

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**PLASTIC TECHNOLOGY**  
**B. E. SEMESTER: VII**

Subject Name: **Advanced Plastic Processing**

Subject Code: **172301**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
3	0	2	5	70	30	30	20

Sr. No	Course Content	Total Hrs.
1.	<p><b>Foam</b></p> <p><b>Process:</b> Introduction to foam process, general production method, various definition {terminology}, foam classification; rigid - Flexible, structural.</p> <p><b>Rigid:</b> Manufacturing foam as PU, polyester cellular, CA, thermosetting foam, epoxy resin, phenolics, UF.</p> <p><b>Flexible:</b> Foamed vinyl, open\closed cell vinyl foam cellular poly ethylene, XLPE, ethylene copolymer monomer, silicone foam, expandable PE.</p>	04
2.	<p><b>Miscellaneous process:</b></p> <p>Casting, Encapsulation, Coloring, Coating, Decoration, Finishing, Machining, Printing, foil embossing, Metalisation, Electroplating.</p>	06
3.	<p><b>Reaction injection molding</b></p> <p><b>A. Introduction:</b> Definition, various terms in RIM, requirements, raw material as monomers like polyols, polyester, Isocyanates, chemistry of monomers, chemical system, concept of equivalent wt. Pre polymers hydroxyl analysis, index, additives and auxiliary materials like surfactants, catalyst, additives, expanding agents, water, harder, cross linkers, storage and handling of polyols and isocyanates. Advantages and limitations as compared to cast urethane technology, comparison with injection molding, applications.</p>	06

	<p><b>B. Process:</b> Formulations, selection of process, process steps in detail from storage to shipment, process variables as mat., process, polymer property, index, density, post curing, advantages &amp; disadvantages. instrumentation &amp; control, gas loading, measuring the gas loading &amp; fillers, process control, structure of micro cellular parts, process adv. &amp; disadv., dimensional characteristics of rim parts, reinforced rim elastomers, other rim processes like nyrim etc., summary of feature of rim process, applications in various fields, PU like rigid &amp; soft foams.</p> <p><b>C. Machine:</b> Basic machine types, characteristics of ideal machine, basic components of rim machine with auxiliary equipments, description &amp; function of individual components of rim machine like metering units with different types of pumps. Mixing unit as screw mix head &amp; injection mix head &amp; compounds as monomer tanks, liquid level controllers, aeration, backup pumps, fillers, drive motors, shut off controllers, pressure gauges, hoses, automatic calibration &amp; clamping unit with classification as universal clamp design. Introduction of color additives in rim machine &amp; head/lay.</p>	
4.	<p><b>Calendering:</b> Process in detail, types of calendars with adv., application &amp; limitations, drive systems, heating &amp; cooling arrangements, material selection criteria, and trouble shooting.</p>	06
5.	<p><b>Advanced Extrusion &amp; compounding:</b> Profile Extrusion Process, Multilayer film, Co-extruder Sheets and pipes process, process control, process optimization, application, merits and demerits</p> <p><b>Compounding:</b> Basic principles, various types of Mixers &amp; Blenders in detail, PVC compounding, master batches etc.</p>	06
6.	<p><b>Rotational Moulding:</b> Process in detail, Moulds, Advantages &amp; Limitations, Applications.</p>	05
7.	<p><b>Plastics Casting:</b> Thin Film Technology, Thin Film Casting for Advanced applications</p>	03
8.	<p><b>Plastic Coatings:</b> Formulations, Applications mainly in Automobile, appliances, furniture, electronics, eyeglasses. Explanation of surface tension, modulus, coefficient of thermal expansion, structure &amp; conformation. Types of Adhesion &amp; Wetting</p>	06

## **Text Book:**

1. Plastic materials & process: Schwartz & Goodman

## **Reference Books:**

1. J. Brandrup, E. H. Immergut, Polymer Handbook, 3rd Ed., VI/411-426 John Wiley & Sons, Inc.
2. M. J. Rosen, Surfactants and Interfacial Phenomenon, 2nd Ed., 240-255 John Wiley & Sons, Inc.
3. C. M. Hanson, J. Paint Tech. 39 (505), 104-117,
4. A Guide to Dow Corning Silane Coupling Agents, Dow Corning Corporation, Midland, MI
5. Chlorinated Polyolefins, Eastman Chemical Company, Kingsport, TN
6. Introduction to RIM: Swaneoy P.
7. Reaction Injection Molding: Walter Backer
8. Fundamentals of RIM: Cristopher W. M., Hanser publications
9. Polyurathane handbook: Gunther oertel, Hanser publication