

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		3ME1115		Subject Name		CAD-CAM			
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:
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 conceptual design using various CAD techniques CO2. Explore the applications of Computer aided design CO3. Understand the different file formats of CAD and AM data exchange formats CO4. Understand pre-processing in CAD AM preparation

Course Content		
Name of UNIT	Content	Hrs
UNIT – 1 Introduction	Overview of process physics, Tooling, Process analysis, Material aspects, Applications, Limitations, Comparison of rapid manufacturing techniques, Vat Photopolymerization (SL, Micro-stereolithography, Two-photon polymerization), Material Jetting, Binder Jetting, Extrusion-based AM (FDM, Bio-Extrusion), Sheet Lamination (LOM, UC), Bonding mechanisms, Material applications, Powder Bed Fusion (SLS, EBM), Powder fusion and handling, Directed Energy Deposition (LENS, DMD), Material delivery, Process-structure-property relationships, Industrial applications.	4
UNIT-2 CAD modeling and data pre-processing	CAD model preparation, Data interfacing: formats (STL, SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP), Data conversion, Validity checks, Process parameters: Part orientation and support generation, Support structure design, Various model slicing algorithms, Contour data organization, Direct and adaptive slicing, Tool path generation.	4

UNIT – 3 Conceptual design in CAD	Design of Curves: Hermite Cubic segments, Curve Trimming and Blending, Bezier segments, Bezier-subdivision, Degree elevation, Composite Bezier, B-spline, Properties of basic functions, Continuity, NURBS, Developing algorithms/computer codes for curves, Design of Surfaces: Surface entities, Surface representation, Surface analysis, Design of analytical and synthetic surfaces, Developing algorithms/computer codes for surfaces, Design of Solids: Solid entities, Boolean operations, B-rep of Solid Modeling, CSG approach of solid modeling, Advanced modeling methods.	20
UNIT – 4 Data exchange formats in AM	CAD Data Exchange Formats and Applications: CAD Data exchange formats, Finite element analysis, 3D digitizing, Reengineering, Additive Manufacturing (AM), AM Data Formats: Tessellated Models, STL Format, STL File Problems, STL File Manipulation and Repair Algorithms, AMF files, 3MF, XML, Meta Data, PLY, STEP for AM Application Protocols (AP).	10
UNIT – 5 AM data processing	AM data pre-processing: Part Orientation and Support Structure Generation, Model Slicing and Contour Data Organization, Direct and Adaptive Slicing, Hatching Strategies, Tool Path Generation.	3

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	To prepare 3D solid parts using AutoCAD command including Extrude, Revolve, Sweep and Loft.
2	2	Develop open source code for various analytical and synthetic curves
3	3	MAGICS software to identify various errors in STL files
4	4	Prepare CAD file using various CAD Data Exchange formats: IGES, ACIS, DXF STL, AMF, STL
5	5	Pre-processing in CURA software for various operations Part orientation, support and Tool path generation etc.

List of Instruments / Equipment / Trainer Board

1	CAD Workstations.
2	3D printer based on any AM technique
3	MAGICS - Materialise
4	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
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1	Additive Manufacturing Technologies: Rapid Prototyping to	Gibson, Rosen, Stucker	Springer
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	Direct Digital Manufacturing		
2	Rapid Manufacturing: An Industrial Revolution for the Digital Age	Hopkinson, Hague, Dickens	Wiley
3	Advanced Manufacturing Technologies for Medical Applications	Ian Gibson	Wiley
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