

# GUJARAT TECHNOLOGICAL UNIVERSITY

## PLASTIC ENGINEERING (24) PLASTICS PROCESSING TECHNOLOGY SUBJECT CODE: 2712402 M.E. 1<sup>st</sup> SEMESTER

**Type of course:** Theoretical + Practical (Regular)

**Prerequisite:** Basic knowledge of hydraulic and Pneumatic, plastics materials controls and drives

**Rationale:** Correlates the processes, operations and analyze the processing methods

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	PA (V)		PA (I)			
					ESE	OEP	PA	RP		
4	0	2#	5	70	30	20	10	10	10	150

**Content:**

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Introduction & Injection Moulding: Basic principles – Classification of processing methods – Effect of polymer properties on processing behaviour. Injection Moulding – Definition of terms – Specification – Types of machines used – Part & their functions – Cycle time – Process variables & its effect on Moulding quality – Cavity pressure profile – Factor influencing moulding shrinkage, annealing – Frozen-in – Stresses – Types of clamping systems and their merits & demerits – Start up and shut down procedures – Processing parameters and special precaution to be taken while processing of Engineering plastics such as Nylon, Acetal, PC, etc., - Common moulding defects, causes and remedies	13	30
2	Compression Moulding : Introduction – principles – definition of Terms – Compression moulding process – specifications – machine used – Bulk factor – flow – cure relationship – ageing of compound – cup flow and spiral flow tests & its significance – cycle time - Preforming, preheating – Methods, machine used, merits & demerits - Influence of process variables such as temperature, pressure, part size & configuration on quality and cycle time - Compression moulding of Thermoplastics – cold forming – sintering – Optimising process parameters & Trouble shooting - Merits & Demerits of Compression moulding - Finishing operation.	04	10
3	Transfer Moulding & Thermoset Injection Moulding: Transfer Moulding - Principles – Types of process – machine used – pot transfer, plunger transfer & screw transfer moulding techniques – moulding cycle – specification – merits and demerits of transfer moulding – Theoretical calculation of pressures – line pressure, Injection ram pressure – trouble shooting.	04	10
4	Extrusion:	13	30

	Introduction – principles – classification of extruders – single screw extruder – specification – screw nomenclature – types of screws – L/D ratio, compression ratio, back pressure – factors governing back pressure – output and factors affecting output heating & cooling systems – breaker plate – screen pack & its functions – screw & hopper cooling-die entry effects and die exit instabilities – shark skin, melt fracture & bambooning. Twin screw extruder – principle – types – process – merits & demerits - Vented barrelextruder – hopper loading devices - Drying equipments - Process, machinery – down stream equipments – dies for producing products such as – film – blow film, cast film – Sheets - Tubes / pipes, corrugated pipes - Mono filaments - Box strapping - Coating / Lamination		
5	Blow Moulding: Introduction – Principle – Processes – Extrusion Blow Moulding – Injection Blow Moulding – Process control – Parison programming – Moulds – Machine used – Constructional features – Material and design factors affecting bottle performance – Trouble shooting – Stretch Blow moulding – Process outline	8	20

#### Reference Books:

1. Denold V. Rosato, Injection Moulding Handbook, International Thomson Publishing Co., 1995.
2. M.S. Welling, Injection Moulding Technology, VDI-Verlag GmbH, 1981.
3. Seymour S. Schwartz & Sidney H. Goodman, Plastics materials and Processes, Van
4. Nostrand Reinhold Company, New York, 1982.
5. A.S. Athalya, Injection Moulding, Multi-tech Publishing Co., New Delhi, 1997.
6. Irvin Rubin, Injection Moulding Theory and Practice, A. Wiley Interscience Publication, 1972.
7. Lee, Blow Moulding Design Guide, Hanser Publishers, Munich, 1998.
8. Friedhelm Hensen, Plastics Extrusion Technology, Hanser Publishers Vienna, New York, 1988.

#### Course Outcome:

After learning the course the students should be able to: operate and analyze the injection moulding process, compression moulding, transfer moulding, Extrusion machine, blow moulding machine. also set the processing parameters of individual process

#### List of Experiments:

1	To study Compression moulding
2	To study Extrusion blown film technique.
3	To study Transfer moulding
4	To study Injection moulding
5	To study Blow moulding
6	To study troubleshooting of injection moulding
7	To study extrusion pipe manufacturing.
8	To study twin screw extruder

#### Open Ended Problems:

- Calculations to determine the shot capacity, plasticizing capacity.
- Calculations to determine the clamping pressure, cavity pressure, injection pressure.

- Design/ drawing of pressure profile curve and temperature profile curve in injection moulding machine.
- Calculate the bulk factor in compression moulding machine.
- Calculations of extrusion output.
- Design the die for pipe, film, sheet manufacturing.

**Major Equipments:** compression moulding machine, extrusion machine, injection moulding machine, blow moulding machine, extrusion pipe plant and blown film.

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

<http://www.nptel.ac.in/>