



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Program Name: Diploma Engineering**

**Level: Diploma**

**Branch: Plastics Engineering**

**Subject Code: DI04023011**

**Subject Name: Decorating and Finishing of Plastic Products**

w. e. f. Academic Year:	2025-26
Semester:	4 <sup>th</sup>
Category of the Course:	PCC

<b>Prerequisite:</b>	Student should have knowledge regarding properties of various plastic material as well as other engineering materials and plastic product manufacturing processes.
<b>Rationale:</b>	The changing demands of consumers with respect to aesthetic & visual appeal, properties, branding & identity, enhanced functionality, applications, information sharing and protection led the plastic engineers for developing various kinds of decorating and finishing processes. A diploma plastic engineer has to select appropriate process, machine and monitor operations of decorating and finishing machineries. This competency requires the knowledge of decorating process, assembling of plastic parts, use of fastening techniques and application of painting and printing. Hence the course has been designed to develop these competencies and its associated cognitive, practical and affective domain learning outcomes.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Select suitable assembling and joining technique.	R,U
02	Apply proper surface treatment method.	R,U,A
03	Apply appropriate painting and coating process.	R,U,A
04	Perform suitable printing process.	U,A
05	Select appropriate hot transfer method for decoration.	U,A

\*Revised Bloom's Taxonomy (RBT)

## Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE(E)	PA(M)	PA(I)	ESE(V)	
3	0	2	4	70	30	20	30	150



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## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
<b>Unit – I Joining and Assembling Techniques</b>	<p>1.1 MECHANICAL FASTENERS</p> <ul style="list-style-type: none"><li>• Function, Advantages, Disadvantages &amp; Applications of :<ul style="list-style-type: none"><li>➤ Self tapping screws – Thread forming and thread cutting</li><li>➤ Post molded and molded-in inserts</li><li>➤ Rivets</li></ul></li></ul> <p>1.2 SOLVENT CEMENTING</p> <ul style="list-style-type: none"><li>• Basic principle of solvent bonding</li><li>• Factors to be considered for good cementing</li><li>• Type of solvents</li><li>• Methods for applying solvents</li></ul> <p>1.3 ADHESIVE BONDING</p> <ul style="list-style-type: none"><li>• Basic principle of adhesive bonding</li><li>• Type of adhesives use for plastics</li><li>• Methods of applying adhesives</li><li>• Application of adhesive bonding</li></ul> <p>1.4 THERMAL BONDING</p> <ul style="list-style-type: none"><li>• Introduction of plastic welding</li><li>• Basic principle, equipment, working, Advantages, Disadvantages &amp; applications of :<ul style="list-style-type: none"><li>➤ Hot gas welding</li><li>➤ Hot plate welding</li><li>➤ Ultrasonic bonding</li><li>➤ Ultrasonic spot welding</li><li>➤ Vibration welding</li><li>➤ Spin welding/Friction welding</li><li>➤ Induction welding</li><li>➤ Induction Cap sealing</li><li>➤ Heat Sealing- Heated Tool welding, Dielectric heat sealing</li></ul></li><li>• Applications of thermal bonding</li></ul>	15	34
<b>Unit – II Surface Treatment</b>	<p>2.1 Significance of surface treatment</p> <p>2.2 Plastic materials which require surface treatment</p> <p>2.3 Factors Affecting Ink Adhesion on Film/Molded surfaces</p> <p>2.4 Types of surface treatments</p> <ul style="list-style-type: none"><li>➤ Washing and cleaning</li></ul>	7	15



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	<ul style="list-style-type: none"> <li>➤ Mechanical abrasion</li> <li>➤ Chemical etching</li> <li>➤ Priming</li> <li>➤ Flame treatment</li> <li>➤ Corona discharge</li> <li>➤ Plasma treatment</li> <li>➤ UV/Ozone treatment</li> </ul>		
<b>Unit – III Painting and Coating</b>	<p>3.1 PAINTING</p> <ul style="list-style-type: none"> <li>• Types of paint materials-Lacquers and Enamels</li> <li>• Process, Equipment and Applications of :               <ul style="list-style-type: none"> <li><input type="checkbox"/> Conventional spray</li> <li><input type="checkbox"/> Electrostatic spray</li> <li><input type="checkbox"/> Roller coating</li> </ul> </li> </ul> <p>3.2 COATING</p> <ul style="list-style-type: none"> <li>• Materials for powder coating</li> <li>• Process, Equipment and Applications of :               <ul style="list-style-type: none"> <li><input type="checkbox"/> Fluidized bed coating</li> <li><input type="checkbox"/> Electrostatic deposition</li> <li><input type="checkbox"/> Powder coating</li> </ul> </li> </ul>	7	15
<b>Unit – IV Printing</b>	<p>4.1 Process, Advantages, Disadvantages &amp; Applications of :</p> <ul style="list-style-type: none"> <li>• Screen printing</li> <li>• Pad printing</li> <li>• Offset printing</li> <li>• In-mold Labelling</li> <li>• Flexography printing</li> <li>• Rotogravure printing</li> <li>• Laser Marking/Engraving</li> </ul>	8	18
<b>Unit – V Hot Transfer Process</b>	<p>5.1 Process, Advantages, Disadvantages &amp; Applications of :</p> <ul style="list-style-type: none"> <li>• Electroplating</li> <li>• Vacuum Metalizing</li> <li>• Hot Stamping</li> <li>• Labels and decals</li> <li>• Water transfer process</li> <li>• Flocking</li> <li>• Embossing and Surface Texturing</li> </ul>	8	18
	<b>Total</b>	<b>45</b>	<b>100</b>



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Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
20	45	35	-----	_____	_____

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

S.No.	Title of Book	Author	Publication with place, year and ISBN
1	The Complete Part Design Handbook	Campo, E.	Hanser Publications, Ohio, 2006, 9783446412927
2	Plastic Materials & Processes	Schwartz S.S. & Goodman S.H.	Van Nostrand Reinhold, 1982, 9780442227777
3	Plastic Engineering Handbook	Berins M.L	Van Nostrand, 1991, 9780412991813
4	Plastics Engineering Handbook	Frados J	Van Nostrand, 1976, 9780442224691
5	Plastics Finishing and Decoration	Donatas S.	Van Nostrand, 2008, 9780442280628
6	Decoration and Assembly of Plastic Parts	Muccio E. A	ASM International, 1999, 9780871706348
7	Decorating Plastics	Margolis J.M	Hanser Publications, 1986, 9780029475805

(b) Open-source software and website:

1. <https://www.jcfasteners.com>
2. <https://skill-lync.com/blogs/technical-blogs/design-dfma-types-of-plastics-joining-methods>
3. <https://youtu.be/GKY0oj0Z2uY>
4. <https://youtu.be/ozcv2zekPPw>
5. [https://youtu.be/5fAJ6Mc\\_8EE](https://youtu.be/5fAJ6Mc_8EE)
6. <https://www.dukane.com/resources/our-processes/vibration-welding>
7. <https://www.rapidirect.com/blog/plastic-welding/>
8. <https://www.masterbond.com/resources/surface-preparation-plastics>
9. <https://www.uniquepadprinting.com/plastic>
10. <https://youtu.be/Gyp7eB7D1nY>



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11. <https://youtu.be/ctL6Oc0STUU>

12. <https://www.plasticweldingtools.co.nz/how-to-weld-plastics/>

### 33. Suggested Practical List:

Sr. No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs Required
1	Prepare any one product using mechanical fastening technique.	2
2	Perform adhesive bonding technique on different types of plastic products.	2
3	Perform solvent cementing process.	2
4	Perform hot gas welding process.	2
5	Perform ultrasonic welding technique.	2
6	Perform corona discharge and flame treatment on plastic products.	2
7	Perform spray painting method on plastic product.	2
8	Perform fluidized bed coating process on plastic product.	2
9	Perform screen printing method.	2
10	Perform pad printing method.	2
11	Perform electroplating process.	2
12	Perform hot stamping process.	2

### Suggested Activities for Students:

1. Assignments
2. Technical Quiz/MCQ Test
3. Students will prepare chart of various mechanical fasteners.
4. Students will prepare application list of various thermal bonding processes.
5. Students will prepare list of plastic product which require surface treatment.
6. Students will collect products with painting and coating application.
7. Students will prepare chart of various printing processes.
8. Students will collect products decorated with various hot transfer processes.

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