

## 17MD006DESIGN SYNTHESIS

COURSE CODE	COURSE TITLE	L	P	T	C
17MD006	DESIGN SYNTHESIS				

**Course Description and Objectives:** Success of a product depends on many factors. They are cost , reliability, safety and simplicity in the product. With the globalization , manufacturers need to adopt high end techniques to remain competent in the current market. It is only possible by adopting methods to reduce time for design and reliable product design , reduction of number of sub assemblies, enhancement in quality with better manufacturing techniques. The basic objective of this course is to acquire the concepts of the product design process and integrating design for manufacturing and design for assembly to arrive at a good quality product in a cost effective way.

**Course Outcomes:**

Upon successful completion of this course student should be able to:

- Analyze various stages involved in the design process
- Apply tolerances and surface finish to design a product
- Select a manufacturing process for different types of components
- Design the product keeping in view assembly , dismantling, maintenance and inspection
- Apply optimization methods for design problems

**SKILLS ACQUIRED:**

1. Need identification and market survey techniques
2. Concept generation and evaluation
3. Manufacturing technique selection based on product
4. Product design based on ergonomics
5. Designing products based on maintenance and inspection

## **UNIT-I**

Design process – Considerations of a Good design – Detailed description of design process – Need identification - Concept Generation – Decision making and concept selection - Embodiment design– Standardization and its application in design.

## **UNIT-II**

Material selection – Performance characteristics of materials – Material selection process

Tolerances from process and function - Interchangeability and selective assembly - Selection of fits for different design situations - Surface finish.

Strength Considerations in product design - Strength based design – Rigidity based design – Designing for uniform strength. Lightweight and rigid constructions.

## **UNIT-III**

Design for Manufacturing – Design of cast, forged, sheet metal parts and welded constructions.

Design for Machining - Design for turning – Design for drilling – Design for milling

## **UNIT-IV**

Design for assembly and dismantling - Design for inspection and maintenance - Design for fasteners

Ergonomic considerations in design - Design of controls and displays

Modern approaches to product design – Concurrent design – Quality function deployment - rapid prototyping.- Liquid, solid and powder based techniques.

## **UNIT-V**

Optimization in design – Engineering applications of optimization - Problem formulation for design optimization - Classification of optimization problems - Linear programming – Non linear programming - Geometric programming - Application to machine design problems.

**ACTIVITIES: 1. Preparation of market survey for a new automobile design .**

**2. Concept generation and evaluation for a domestic electric appliances like refrigerator, washing machine , sewing machine etc.**

3. Ergonomic design for a machine tool keeping controls and levers.

4. House of quality preparation for an industrial product.

5. Optimum design of gear box for automobile application.

.

## **TEXTBOOKS:**

1. George E. Dieter, "Engineering Design - A Materials & Processing Approach", 4<sup>th</sup> Edition, McGraw Hill Publishers, 2015
2. S.S. Rao, "Engineering Optimization", 4<sup>th</sup> Edition, John Wiley & Sons, 2009.

## **REFERENCE BOOKS:**

1. Kevin Otto, Kristion Wood, "Product Design", 1<sup>st</sup> Edition, Pearson Publications, 2006.
2. A.K. Chitale, R.C. Gupta, "Product design and Manufacturing", 3<sup>rd</sup> Edition, PHI Publications,