

DESIGN FOR MANUFACTURING AND ASSEMBLY

VIII Semester: B Tech								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AME520	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			

OBJECTIVES:

The course should enable the students to:

- I. Understand various general design rules for manufacture ability and criteria for material selection.
- II. Apply various machining process and tolerance aspects in machining.
- III. Analyze the design considerations for casting and welding process.
- IV. Apply the conceptual design factors to be considered in forging, extrusion and sheet metal work, design guidelines for manual assembly and development of DFA methodology.

COURSE OUTCOMES(COs):

1. Identifying primary and secondary components through functional analysis
2. Calculate the design efficiency for their product design
3. Identify various design recommendation of design process
4. Analyze and derive the gripping, insertion and fixing values through fitting analysis of the product
5. Apply the Design guidelines and assembly techniques to mechanical designs.

COURSE LEARNING OUTCOMES (CLOs):

1. Identify and understand of basic concepts of DFM and DFA
2. Understand and Apply concepts of Generative DFMA
3. Understand the Various types of materials, its classification, suitable materials for product design
4. Understand the selection of manufacturing sequences and optimal selection.
5. Identify the reasons for optimal selection of machining parameters.
6. Identify the various casting design, machining design, designing of formed components
7. Identity various design recommendation for permanent joining such as welding, soldering and brazing.
8. Understand the different design factors for forging, closed dies forging design
9. Apply the different Design guidelines for extruded sections.
10. Understand various design principles for punching, blanking, bending, deep drawing.
11. Understand the different conventional approach and Assembly optimization processes.
12. Create the knowledge on cost consciousness & an awareness of Designers' accountability in product design lifecycle.
13. Understand the cost factors that play a part in DFA.
14. Understand the general design guidelines for manual assembly and development of the systematic DFA methodology.
15. Using CAD, apply design for manufacturing and assembly techniques to mechanical designs.
16. Understand the effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.

UNIT-I	INTRODUCTION	Classes: 09
Introduction: Design philosophy steps in design process, general design rules for manufacturability, basic principles of design Ling for economical production, creativity in design; Materials selection of materials for design developments in material technology, criteria for material selection, material selection interrelationship with process selection process selection charts.		
UNIT-II	MACHINING PROCESS, CASTING	Classes: 09
Machining process: Overview of various machining processes, general design rules for machining, dimensional tolerance and surface roughness, design for machining, ease of redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.		
UNIT-III	METAL JOINING, FORMING	Classes: 09
Metal casting: Appraisal of various casting processes, selection of casting processes, general design considerations for casting, casting tolerances, use of solidification simulation in casting design, product design rules for sand casting 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;		
UNIT-IV	DESIGN FOR FORGING	Classes: 09
Forging, design factors for forging, closed dies forging design, parting lines of die 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.		
UNIT-V	DESIGN FOR ASSEMBLY AND AUTOMATION	Classes: 09
Design for assembly: General design guidelines for manual assembly, development of systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time.		
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. 		