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	**3ME1117**		Subject Name	**Additive Manufacturing - I**		
Teaching scheme				Examination scheme (Marks)		

(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	2	0	5	Theory	40	60	100
Hours	3	0	4	0	7	Practical	60	40	100

Pre-requisites:
Students should be compatible to basics of computer systems operating, basics of engineering drawing and drafting, to perform AutoCAD two dimensional drawings, formal knowledge of limit, fit, tolerances and surface finish symbols.

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. Understand the working principle and process parameters of AM processes   CO2. Explore the applications of AM processes in various fields   CO3. Select the suitable material and process for fabricating a given product   CO4. Apply the knowledge in Material science in Additive Manufacturing components   CO5. Design and develop a product for AM Process

Course Content		
Name of UNIT	**Unit Content**	**Hrs**
UNIT – 1 **AM processes**	Process Physics, Tooling, Process Analysis, Material and Technological Aspects, Applications, Limitations, Comparison of Rapid Manufacturing Processes, Vat Photopolymerization AM: Stereolithography (SL), Materials, Process Modeling, SL Resin Curing, Micro-Stereolithography, Mask Projection, Two-Photon Polymerization, Material Jetting, Binder Jetting, Extrusion-Based AM: Fused Deposition Modelling (FDM), Bio-Extrusion, Contour Crafting, Sheet Lamination AM: Bonding Mechanisms, Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC), Powder Bed Fusion: Selective Laser Sintering (SLS), Electron Beam Melting (EBM), Directed Energy Deposition: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Processing-Structure-Properties, Applications.	**30**
UNIT – 2 **Errors in AM processes**	Pre-processing errors: CAD model inaccuracies, Data conversion issues, Support structure design flaws, Incorrect part orientation. Post-processing errors: Surface finish defects, Dimensional inaccuracies, Improper curing or sintering, Material removal challenges. Part building errors: Layer adhesion defects, Warping and shrinkage, Porosity, Inconsistent material deposition, Thermal stress-induced distortions.	**10**

	Unit – 3 Post processing in AM	Support Material Removal: Techniques for removing support structures, Mechanical and chemical removal methods. Surface Texture Improvement, Accuracy Improvement: Smoothing processes, Precision enhancement techniques, Post-processing for dimensional accuracy. Aesthetic Improvement: Surface finishing, Coloring, Polishing, and Coating methods. Preparation for Use as a Pattern: Enhancements for mold-making and casting applications. Property Enhancements using Non-Thermal and Thermal Techniques: Strengthening through heat treatment, Chemical treatments, Surface hardening, and Other modification techniques.	5

List of Practical

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

No.	Unit	Name of Practical
1	1	To prepare 3D solid parts using AutoCAD command including Extrude, Revolve, Sweep and Loft.
2	2	Print the 3D printed part using FDM 3D printer.
3	3	Print the 3D printed part using PJ 3D printer.
4	3	Post processing of the 3D printed part.

List of Instruments / Equipment / Trainer Board

1	CAD Workstations.
2	3D printer based on any AM technique
3	Latest educational network version of solid works Creo, Unigraphics, CATIA, Solid Edge, Inventor, software (Any one).

List of Reference Books

No.	Title of Reference Books	Authors	Publication
1	Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing	Gibson, Rosen, Stucker	Springer
2	Rapid Manufacturing: An Industrial Revolution for the Digital Age	Hopkinson, Hague, Dickens	Wiley
3	Advanced Manufacturing Technologies for Medical Applications	Ian Gibson	Willey
4	Rapid Prototyping: Principles and Applications in Manufacturing	Noorani R	John Wiley & Sons
5	Rapid Tooling: Technologies and Industrial Applications	Hilton P, Jacobs P F	CRC Press
6	Rapid Prototyping: Theory and practice	Kamrani A K, Nasr E A	Springer