GUJARAT TECHNOLOGICAL UNIVERSITY

PLASTIC TECHNOLOGY (24)
ADVANCED PLASTICS PROCESSING
SUBJECT CODE: 2732405
M.E. 3rd SEMESTER

Type of course: Theoretical + Practical (Regular)

Prerequisite: Basic knowledge processing techniques, plastics materials, Hydraulics and pneumatics

Rationale: correlates the processes, operations and analyze the processing methods

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks		Practical Marks				
L	T	P	C	ESE (E)	PA (M)	ESE (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Advanced Extrusion** Profile Extrusion Process, Multilayer film, Co-extruded sheets and pipes process, process control, process optimization, application, merits and demerits, Cable coating process, Nylon Braided hosepipe manufacturing.	**08**	20
2	**Advanced injection** Gas assisted injection moulding and Water assisted injection moulding -In-mold lamination techniques, Multi colour Injection mouldling, Co- injection moulding machine- introduction, process, advantages and disadvantages, All Electric Injection Moulding Machines.	**10**	20
3	**Foaming process** **Process:** Introduction to foam process, General production method, foam classification; rigid - Flexible, structural. **Rigid:** Manufacturing foam as PU, polyester cellular, epoxy resin, phenolics, UF. **Flexible:** Foamed vinyl, open\closed cell vinyl foam cellular poly ethylene, XLPE, silicone foam, expandable PE, EPS.	**8**	20
4	**Reaction injection molding** **Introduction:** Definition, various terms in RIM, requirements, raw material as monomers like polyols, polyester, Isocynates, chemistry of monomers, **Process:** Formulations, selection of process, process steps in detail from storage to shipment, process variables, advantages & disadvantages. **Machine:** Basic machine types, characteristics of ideal machine, basic components of rim machine with auxiliary equipments.	**6**	20
5	**Miscellaneous process:** Casting, Encapsulation, Coloring, Coating, Machining, Printing, foil embossing, Metalisation, Electroplating. **Auxiliary Equipments-** Silo and Feeding System, Dehumidified Air Dryer, Central Conveying System, Compact Chiller, Mould Temperature Controller,	**10**	20

	Servo Robots, Conveyor Belt, Volumetric Gravimetric Blender, Agglomerater, blenders.		

Reference Books:

1. Plastic materials & process: Schwartz & Goodman
2. Introduction to RIM: Swaneoy P.
3. Reaction Injection Molding: Walter Backer
4. Fundamentals of RIM: Cristopher W. M., Hanser publications
5. Plastics Processing Data Handbook by Rosato.
6. Thermoforming by Throne.
7. Plastic engineering by Crawford.
8. John Brydson, "Plastics Materials", 7th edition, Butterworth – Heinman, London (1999).

Course Outcome:

After learning the course the students should be able to: operate and analyze the extrusion machine, Injection molding machine, RIM and various Printing machines. Also set the processing parameters of individual process.

List of Experiments:

1	To study multi layer film extrusion.
2	To study co-extruder pipes.
3	To study Gas-assisted injection molding.
4	To study Water-assisted injection molding.
5	To study Reaction injection molding (RIM).
6	Manufacturing of polyurethane foam.
7	To study various printing processes.
8	To study casting process.

Major Equipments: Injection molding machine, Extruder, Pad printing, hot foil stamping, blown film extruder.

Open ended problems/ design oriented problems

- Calculations to determine the output of multi layer extruder and thickness control of film, pipe etc
- Calculations to determine the processing temperature, pressure or vacuum, in various processes.
- Design the die for pipe, film, sheet manufacturing.

List of Open Source Software/learning website: http://www.nptel.ac.in/, http://www.bpf.co.uk/

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.