

# GUJARAT TECHNOLOGICAL UNIVERSITY

## PLASTIC TECHNOLOGY (23) PLASTIC PACKAGING TECHNOLOGY SUBJECT CODE: 2162310 B.E. 6<sup>th</sup> SEMESTER

**Type of course:** Elective

**Prerequisite:** NA

**Rationale:** NA

**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)	
				PA	ALA	ESE	OEP			
3	0	3	6	70	20	10	20	10	20	150

**Content:**

Sr. No.	Content	Total Hrs	% Weightage
1	<p><b>INTRODUCTION:</b> Historical background, definition of packaging as an integral part of production &amp; marketing. Basic concepts-Physical &amp; Physico-chemical such as colloidal properties, gas laws, surface tension, dialysis, diffusion, energy measurements, etc. Package – components, separations, clearance, support, positioning, cushioning, weight distribution, suspension &amp; closures</p>	07	15
2	<p><b>Packaging Characteristic :</b></p> <ul style="list-style-type: none"> <li>• Physical characteristics of product – physical state, weight, center of gravity, symmetry, fragility, rigidity, surface finish, etc.</li> <li>• Physico-chemical characteristic – susceptibility to water, water vapour, gases, odour, heat, light – mechanism of spoilage.</li> <li>• Principles of corrosion &amp; prevention.</li> <li>• Compatibility – permissible plasticizers in plastics &amp; coating media, their migration to food – can lining compounds &amp; lacquers for containers for fruit &amp; vegetables, fish, meat &amp; other products.</li> <li>• Package design – factors influencing design / product-package relationship. Role of nano technology in packaging</li> </ul>	10	15
3	<p><b>Raw Material Selection Criteria:</b> Materials used, Advantages, limitations of various plastics like PE, PP, PVC, PS, POLYESTER, NYLON, EVA COPOLYMER, EVOH, PC, IONOMER, PVDC,</p>	10	10

	IMIDE COPOLYMERS, ADHESIVE RESIN, & ACIDIC COPOLYMER OF ETHELENE.		
4	<p>CONVERSION PROCESSES :</p> <ul style="list-style-type: none"> <li>• Injection moulding- containers, closures, containers with safety closures, small size containers.</li> <li>• Extrusion process- Mono layer, multi layer, shrink, oriented films, cast, coating films, tapes, woven sacks, aluminium foil, laminations, sheet, tubes &amp; profiles, twist wrap film, plasma barrier coating.</li> <li>• Blow molding process- composite containers, composite drums, small hollow containers , medical &amp; pharmaceutical bottles, stretch blow moulding</li> <li>• Foam moulding process – expanded polyethylene, poly styrene, structural &amp; decorative foams.</li> <li>• Rotary thermo forming, Batch &amp; continuous thermo forming, Compression Moulding, Transfer moulding</li> </ul>	15	20
5.	<p>Fabrication &amp; decorative Techniques:</p> <ul style="list-style-type: none"> <li>• Cutting, sealing, welding, adhesive bonding.</li> <li>• Printing, metallising, embossing, labeling, painting, lacquering, foil in lay moulding, hot stamping, Inmould decoration</li> </ul>	07	15
6.	<p>Testing Of Plastics Packages:</p> <p>Introduction ; General test methods, Heavy duty packages, laminates, drop tests, stack test, load test, vibration test, Testing of flexible films, Indian standard .for food containers</p>	07	15
7.	<p>Packaging &amp; Hazardous &amp; their controls</p> <ul style="list-style-type: none"> <li>• Types – static charge problems, damaging factors &amp; effects</li> <li>• Pollution factors</li> <li>• Toxicity of Materials</li> </ul>	05	10

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

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
<b>10</b>	<b>15</b>	<b>20</b>	<b>15</b>	<b>10</b>	<b>0</b>

**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. Honlon J F ;Packaging Engineering ., 2nd edition; 1984 ;McGraw Hill
2. Bruins Paul F; Packaging with plastics ; 5thed.; 1974 ; Gordon & Breach

3. John Briston ; Advances in plastics packaging technology ; 2nd ed; 2004 ; John wiley & sons, New York

**Course Outcome:**

After learning the course the students should be able to:

1. Identify packages and materials
2. Design Packages

**List of Experiments:**

1. Determination of Tensile strength & % elongation of film.
2. Determination of Dart impact strength.
3. Demonstration of stack & load test
4. Determination of MFI
5. Demonstration of welding, printing, painting, labeling, hot stamping
6. Determination of Toxicity & barrier test

**Design based Problems (DP)/Open Ended Problem:**

Design Packages for Retort applications

**Major Equipment:** Extruder, Injection Moulding; Thermoforming; Testing machines for films, etc

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

1. [www.wikipedia.org](http://www.wikipedia.org)
2. [www.sciencedirect.com](http://www.sciencedirect.com)
3. [www.mit.edu](http://www.mit.edu)

**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.