



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Minor/Hons. Program

Level: UG

Branch: Minor/Hons. 3 D Printing

Course / Subject Code : BE040AN011

Course / Subject Name : Introduction to Additive Manufacturing

w. e. f. Academic Year:	2025-26
Semester:	4 th
Category of the Course:	Core Courses

Prerequisite:	NIL
Rationale:	This course aims to familiarize students with basic terminologies of the 3 D printing (Additive Manufacturing) and materials,

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Understand principles of additive manufacturing
02	Select additive manufacturing process for a given material and application
03	Design the selective process of additive manufacturing
04	Differentiate different 3D printing materials for future application

Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
L	T	P	PBL*	TH		Theory		Tutorial / Practical			
						ESE (E)	PA (M)	PA (I)	PBL (I)	ESE (V)	
45	0	30	45	120	4	70	0	0	30	50	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction Definition, classification, Stages of additive manufacturing process, advantages limitations, applications, process selection, evaluation, benchmarking, future growth and opportunities.	04	10
2.	Liquid Based Processes Principle and working of Stereolithography Apparatus (SLA), PolyJet 3D Printing, Multi jet Printing, Digital Light Processing (DLP)	12	25



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	Process Parameters, Challenges, Materials and Applications		
3.	Powder Based Processes Principle and working of Selective Laser Sintering (SLS), Laser Engineering Net Shaping (LENS), Electron Beam Melting (EBM), and Colorjet Printing (CJP), Process Parameters, Challenges, Materials and Applications.	12	25
4.	Solid Based Processes Basic principle and working of Fused Deposition Modeling process (FDM), Selective Deposition Lamination (SDL), Laminated Object Manufacturing (LOM), Process Parameters, Challenges, Materials and Applications.	12	25
5.	AM Materials: Functionalities of AM materials – metals, plastics, ceramics and composites. Use of certified Materials and challenges in adapting new materials. Comparisons of AM materials with cast or forged structural alloys. Common Defects in AM Parts and their implications	05	15
	Total	45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	25	25	25	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. C. K. Chua, K. F. Leong, C. S. Lim, Rapid Prototyping – Principles and Applications, World Scientific publishing Co. Pte Ltd, 3rd Edition, 2010.
2. R. Noorani, 3D Printing Technology, Applications and Selection, CRC Press, 2017.
3. Additive Manufacturing Technologies and Applications, Special Issue Editors Salvatore Brischetto Paolo Maggiore Carlo Giovanni Ferro, MDPI

(b) Open source software and website:

1. https://onlinecourses.nptel.ac.in/noc22_me122/preview



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Suggested Course Practical List:

Exercise on

- 1) Stereolithography Apparatus (SLA)
- 2) Fused deposition modeling (FDM)
- 3) Selective Laser Sintering (SLS)

List of Laboratory/Learning Resources Required:

Additive manufacturing lab equipped with FDM, DLP Printer

Suggested Project List: NA

List of suggested activities for Problem Based Learning:

Sl. No.	Name of the activity	No. of hours	Evaluation Criteria
1.	Industry/Research laboratory visit	Visit=5hrs. , Report preparation = 5hrs. Total = 10hrs.	Based on report submitted. Report should contain observations and calculations based on industry/lab Data.
2.	Technical Video based learning related to the subject	Duration of video=5hrs. Report preparation=5hrs. Total = 10hrs.	Report/presentation based on the video learning outcomes.
3.	Assignment writing .Numerical Based assignment is preferable.	5assignmentsof4hrs.each. Total=20hrs.	Based on the correctness of Submitted assignment.
4.	Problem solving/Coding using C, C++,MATLAB, Python, SCILAB ,modeling and Analysis software or any other software	5 small coding-based assignment of 2hrs.each. Total = 10hrs.	Based on the coding solution submitted.
5.	Self-learning online course	Minimum duration of the course should be 10hrs.	Examination based assessment at the end of course. Based on the certificate produced.
6.	Identification and solution of Complex problem	Maximum 2 problems .Study of the problem and solution Finding, Total=10hrs.	Based on the depth of the solution submitted.
7	Videos on Industrial safety/Disaster Management aspects based on subject	Duration of video=5hrs. Report preparation=5hrs. Total = 10hrs.	Based on quiz/report submitted



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8	Technical paper reading and Summarization of research papers	5 research papers = 20 hrs.	Summarize research paper and Evaluation critical parameters
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S. No.	Activity	Duration	Evaluation Basis
9	Poster/Chart/PowerPoint Preparation on Technical Topics	6 Hours	Based on poster/chart preparation and presentation skills.
10	Working/Non-Working Model on Technical Topics	Working Model – 12 Hours Non-Working Model – 8 Hours	Based on inter-department or external evaluation.
11	Industrial Exposure (2–3 Days)	Industrial Exposure – 15 Hours Problem Identification and Tentative Solution – 10 Hours Total – 20 Hours	Based on evaluation of identified problems and proposed solutions.
12	Group Discussion on Emerging/Trending Technical Topics	Minimum 1 Hour per Subject Maximum 3 Hours per Subject	Based on performance in group discussion, technical depth, and knowledge demonstrated.
13	Real-World Case Study–Based Learning	Data Collection/Study – 5 Hours Report Preparation – 5 Hours Total – 10 Hours	Based on in-depth study, technical depth, data collected, and fact-finding.
14	Application/Software Development	10 Hours	Depending on the complexity and functionality of the developed application or software.
15	Research Paper Publication	10 Hours	Based on submission of proof of publication.
16	Upgradation/Reverse Engineering Studies of Existing Laboratory Equipment	10 Hours	Based on performance improvement or functionality enhancement of the equipment.
17	Expert Lecture/Session	3 Hours (2 Hours for	Based on proof of



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		Lecture + 1 Hour for Report Writing)	attendance and quality of the report submitted.
18	Annotated Video Explanation of Concept/Problem	10 Hours (Preparation + Recording + Submission)	Based on accuracy of explanation, clarity, and presentation style.
19	Patent Search and Innovation Gap Identification	10 Hours (Search + Report Preparation)	Based on number of relevant patents analyzed and identification of innovation scope.

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