

Course Type	Course Code	Name of the Course	L	T	P	Credit
DE	OMED617	Rapid Manufacturing	3	0	0	3

Prerequisites
The student should have completed two semesters of UG Engineering or Science program.
Course Objective
1. Understanding Rapid Manufacturing Principles. 2. Design for Manufacturing and Assembly (DFMA) and Geometric Modelling and CAD/CAM 3. Identify and select appropriate rapid manufacturing processes for different applications, to optimize these processes for desired outcomes and to understand the materials used in rapid manufacturing, their properties, and how they influence the final product. 4. Learn about the various post-processing techniques required to refine and finish rapid manufactured parts, the aspects of product costing specifically related to rapid manufacturing and will explore the process of rapid product development. 5. Gain experience with rapid prototyping machines and related software and also aims to bridge the gap between academic learning and industry requirements by focusing on practical applications and preparing students for careers in manufacturing sectors that utilize rapid manufacturing technologies.
Learning Outcome
1. Gain knowledge of various rapid prototyping techniques and their applications in different industries like aerospace, medical, and tooling. 2. The course will cover DFM principles, including geometric modelling, design for assembly, and modular design, which are crucial for efficient manufacturing. 3. Learn about the fundamentals of AM, including metal AM, and understand the factors influencing the cost, performance, and quality of AM parts. 4. Emphasizes the importance of modular design in rapid manufacturing and how it can improve efficiency and flexibility in production. 5. Introduction to the latest trends in manufacturing, including the impact of the Internet of Things (IoT), digital manufacturing, and the fourth industrial revolution on RM.

Unit No.	Topics to be Covered	No. of Lecture Videos	Video Time (Minutes)	Learning Outcomes
1	Introduction to Rapid Manufacturing (RM)	3	90	Understand fundamentals, evolution, advantages, and industrial relevance of RM.
2	Product Design Process	3	90	Understand product life cycle and role of RM in product development.
3	Design for Modularity	4	120	Learn modular design principles and RM-enabled customization.
4	Reverse Engineering	3	90	Understand reverse engineering techniques and RM integration.
5	3D Measurement and Laboratory Demonstration	4	120	Learn 3D scanning, measurement techniques, and practical applications.
6	Polymerization and Powder-Based RM Processes	5	150	Understand SLA, SLS, and related processes and materials.
7	Liquid-Based and Sheet Stacking RM Processes	3	90	Understand FDM, material jetting, and LOM processes.
8	3D Printing RM Processes and Laboratory Demonstration	4	120	Gain hands-on exposure to 3D printing technologies.
9	Beam Deposition RM Processes and Materials	3	90	Understand EBM, DED processes and material behavior.

10	Post-Processing and Costing in RM	4	120	Learn post-processing techniques and cost analysis.
11	Rapid Product Development (CAD/CAE/CIM)	4	120	Understand digital integration with RM.
12	Rapid Product Development Software Demo and Case Studies	4	120	Analyze industrial case studies and software workflows.
Total		44	1320	

Textbooks:

1. “Engineering design and rapid prototyping” by Kamrani, A.K. and Nasr, E.A., 2010. Springer Science & Business Media.
2. “Understanding additive manufacturing” by Gebhardt, A., 2011.

Reference Books:

1. “Additive manufacturing technologies (Vol. 17)” by: Gibson, I., Rosen, D.W. and Stucker, B., 2014. New York: Springer
2. “Rapid manufacturing: an industrial revolution for the digital age” by: Hopkinson, N., Hague, R. and Dickens, P. eds., 2006. John Wiley & Sons.