

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING AND TECHNOLOGY									
Programme		Master of Technology			Branch		Mechanical Engineering (Specialization in Additive Manufacturing)		
Semester		I			Version		1.0.0.0		
Effective from Academic Year			2025-26		Effective for the batch Admitted in			July 2025	
Subject code		3ME1120		Subject Name		Composites in Additive Manufacturing			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	2	0	2	0	4	Theory	40	60	100
Hours	2	0	4	0	6	Practical	60	40	100

Pre-requisites:
Fundamentals of Polymers and Composite Materials, basics of Additive Manufacturing processes, knowledge of material characterization techniques.

Course Learning Outcomes:
The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes: CO1. To understand the role of polymers as matrix materials in composite additive manufacturing. CO2. To study polymer-based composite feedstocks and their processing routes. CO3. To explore the design, fabrication, and applications of polymer composites in AM. CO4. To develop skills in characterization and performance evaluation of polymer composites for AM.

Sr. No.	Unit Content	Hrs
1	Introduction to Polymers and Composites in AM – Classification of polymers; Thermoplastics vs. Thermosets; Role of polymer matrices in composites; Applications of polymer composites in AM	4
2	Polymer Matrix and Reinforcement Materials – Types of polymers used (PLA, ABS, Nylon, PEEK, PEKK, Epoxy); Reinforcement types (fibers, particulates, nanomaterials, graphene, CNTs); Polymer–filler interactions	6
3	Composite Feedstock Development for AM – Filament extrusion, pellet-based feedstocks, resin formulations; FDM/FFF, SLA, DLP, SLS approaches for polymer composites; Processing challenges	6
4	Characterization of Polymer Composites – Thermal (DSC, TGA), Mechanical (tensile, flexural, impact), Morphological (SEM, AFM), Rheological behavior, Interfacial bonding analysis	6
5	Applications and Case Studies – Structural, biomedical, aerospace, defense, and automotive applications; Functionally graded composites; Sustainable/green composites; Challenges and future scope	4
	Total	26

List of Practical

The practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate course learning outcomes.

No.	Unit	Name of Practical
1	1	Preparation of short-fiber or nanoparticle reinforced polymer filament for FDM.
2	2	Thermal analysis of a polymer composite sample (DSC/TGA).
3	3	Printing of polymer composite part using FDM/SLS/SLA
4	2	Mechanical testing of polymer composite samples (tensile/flexural).
5	4	Case study presentation on applications of polymer composites in aerospace/biomedical/automotive sectors.

List of Instruments / Equipment / Trainer Board

1	Filament Extruder Setup
2	Setup for Thermal Characterization i.e. DSC/TGA
3	UTM for Composites Mechanical Properties Testing

List of Reference Books

No.	Title of Reference Books	Authors	Publication
1	Additive Manufacturing of Polymer–Matrix Composites	Vikas Mittal	CRC Press
2	Additive Manufacturing of Polymers	Andreas Gebhardt	Hanser Publications