

GUJARAT TECHNOLOGICAL UNIVERSITY

PLASTIC TECHNOLOGY (24) COMPOSITE MATERIAL TECHNOLOGY SUBJECT CODE: 2722405 SEMESTER: II

Type of course: Theoretical + practical

Prerequisite: Basic knowledge of fibers, thermoset materials.

Rationale: Correlates the Matrix, Reinforcement & Processes, operations and analyze the Testing methods

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
				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	Introduction : Materials- Polymeric materials, Blends & alloys, composites. Resins for composites: Manufacturing, properties and applications of Polyester resins, Epoxy resin, Phenolic resins, Vinyl ester resins, Alkyd resins.	10	20
2	Reinforcements for Composites : Introduction, Types & other alternatives. Natural fibers – jute, sisal, Hemp, wool. Synthetic fibers- polyethylene fibers. glass fibers, types & types, different forms of carbon fibers - classification and properties graphite fibers, Mineral fibers - silicon carbide and boron fibers.	05	15
3	Additives for composites : Prepolymers, catalysts,– room temperature and elevated temperature – accelerators – coupling agents – fillers & types – flame retardants – toughening agents – UV stabilizers	05	15
4	Processing of Composites : Important processes like hand lay-up, spray-up, resin transfer moulding, vacuum bag, pressure bag moulding, centrifugal casting, pultrusion, filament winding, moulding compounds – SMC, DMC, BMC, TMC.	12	30
5	Testing Quality Control & End Use of Plastics: Testing for mechanical, electrical, thermal, optical and chemical properties, Determination of shelf life and gel time – Non-destructive testing methods. Application of FRP products - in marine, chemical, railways, electrical and electronic industry, space structures, Robotics.	8	20

Reference Books:

1. P.K. Mallic, Fiber Reinforced composites, Morcal Dekker Inc. 1988.
2. Sidney H. Goodman, Handbook of Thermoset Plastics, John Wiley & Sons, 1984.
3. T.G. Gutowski, Advanced Composites Manufacturing, John Wiley & Sons, 1997.
4. S.M. Lee, Reference Book for Composite Technology I, II & III, Technomic Publishing Co., 1989.
5. Donald V. Rosato, Data Handbook, International Thomson Publishing Co., 1995.
6. Seymour S. Schwartz & Sidney H. Goodman, Plastics materials and Processes, Van Nostrand Reinhold Company, New York, 1982.

Course Outcome:

After learning the course the students should be able to: operate and analyze the composite, thermosets moulding processes , compression moulding, transfer moulding, hand layup, spraylayup, filament winding etc. and also set the processing parameters of individual process.

List of Experiments:

- 1 To study Compression moulding
- 2 To study Hand layup technique.
- 3 To study Transfer moulding
- 4 To study Spray layup technique.
- 5 To study filament winding
- 6 To study troubleshooting of compression molding
- 7 To study composite manufacturing.
- 8 To study treatment of fibers.

Major Equipments: compression moulding machine, hand roller, Chopper gun.

Open ended problems/ design oriented problems

- Calculations to determine the curing time.
- Calculations to determine the effect of orientation of fiber in composites.
- Calculate the bulk factor in compression moulding machine.
- Calculations of filament winding output.

List of Open Source Software/learning website:

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

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.