

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: VIII

PLASTIC TECHNOLOGY

Subject Name: **Fiber Reinforced Plastics and Composites**

Sr. No	Course Content	Total Hrs.
1.	General introduction. Introduction- Need of FRP - Need of resin- Reinforcements - Process developments.	2
2.	Designing in FRP Introduction - Design-material selection-process selection- section thickness flanges and corners-inserts - Flat sheets-building and cladding panels.-hollow structures.	4
3.	Molds. : Introduction - Types of simple molds- GRP molds-single one part-split mold and matching molds- Epoxide molds, single stage casting-two stage casting, Epoxide resin molds-single stage casting and two stage casting - Steel molds.-hot press molding - centrifugal molding-transfer and Inj.molding –Pultrusion - Aluminum alloy molds- Nickel shell molds-other mold.	5
4.	Polyester resins. Introduction-polyester resins -glycols-unsaturated acids-saturated acids-monomers-inhibitors - Commercial resins - Gelcoat/top coat resins- General purpose resins Chemical resistant resins- Reduced flammability resins - Low styrene emission resins - Low shrinkage /low profile resins- Special purpose resin - Coating resin Foamed polyester resins - Commercially available resins.	6
5.	Catalyst/Accelerators and Inhibitors for unsaturated polyester resins. Introduction - Curing reactions - Catalyst inhibitors-diacyl peroxides-ketone peroxides-hydro peroxides-dialkyl and diaralkyl peroxide -peroxy esters- perketals. Accelerators or promoters-metal compounds-totality amine -accelerators-mixed motel salts-t-amine accelerators,-inhibitors - Commercially available material	5
6.	Reinforcements: Introduction - Surfacing tissue – GFR - Continuous filament rovings- Chopped strands- Chopped strand mats- Continuous strand mat- Woven glass fabrics- Carbon fiber- Aromatic polyamide (aramid) fibers - Other reinforcing fibers Polyester fibers- Polyacrylonitrile fibers - Nylon - PVC and PVDC Cotton – Sisal - Asbestos – Paper – Jute- Boron fibers - Commercially available reinforcements	6
7.	Fillers and Pigments: Introduction - Mineral fillers-carbonates-silica and silicates-aluminum silicates and Clays - Glass fillers - Metal oxide fillers - Metallic powder fillers - Other fillers- Thixotropic additives- Flame retardant fillers - Pigments and dyes	4
8.	Bulk, Dough and Sheet molding Compounds and Prepregs. Introduction- Dough and bulk molding compounds - Sheet mould compounds- manufacture of SMC- Prepregs- manufacture of prepregs - Commercial products	5
9.	Molding Processes. Introduction - Contact molding -wet lay up-hand lay up - Spray lay-up - Vacuum bag molding - Wet lay-up - Prepreg systems - Pressure bag molding - Resin transfer or resin injection molding-pressure injection- Vacuum impregnation and injection - Vacuum impregnation- Vacuum injection molding-Hoechst process - Vacuum injection- British rail process- Monoforming - CSI process- Foam reservoir molding - Cold press molding - Hot press/matched metal molding - Liquid resin /chopped strand mat – Liquid resin/perform -SMC and Prepregs - DMC or BMC - Transfer molding - Injection molding-	10

	Filament winding - Wet lay up-prepregs-other applications - Centrifugal molding - Continuous sheet manufacture – Pultrusion - Sandwich with preformed materials 1.c-flex landing system -. 'Duradense' building system - Trimming and finishing	
10.	Vacuum Infusion Molding: Process - Equipment Details - Process parameters – Troubleshooting Applications	3
11.	Vacuum Assisted Resin Transfer Molding : Process - Equipment Details - Process parameters – Troubleshooting – Application	3
12.	Closed Cavity Bag Molding: Process - Equipment Details - Process parameters – Troubleshooting Applications	3

Textbooks:

1. FRP technology by Weatherhead.
2. Hand book of Reinforcement for plastics – Milewski
3. Composites by Sheldon.
4. D R Paul and S Newman, “Polymer Blends Vol. I & II”, Academic Press Inc,
5. M O W Richardson “Polymer Engineering Composite” – Applied Science.

References:

1. O Olabisi, I W Rubison and M T Shaw Polymer – Polymer Miscibility Academic Press – New York,1997.