

DESIGN FOR MANUFACTURING

V Group: ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AMEB48	Elective	3	-	-	3	30	70	100
Contact Classes: 45		Tutorial Classes: Nil		Practical Classes: Nil		Total Classes: 45		
<p>COURSE OBJECTIVES: The course should enable the students to:</p> <ol style="list-style-type: none"> I. The techniques of Design for Manufacturing and Assembly applied for minimizing product cost through design and process improvements. II. The selection of material and process used in the prototype design in the early stages of product development for cost effectiveness. III. The pattern movement in assembly process, assembly errors and minimization steps by considering logical sub-assemblies and re-orientation of parts during machining. <p>COURSE OUTCOMES: At the end of the course students are able to:</p> <ol style="list-style-type: none"> CO 1 Identify the concepts of Design for Manufacture and Assembly (DFMA) for product development which minimizes part count in manufacturing process. CO 2 Interpret the specific materials compatible with existing production processes that will minimize processing time and functional requirements. CO 3 Construct the appropriate assembly of the mating parts as per the design specifications verified with basic go / no-go tools. CO 4 Make use of the suitable materials for product manufacturing in engineering applications to eliminate expensive and complex features. CO 5 Select the proper gating and riser system needed for casting requirements to achieve defect/error free components. CO 6 Categorize various defects and shortcomings during gas welding operation such as TIG, MIG and Spot welding for real time applications. CO 7 Outline the steps involved in making a casting the desired pattern for automotive industry components cylinder heads, engine blocks. CO 8 Apply the appropriate metal forming techniques, for producing components like bolts and nuts. CO 9 Explain the working principle of hot and cold extrusion processes and their application in industries for making of pipes and tubes. CO 10 Analyze the manufacturing defects as well as material characterization and its application. CO 11 Classify the various forging techniques based on functionality, cost and time in development of critical products. CO 12 Examine the appropriate manufacturing process parameters, for effective optimization of prototype / products. 								
MODULE-I	INTRODUCTION						Classes : 09	
Introduction: Overview of the course, Design for manufacturing, Typical Case studies, Innovative product and service designs. Material Selection: Requirements for material selection, systematic selection of processes and materials, ASHBY charts.								
MODULE-II	MACHINING PROCESS						Classes : 09	
Machining process: Overview of various machining processes, general design rules for machining, dimensional tolerance and surface roughness, design for machining, ease, redesigning of components for machining ease with suitable examples, general design recommendations for machined parts.								

MODULE-III	METAL CASTING	Classes: 09
Metal casting: appraisal of various casting processes, selection of casting process, general design considerations for casting; Casting tolerances, use of solidification simulation in casting design, product design rules for sand casting.		
MODULE-IV	METAL JOINING	Classes: 09
Metal joining: Appraisal of various welding processes, Factors in design of weldments, general design guidelines - pre and post treatment of welds, effects of thermal stresses in weld joints, design of brazed joints; forging, design factors for Forging, closed dies forging design, parting lines of dies drop forging die design, general design recommendations; Extrusion and sheet metal work: design guidelines for extruded sections, design principles for punching, Blanking, bending, deep drawing, Keeler Goodman Forming line diagram; component design for blanking.		
MODULE-V	DESIGN FOR SHEET METAL WORKING&POWDER METAL PROCESSING	Classes : 09
Design for Sheet metal working: Press selection, press brake operations, design rules, design for powder metal processing: Powder metallurgy, tooling and presses for compaction, sintering, materials, heat treatments, design guidelines.		
Text Books:		
<ol style="list-style-type: none"> 1. Geoffrey Boothroyd, –Assembly Automation and Product Design, Marcel Dekker Inc., NY, 1st Edition, 2013. 2. George E, Dieter, –Engineering Design - Material & Processing Approach, McGraw-Hill, 2nd Edition, 2000. 3. Geoffrey Boothroyd, –Hand Book of Product Design, Marcel and Dekken, 1st Edition, 2013. 4. Geoffrey Boothroyd, Peter Dewhurst, Winston –Product Design for Manufacturing and Assembly, CRC Press, 1st Edition, 2010. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Geoffrey Boothroyd, —Hand Book of Product Design, Marcel and Dekken, 1st Edition, 2013. 2. Geoffrey Boothroyd, Peter Dewhurst, Winston —Product Design for Manufacturing and Assembly, CRC Press, 1st Edition, 2010. 		
Web References:		
<ol style="list-style-type: none"> 1. http://www.nptel.ac.in/courses/107103012/ 2. http://nptel.ac.in/courses/112101005/ 		
E-Text Book:		
<ol style="list-style-type: none"> 1. http://www.sciencedirect.com/science/book/9780750673419 2. http://www.faadoengineers.com/.../11227-Amie-Fundamental-of-design-and-manufacturin... 		