

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Diploma Engineering			Branch		AUTOMOBILE ENGINEERING		
Semester		VI			Version		1.0.0.0		
Effective from Academic Year			2020-2021		Effective for the batch Admitted in			July 2018	
Subject code		1ME2604	Subject Name		Fundamentals of Additive Manufacturing (3D Printing)				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1		4	Theory	40	60	100
Hours	3	0	2		5	Practical	30	20	50

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. To understand the fundamental and nature of additive manufacturing techniques. CO2. To understand the techniques uses for processing CAD models. CO3.To learn and understand different types of additive manufacturing processes. CO4. To understand various applications and limitations of additive manufacturing processes.

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
<b>UNIT – 1 Introduction</b>	1.1 General overview about prototyping. 1.2 Traditional manufacturing process Vs. additive manufacturing process for prototyping. 1.3 applications and scope of additive manufacturing processes.	1a. State the need of additive manufacturing along with comparison with traditional manufacturing. 1b. State the applications along with limitation of additive manufacturing.	<b>5</b>	<b>5</b>
<b>UNIT- 2 Additive Manufacturing Processes</b>	2.1 Generalized steps in additive manufacturing process 2.2 classification of additive manufacturing process, Principle-process of different AM processes: Photo polymerization based; Extrusion based; Powder bed fusion.	2a. Describe steps in any additive manufacturing process. 2b. Explain different types of additive manufacturing processes.	<b>25</b>	<b>20</b>

<b>UNIT – 3 Materials in Additive Manufacturing process</b>	3.1 Different materials uses in AM: Polymer, Ceramic, Metal, Composites etc. 3.2 Use of multifunctional and graded materials.	3a.Explain different types of materials uses in additive manufacturing.	<b>15</b>	<b>10</b>
<b>UNIT – 4 Data Processing in Additive Manufacturing process</b>	4.1 Preparation of CAD models, Problems with STL files, STL file manipulation 4.2 RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, and STEP.	4a. explain use of CAD model file formats in additive process.	<b>5</b>	<b>5</b>
<b>UNIT – 5 Role of Additive Manufacturing in customer market</b>	5.1 Trends, Business opportunities of different additive manufacturing 5.2 Future applications of additive manufacturing. 5.3 Limitations of additive manufacturing processes 5.4 Scope of research and development in additive manufacturing	5a. Explain futuristic approach for additive manufacturing in real time.	<b>10</b>	<b>5</b>

#### 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 any parametric software
2	3	Print the 3D printed part using any 3D printer.
3	5	Post processing of the 3D printed part using tensile testing.
4	5	Post processing of the 3D printed part using flexure testing.
5	5	Post processing of the 3D printed part using CMM testing.
6	5	Post processing of the 3D printed part using roughness tester.
7	5	Study the dimensional difference between modelled and 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).

<b>List of Text Books</b>			
<b>No.</b>	<b>Title of Reference Books</b>	<b>Authors</b>	<b>Publication</b>
1	Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing	Gibson, Rosen, Stucker	Springer
2	Rapid Prototyping: Theory and practice	Kamrani A K, Nasr E A	Springer

<b>List of Reference Books</b>			
<b>No.</b>	<b>Title of Reference Books</b>	<b>Authors</b>	<b>Publication</b>
1	Rapid Manufacturing: An Industrial Revolution for the Digital Age	Hopkinson, Hague, Dickens	Wiley
2	Advanced Manufacturing Technologies for Medical Applications	Ian Gibson	Wiley
3	Rapid Prototyping: Principles and Applications in Manufacturing	Noorani R	John Wiley & Sons
4	Rapid Tooling: Technologies and Industrial Applications	Hilton P, Jacobs P F	CRC Press

<b>Link of Learning Web Resource</b>	
1	<a href="https://www.youtube.com/watch?v=chVY3dBXBmc">https://www.youtube.com/watch?v=chVY3dBXBmc</a>
2	<a href="https://www.cs.cmu.edu/~scoros/cs15869-s15/lectures/02-3dPrinting.pdf">https://www.cs.cmu.edu/~scoros/cs15869-s15/lectures/02-3dPrinting.pdf</a>
3	<a href="https://www.youtube.com/watch?v=BOlaaXs9JWA">https://www.youtube.com/watch?v=BOlaaXs9JWA</a>
4	<a href="http://home.iitk.ac.in/~nsinha/Additive_Manufacturing%20I.pdf">http://home.iitk.ac.in/~nsinha/Additive_Manufacturing%20I.pdf</a>
5	<a href="https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/112104204/lec47.pdf">https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/112104204/lec47.pdf</a>
6	<a href="https://www.youtube.com/watch?v=t8aU5A9XC0E">https://www.youtube.com/watch?v=t8aU5A9XC0E</a>