



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

DESIGN FOR MANUFACTURING AND ASSEMBLY								
I SEMESTER: CAD/CAM								
Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCCD04	Elective	3	-	-	3	40	60	100
		Contact Classes: 48			Tutorial Classes: Nil		Practical Classes: Nil	
						Total Classes: 48		
Pre requisites: Design for Manufacturing								

I. COURSE OVERVIEW:

The aim of this course is to introduce about the basic design process which based on different aspects of manufacturing as well assembly. Design for manufacturing is an engineering methodology that focuses on reducing time-to-market and total production costs by prioritizing both the ease of manufacture for the product's parts and the simplified assembly of those parts into the final product.

II. COURSE OBJECTIVES:

The students will try to learn:

- I. The design of a product and the manufacturing constraints that influence the design of parts and part systems.
- II. The general design consideration for machining and casting processes
- III. The design guidelines for welding, extrusion process and sheet metalwork.
- IV. The development of the assemble process, classification of automatic assembly and design guidelines of manual assembly.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

- CO1 Illustrate the design philosophy, material selection and principles for economical production.
- CO2 Apply the design recommendations for various manufacturing processes
- CO3 Evaluate the modifications in a design that can be facilitated during welding, forging, extrusion and sheet metal work
- CO4 Apply feasible solutions for various product assembly lines
- CO5 Classify for manual assembly requirements for various products workstations

IV. COURSE CONTENT:

MODULE -I: Introduction To Design (09)

Introduction: Design philosophy steps in design process, general design rules for manufacturability, basic principles of designing 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.

MODULE -II: Machining Process (10)

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 process, general design considerations for casting, casting tolerances, use of solidification simulation in casting design, product design rules for sandcasting.

MODULE -III: Metal Joining (09)

Metal joining: Appraisal of various welding processes, factors in design of weldments, general design constitution 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.

MODULE -IV: Assembly Advantages (10)

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

MODULE -V: Design Of Manual Assembly (10)

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.

V. 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.

VI. REFERENCE BOOKS:

1. A. Delbainbre, “Computer Aided Assembly”, Springer, 2nd edition, 1992.
2. Geoffrey Boothroyd, Peter Dewhurst, Winston. A.Knight, “Product Design for Manufacturing an Assembly”, CRC Press, 3rd edition, 2013.

VII. WEB REFERENCES:

1. <http://nptel.ac.in/courses/107103012/>
2. <http://me.gatech.edu/files/capstone/L071ME4182DFA>

VIII. E-TEXT BOOKS:

1. https://books.google.co.in/books/about/Assembly_Automation_and_Product_Design.html?id=XFtgaNFzMHQC
2. https://books.google.co.in/books/about/Product_Design_for_Manufacture_and_Assem.html?id=qYGgjwEACAAJ.

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Assignments
4. Model question paper – I
5. Model question paper – II
6. Lecture notes
7. PowerPoint presentation