



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Plastics Engineering

Course Code : DI03023011

Course Name : Compression Transfer and Injection Moulding of Thermosets

w. e. f. Academic Year:	2024-25
Semester:	3 <sup>rd</sup>
Category of the Course:	PCC

<b>Prerequisite:</b>	-
<b>Rationale:</b>	The course deals with operations of Compression transfer and Injection moulding process of various thermo set materials. This course will help students to understand The knowledge of compression, Transfer and Injection molding process and the working principle of different kinds of plastic moulding machines and tools involved in the process. Learning of this course would make students aware about the concepts of moulding process, the understanding the various troubles shoots for manufacturing of flexible products.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Set process parameters for compression m/c, transfer m/c and injection m/c of thermoset	A
02	Select appropriate compression mould and material for various products.	U
03	Select pot type/plunger type transfer moulding process	U
04	Troubleshoot problems in processing of thermo set materials.	U
05	Select manufacturing process for a thermoset product.	A

\*Revised Bloom's Taxonomy (RBT)



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### 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

### Course Content:

Unit No.	Content	No. of Hours	% of Weight age
<b>UNIT – I</b>	<b>Compression moulding process</b> <ul style="list-style-type: none"> <li>Basic principle of compression moulding process</li> <li>Compression moulding press, Types, Manual, Semi automatic, Fully automatic.</li> <li>Constructional details,</li> <li>Types of heating system, Steam heating, Electric heating, Oil heating.</li> <li>Material selection criteria, Fillers and additives,</li> <li>Preheating system types, Bulk factor and performs materials.</li> <li>Complete moulding cycle, Moulding cycle v/s time diagram, Process variables,</li> <li>Post curing, cooling fixtures and finishing</li> <li>Advantages and disadvantages, Trouble shooting,</li> <li>Start-up and shut down procedure.</li> <li>Applications of compression moulding process</li> </ul>	14	30% (20 Marks)
<b>UNIT– II</b>	<b>Compression mould</b> <ul style="list-style-type: none"> <li>Introduction of compression mould</li> <li>Types of mould materials</li> <li>Hand compression mould, Mould parts, Function, Types, Open flash mould, Positive mould, Landed positive mould, Semi-positive mould.</li> <li>Assembly and detail drawing, Automatic compression mould, Land length, Pressure pad, Powder well, Core pins and loose parts, significance, Methods of ejection</li> <li>Volume calculation, Height calculation,</li> </ul>	08	20% (15 Marks)



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	<ul style="list-style-type: none"> <li>• Press tonnage requirement for mould</li> <li>• Stripper plate mould, side-ram moulds</li> </ul>		
<b>UNIT- III</b>	<p><b>Transfer moulding process</b></p> <ul style="list-style-type: none"> <li>• Basic principle of transfer moulding process</li> <li>• Transfer moulding machine, Constructional details,</li> <li>• Types, Pot transfer, Plunger transfer, Screw transfer Moulding process, Process steps, Process variables, Advantages and disadvantages,</li> <li>• Trouble shooting,</li> <li>• Auxiliary equipments.</li> <li>• Start-up and shut down procedure,</li> <li>• Applications of transfer moulding</li> <li>• Compression moulding process vs. Transfer molding process.</li> </ul>	08	20 % (15 Marks)
<b>UNIT - IV</b>	<p><b>Transfer moulds</b></p> <ul style="list-style-type: none"> <li>• Integral pot transfer mould, Mould parts, Function, Factors to be considered for determining pot dimensions, Plunger transfer mould,</li> <li>• Types, Top plunger, Bottom plunger</li> <li>• Mould parts, Function, Transfer chamber calculation, Chamber depth, Transfer pressure,</li> <li>• Compare Integral Pot transfer mould V/s Plunger transfer mould.</li> <li>• Venting, gate and runner designs for transfer mould</li> <li>• Cull and its removal Techniques.</li> </ul>	08	15% (10 Marks)
<b>UNIT - V</b>	<p><b>Injection moulding of thermoset</b></p> <ul style="list-style-type: none"> <li>• Basic principle of injection moulding,</li> <li>• Constructional details of injection moulding machine</li> <li>• Moulding process, Process cycle steps.</li> <li>• Materials selection criteria for moulding process</li> <li>• Process variables, Advantages and disadvantages, Trouble shooting,</li> <li>• Start-up and shut down procedure, Applications of injection moulding process</li> <li>• Comparison with injection molding of thermoplastics.</li> </ul>	07	15% (10 Marks)
	<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
35%	35%	30%	-	-	-

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	Injection Moulding Advanced Troubleshooting Guide: The 4m Approach	Randy Kerkstra Steven Brammer	Publication:Hanser ISBN :978-1-56990-834-1 Year:2021
2	Injection moulding machine	A. Whelan	Publication: Elsevier applied science publishers ISBN: 0-85334-245-8 Year: 1984
3	Injection moulding theory and practice	Irvin I. Rubin	Publication: Wiley ISBN: 978-81-265-4576-6 Year:2014
4	Injection Molding: Technology and Fundamentals	Ghosh Pramamoy	Publication: Hanser ISBN: 978-3446416857 Year:2009
5	Injection molding handbook	Dominick V. Rosato, Donald V. Rosato, Marlene G. Rosato	Publication: Springer Science Business Media, LLC ISBN 978-1-4613-7077-2 Year:2000
6	Plastics Materials and Processes	Sydneyh.good man	Publication: Van ISBN:9780442227777 Year:1982
7	Injection and Compression Molding Fundamentals	Avraam I. Isayev	Publication: Taylor & Francis Inc CRC Press ISBN: 978-0824776701 Year:1987
8	Compression Molding	Bruce Allen Davis	Publication: Carl Hanser Verlag GmbH & Co ISBN: 3446221662, 9783446221666 Year: 2003



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## (b) Open source software and website:

1. Moldex3D 2022
2. Autodesk Mold flow
3. Cad mould
4. Mold flow Insight
5. Solid Works Plastics
6. Cad press
7. Free3d molding
8. Siemens Automations
9. www.youtube.com
10. <https://www.youtube.com/watch?v=RDmvwAPdmNw>
11. <https://www.youtube.com/watch?v=PYTiDOS-ixU>

## Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Identify the different parts of compression moulding machine	1	02
2	Adjust the settings of a compression moulding machine for producing a particular product	1	02
3	Calculate compression moulding pressure for Urea formaldehyde(UF)	2	02
4	Operate an automatic compression mould for a given product safely	2	04
5	Identify the different parts of transfer moulding machine	3	02
6	Calculate transfer moulding cycle time for a given product	3	02
7	Operate a transfer moulding machine for a given product safely	3	02
8	Calculate transfer moulding temperature for Phenol formaldehyde(PF)	3	02
9	Design to produce integral pot transfer mould for a given product	4	04
10	Design plunger transfer mould for a given product	4	02
11	Identify the parts of an injection moulding machine for thermoset	5	02
12	Operate an injection moulding machine for thermoset safely	5	04
<b>Total</b>			<b>30</b>



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## List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications
1	Compression molding machine
2	Transfer molding machine
3	Injection molding machine for thermo set
4	Pot transfer mold, Plunger Transfer mold
5	Hopper loader
6	Weighing scale

## Suggested Project List:

1. Prepare comparative chart for different compression transfer mould
2. Prepare a chart of different moulding process
3. Compare different process parameter for operation of machines
4. Prepare charts for various polymer reactions
5. Prepare model of machines
6. Prepare a drawing sheet for different type's moulds.

## Suggested Activities for Students:

1. Assignments
2. Technical Quiz/MCQ Test
3. Presentation on some course topic
4. I-net based assignments
5. Students are encouraged to register themselves in various MOOCS such as: NPTEL Swayam, edx, Coursera, Udemy etc to further enhance their learning
6. Prepare some models base on topics.

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