COURSE TITLE	**DESIGN FOR MANUFACTURING**
COURSE CODE	**01ME0507**
COURSE CREDITS	**4**

Objective:

1 To develop an integrated understanding of Design for Manufacturing principles for creating cost-effective, high-quality, and sustainable products. The course aims to enable students to select appropriate materials, processes, and design parameters while optimizing product performance and manufacturability using modern engineering tools.

Course Outcomes: After completion of this course, student will be able to:

1 Use the principles of Design for Manufacturing to reduce cost, improve quality, and enhance product sustainability.

2 Select appropriate materials and manufacturing processes using tools such as Ashby charts, performance indices, and multi-attribute analysis.

3 Apply design rules for geometry, tolerances, and part features to ensure manufacturability and functional reliability.

4 Analyse the impact of design decisions on cost, performance, ergonomics, recyclability, and biocompatibility.

5 Apply digital tools (CAD/CAE, prototyping, optimisation) to assess and improve manufacturable designs.

Pre-requisite of course: Understanding the importance of Design in Manufacturing.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction** Concepts of DFM, Role of DFM, Material and Process Selection	6
2	**Components Design** Design for Quality, Design for Assembly, Design for Cost, Design for Performance, Design for Biocompatibility, Design for Ergonomics, Design for Recycling and other factors.	12
3	**Methods of Material Selection** Material Selection on the basis of Engineering Properties, Material Selection on the basis of material performance indices, Material Selection on the basis of charts, Evaluation of single and multi-attribute utilities.	8

Contents : Unit	Topics	Contact Hours
4	**Design Rules** Design rules for material and process, Part geometry and tolerances, Shape factor, Prototyping, Computer aided Material, Functional Modelling, mathematical optimization, formation of objective, Constraint functions, factorial analysis.	10
5	**Case Studies** Case studies on product design, Case study on manufacturing design., Case study on design of assembly.	6
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment 1** For a given products/component, identify differences and similarities between Design for Manufacturing.	2
2	**Experiment 2** Perform an exercise to identify features (self-locating, self-fastening, minimize orientation during assembly, retrieval, handling and insertion, symmetry) for assembly of a component.	2
3	**Experiment 3** Redesign: Perform exercise for a product to minimize number of parts without compromising its function.	2
4	**Experiment 4** Geometric Dimensioning and Tolerance in Tolerance Analysis.	2
5	**Experiment 5** Case study on Machining consideration	2
6	**Experiment 7** Case study on Life cycle assessment of product.	2
7	**Experiment 6** Case study on casting consideration	2
8	**Experiment 8** Simulation exercise for design of components for manufacturing by CAD tools	2
9	**Experiment 9** case study on arc welding process	2
10	**Experiment 10** case study on metal forming process	2
11	**Experiment 11** case study on punching process	2
12	**Experiment 12** case study on fly press machine	2
Total Hours		**24**

Textbook :

1 Design for the Environment , Fixel, J., McGraw Hill , 1996

2 Engineering Design and Design for Manufacture and Structural Approach, Dickson, John. R, and Corroda Poly, Field Stone Publisher, 1995

References:

1 Design for Manufacturing A Structured Approach, Design for Manufacturing A Structured Approach, C. Poli , Elsevier Science, 2001

2 Design for Manufacturing and Assembly, Design for Manufacturing and Assembly, O. Molloy, E.A. Warman, S. Tilley ·, Springer US, 2012

3 Design for Manufacture handbook, Design for Manufacture handbook, Bralla, McGraw Hill, 1999

4 Material Selection in Mechanical Design, Material Selection in Mechanical Design, Michael Ashby., Elsevier , 1992

5 Product design and development,, Product design and development,, K.T. Ulrich and S.D. Eppinger, McGraw Hill, 1994

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
15.00	15.00	20.00	15.00	25.00	10.00

Instructional Method:

1 1. Minimize Part Count. ... 2 | Standaradize Parts and Materials. ... 3 | Create Modular Assemblies. ... 4 | Design for Efficient Joining. ... 5 | Minimize Reorientation of Parts During Assembly & Machining.

Supplementary Resources:

1 http://nptel.ac.in/courses/112101005

2 https://ocw.mit.edu/index.htm