



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3162310**

**Semester – VI**

**Subject Name: Plastics Packaging Technology**

**Type of course: Professional Elective Course**

**Prerequisite: - NA**

**Rationale:** At the end of this course the students will be able to understand the types and functions of packaging and advantages of plastics in packaging. Students will gain knowledge about the plastic materials, conversion techniques, types of flexible packaging ,package wrapping techniques & package tests. They will be able to apply their knowledge in the field of packaging with plastics.

### Teaching and Examination Scheme:

Teaching Scheme			Credits	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	<b>Introduction to Packaging</b> <ul style="list-style-type: none"><li>• Definition of Packaging</li><li>• Types of Packaging</li><li>• Hazards in Distribution</li><li>• Functions of Packaging</li><li>• Package Design Fundamentals</li><li>• Need for changes in Package Design,</li><li>• Features of effective Design: Design factors, Customer Appeal-Packaging Graphics</li><li>• Package Colour</li><li>• Shelf life in designing packaging</li></ul>	4
2	<b>Plastics in Packaging</b> <ul style="list-style-type: none"><li>• Material Selection criteria</li></ul> -Advantages and limitations of plastic packaging - Plastics used for packaging applications[ industry wise ] FILMS: LDPE, HDPE, HMHDPE, LAMINATED FILMS, BOPET/BOPP FILMS, ABS, RETORT FILMS, etc. Bottles[ caps and closures] : HDPE, PET, PP ,SAN, etc. Tetrapack films	9
3	<b>FLEXIBLE PACKAGING</b> <ul style="list-style-type: none"><li>• Characteristics of Flexible Packaging</li><li>• Types of Interactions in packaging: Permeation, Migration,Sorption</li><li>• Pouch Styles- Pillow Pouches, Four-side Seal pouches, Stand up pouches</li></ul>	10



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	<ul style="list-style-type: none"> <li>• Forming Pouches, Retort Pouches, Bulk and Heavy-Duty Bags, Bag-in-box</li> <li>- Control of Packaging Atmosphere               <ul style="list-style-type: none"> <li>• Vacuum-packaging</li> <li>• Modified Atmosphere Packaging(MAP)</li> <li>• Controlled Atmosphere Packaging(CAP)</li> <li>• Active Packaging Technology</li> </ul> </li> <li>-Aseptic Packaging</li> <li>-Blister Package and Pouch package</li> <li>-Retort Package</li> <li>-Cushion Packaging: Need of Cushion Package, methods of isolation of shock, Fragility of Products, Cushion Materials</li> <li>-Package Wrapping Techniques:- Shrink Film Wrapping, properties of Heat Shrinkable films, Stretch Wrapping, Skin packaging</li> <li>- Tetra packs for Dairy Industry</li> <li>- Agriculture produce markets : Nets, films, etc.</li> <li>-FMCG Industry</li> </ul>	
<b>4</b>	<ul style="list-style-type: none"> <li>• <b>RIGID PACKAGING</b></li> <li>• Bottles for Pharma, Pesticide, Chemical Industry, Dairy industry, etc.</li> <li>• Caps designs like CRC caps, spouts,etc</li> </ul>	<b>07</b>
<b>5</b>	<p><b>Machinery used for Packaging</b></p> <ul style="list-style-type: none"> <li>• Form/Fill/Seal machines</li> <li>• Flow Wrap machines</li> <li>• bottle filling lines with automation like labelling, auto capping, coding[ ink jet ], collating and shrink wrapping</li> <li>• Induction and heat sealing</li> <li>• Export and Sea worthy Packaging</li> </ul>	<b>08</b>
<b>6</b>	<p><b>Testing of Plastics Packages:</b></p> <ul style="list-style-type: none"> <li>-Types of tests:-Drop testing, Vibration Testing, Impact Testing, Compression Testing</li> <li>-Migration Test:- Water Vapour Transmission Rate, Gas transmission rate</li> <li>- Testing of plastic films:- Optical properties, Mechanical Tests</li> <li>- Online testing of Packages</li> <li>- Testing for both flexible and Rigid packages [ Industry wise]</li> </ul>	<b>04</b>

**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	20	20	15	3	2

**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.**



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**Reference Books:**

1. Handbook of Packaging Engineering, J.F.Honlo, 3<sup>rd</sup> edition, CRC Press
2. Plastics Packaging Properties, Processing, Applications and Regulations 2<sup>nd</sup> Edition by Susan Selke, John D Culter, Ruben J. Hernandez, Hanser Publications
3. Fundamentals of Packaging Technology by S. Natarajan, M. Govindrajan, B. Kumar 2<sup>nd</sup> edition, PHI learning Pvt Ltd. Delhi
4. Packaging with plastics by Bruins Paul F , Gordon and Breach Science Publishers (1974)
5. Advances in plastics packaging technology by John Briston

**Course Outcomes:**

**After learning the course the students should be able to:**

Sr. No.	CO statement	Marks weightage	%
CO-1	Define packaging and list its functions, types and importance	20	
CO-2	Explain the role of various Plastics in Packaging	25	
CO-3	Apply the knowledge of different types of Flexible and Rigid Packaging in packaging applications.	25	
CO-4	Describe the functions and working of the Machineries used for packaging	15	
CO-5	Perform Testing of Plastic Packages[ Industry wise]	15	

**List of Experiments: - As per the above syllabus topics-**

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

1. <https://nptel.ac.in>
2. [www.bpf.co.uk](http://www.bpf.co.uk)
3. [www.youtube.com](http://www.youtube.com)