling Tester, Specific gravity balance, Weighing balance, Adhesion Tester, Tensile Testing Machine etc.

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

- <http://americanurethane.com/polyurethane-properties.html>
- [http:// www.crcpress.com](http://www.crcpress.com)
- <http://www.polyurethanes.covestro.com/>