

ADDITIVE MANUFACTURING PROCESSES

VI Semester: ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEB39	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Tutorial Classes: Nil			Practical Classes: Nil		Total Classes: 60	
<p>COURSE OBJECTIVES: The students will try to learn:</p> <ol style="list-style-type: none"> I. The Importance of Additive manufacturing Technology in the day-to-day life, and study the basic 3D Printing processes and techniques used. II. The knowledge in various materials and machines used for the development of prototypes. III. Design features that make each of these Additive manufacturing process both harder, easier, assess design and manufacturing features on real products. <p>COURSE OUTCOMES: After successful completion of the course, students will be able to:</p> <p>CO 1 Outline the steps involved in making a prototype with desired method for automotive and medical industry components cylinder valves, micro actuators and dental prosthesis etc.</p> <p>CO 2 Develop the CAD model in the system needed for rapid prototype requirements to achieve defect/error free components</p> <p>CO 3 Categorize various methods during liquid based additive manufacturing operation such as SLA, SGC and SOUP etc. for real time applications.</p> <p>CO 4 Illustrate the properties and bonding techniques of liquid based 3D printing and various printing techniques in micro and macro scales.</p> <p>CO 5 Explain the process parameters and techniques for producing components using solid as a base material.</p> <p>CO 6 Explain the working principle of various Powder based Rapid prototyping processes and their application in industries for making of commercial prototypes.</p> <p>CO 7 Define the manufacturing technology adopted for Powder based 3D printing as well as material characterization and its application.</p> <p>CO 8 Classify the various Additive Manufacturing techniques based on functionality, cost and time in development of critical products.</p> <p>CO 9 Identify the appropriate Rapid Tooling process parameters, for effective optimization of prototype / products using 3DP.</p>								
MODULE-I	INTRODUCTION TO RAPID PROTOTYPING						Classes: 09	
<p>Introduction: Prototype Fundamentals, Types and Roles of Prototype, Fundamentals of Rapid Prototyping, Phases of Development Leading to Rapid Prototyping, Advantages of Rapid Prototyping and Classifications of Rapid Prototyping System, Generic RP process. Rapid Product Development: An Overview virtual prototyping and testing technology, Physical Prototyping and Rapid Manufacturing technologies and Synergic Integration Technologies.</p>								
MODULE-II	LIQUID-BASED RAPID PROTOTYPING SYSTEMS						Classes: 09	
<p>Liquid-Based Rapid Prototyping Systems: Principle, Process parameter, Process details, Advantages, Disadvantages and Applications of Stereolithography Apparatus (SLA), Solid Ground Curing (SGC), Solid Object Ultraviolet-Laser Printer (SOUP), Rapid Freeze Prototyping and Micro fabrication</p>								

MODULE-III	SOLID-BASED RAPID PROTOTYPING SYSTEMS	Classes: 09
<p>Solid-Based Rapid Prototyping Systems: Principle, Process parameter, Process details, Advantages, Disadvantages and Applications of Laminated Object Manufacturing (LOM);</p> <p>Fused Deposition Modeling (FDM), Paper Lamination Technology (PLT), Multi-Jet Modeling System (MJM) and CAM-LEM.</p>		
MODULE- IV	POWDER-BASED RAPID PROTOTYPING SYSTEMS	Classes: 09
<p>Powder-Based Rapid Prototyping Systems: Principle, Process parameter, Process details, Advantages, Disadvantages and Applications of Selective Laser Sintering (SLS), Laser Engineered Net Shaping (LENS), Multiphase Jet Solidification (MJS), Electron Beam Melting (EBM) and Three-Dimensional Printing (3DP) – Hands on Session.</p>		
MODULE-V	RAPID TOOLING	Classes: 09
<p>Rapid Tooling: Introduction to rapid tooling (RT), Indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, and 3D Keltool process, Direct rapid tooling methods: DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.</p>		
Text Books:		
<ol style="list-style-type: none"> 1. Chua C K, Leong K F, Chu S L, “Rapid Prototyping: Principles and Applications in Manufacturing”, World Scientific, 3rd Edition, 2008. 2. Liou W L, Liou F W, “Rapid Prototyping and Engineering applications: A Tool Box for Prototype Development”, CRC Press, 1st Edition, 2007. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Gibson D W Rosen, Brent Stucker, “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer, 1st Edition, 2014. 2. Kamrani A K, Nasr E A, “Rapid Prototyping: Theory and practice”, Springer, 1st Edition, 2006. 3. Rafiq I. Noorani, “Rapid Prototyping: Principles and Applications”, John Wiley & Sons, 1st Edition, 2005. 		
Web References:		
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/112102103/16 2. https://nptel.ac.in/courses/112107078/37 		
E-Text Books:		
<ol style="list-style-type: none"> 1. https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf 		