

DESIGN FOR MANUFACTURING

Professional Elective – I

Course code	23ME4501A	Year	III	Semester	I
Course category	Professional Elective	Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Material Science And Metallurgy, Manufacturing Processes
Continuous Internal Evaluation:	30	SemesterEnd Evaluation:	70	Total Marks:	100

Course Outcomes													
Upon successful completion of the course, the student will be able-to												Blooms Level	
Understand the basic concepts of designing and assembly for various basic and emerging manufacturing processes.												L2	
Understand the basic concepts of design for manual assembly												L3	
Identify basic design procedure of various machining processes.												L3	
Illustrate the design considerations for metal casting, extrusion and sheet metal work, various metal joining process.												L3	
Understand the basic design concepts involved in the design for assembly automation and Additive Manufacturing.												L3	
Contribution of Course outcomes towards the achievement of program outcomes & Strength of correlations (High :3,Medium:2,Low:1)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	2	-	-	-	1	1	1	3	2
CO2	3	2	2	1	1	-	-	-	1	1	1	3	2
CO3	3	3	2	2	2	-	-	-	1	1	1	3	2
CO4	3	3	3	2	2	-	-	-	1	2	1	3	2
CO5	3	2	3	2	3	-	-	-	1	2	2	3	2

SYLLABUS		
Unit	Contents	CO'S
I	<p>INTRODUCTION TO DFM, DFMA: How Does DFMA Work? Reasons for Not Implementing DFMA, What Are the Advantages of Applying DFMA During Product Design? Typical DFMA Case Studies, Overall Impact of DFMA on Industry.</p> <p>DESIGN FOR MANUAL ASSEMBLY: General Design Guidelines for Manual Assembly, Development of the Systematic DFA Methodology, Assembly Efficiency, Effect of Part Symmetry, Thickness, weight on Handling Time, Effects of Combinations of Factors and application of the DFA Methodology.</p>	CO1, CO2

II	MACHINING PROCESSES: Overview of various machining processes-general design rules for machining dimensional tolerance and surface roughness-Design for machining – ease –re-designing of components for machining ease with suitable examples. General design recommendations for machined parts.	CO1, CO3
III	METAL CASTING: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design product design rules for sand casting. EXTRUSION & SHEET METAL WORK: Design guide lines extruded sections-design principles for punching, blanking, bending, and deep drawing-Keeler Goodman forging line diagram – component design for blanking.	CO1, CO4
IV	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 die forging design – parting lines of dies –drop forging die design – general design recommendations.	CO1CO4
V	DESIGN FOR ASSEMBLY AUTOMATION: Fundamentals of automated assembly systems, System configurations, parts delivery system at workstations, various escapement and placement devices used in automated assembly systems, Quantitative analysis of Assembly systems, Multi station assembly systems, and single station assembly lines. DESIGN FOR ADDITIVE MANUFACTURING: Introduction to AM, DFMA concepts and objectives, AM unique capabilities, exploring design freedoms, Design tools for AM, Part Orientation, Removal of Supports, Hollowing out parts, Inclusion of Undercuts and Other Manufacturing Constraining Features, Interlocking Features, Reduction of Part Count in an Assembly, Identification of markings/ numbers.	CO1, CO5

Learning Resource	
Textbooks:	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Design for manufacture, John Cobert, Adisson Wesley. 1995 2. Design for Manufacture by Boothroyd, 3. Design for manufacture, James Bralla, 	
Reference books	
<ol style="list-style-type: none"> 1. M F Ashby and K Johnson, Materials and Design - the art and science of material selection in product design, Butterworth-Heinemann, 2003. 2. Molloy, E.A. Warman, S. Tilley, Design for Manufacturing and Assembly: Concepts, Architectures and Implementation, Springer, 1998 3. K G Swift and J D Booker, Process selection: from design to manufacture, London: Arnold, 1997. 	

E-Resources & other digital Material:
<ol style="list-style-type: none"> 3. https://nptel.ac.in/courses/112105233 4. https://nptel.ac.in/courses/112/104/112104250/