DESIGN FOR MANUFACTURING AND ASSEMBLY

I Semester: M Tech (CAD/CAM)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCCB04	Core	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Understanding the basics of Computer Graphics needed for CAD/ CAM applications.
II. Applying the geometrical modeling for computer graphics.
III. Applying data structures in computer graphics.

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 TO DESIGN	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	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; 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		
UNIT-III	**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 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-IV	**ASSEMBLY ADVANTAGES**	**Classes: 09**
Assembly advantages: Development of the assemble process, choice of assemble method assemble advantages social effects of automation, automatic assembly transfer systems: Continuous transfer, intermittent transfer, indexing mechanisms, and operator, paced free, transfer machine.		
UNIT-V	**DESIGN OF MANUAL ASSEMBLY**	**Classes: 09**
Design of manual assembly: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.		

Text Books:

1. Geoffrey Boothroyd, "Assembly Automation and Product Design", CRC Press, 2nd Edition, 2013.
2. George E. Deiter, "Engineering Design - Material & Processing Approach", Tata McGraw Hill, 2nd Edition, 2000.
3. Geoffrey Boothroyd, "Hand Book of Product Design", Marcel and Dekken, 1st Edition, 1990.

Reference Books:

1. A Delbainbre, "Computer Aided Assembly"1992.
2. Geoffrey Boothroyd, Peter Dewhurst, Winston. A. Knight, "Product Design for Manufacturing and Assembly", CRC Press, 3rd Edition, 2013.