

Subject Code	Courses	L	T	P	Hrs.	Credits
ME5CD02	Machine Design	4	0	0	4	4

Unit-1

Introduction: Considerations of a Good Design, Design Process, Concurrent and Computer aided engineering concepts, Design codes and Standards, Design Review and societal considerations. Need Identification and gathering information: Evaluating Customer requirements and Bench marking, Product Design Specification, Information sources, Copyright, Expert systems.

Unit-2

Concept Generation and Evaluation and Embodiment Design: Creativity and Problem solving, Theory of Inventive Problem solving, Conceptual Decomposition and Axiomatic Design, Decision concept evaluation and decision making. Introduction, Product Architecture, Configuration and Parametric design Concepts, Industrial Design, Ergonomics and Design for Environment, Modelling and Simulation for engineering design process, Material selection and detailed design. Team Work and Ethics in engineering design, Team formation, functioning, discharge, team dynamics, Ethical issues considered during engineering design process.

Unit-3

Design for Material and Manufacturing – Design for brittle fracture, fatigue failure, design for corrosive resistance, wear, design for plastics. Role of manufacturing in design, Manufacturing process selection, DFM, DFA, Design for different Manufacturing process. Risk reliability and safety, probability approach to design, design for reliability. FMEA (failure mode and effect analysis), Concept of total Quality, quality control and assurance, Optimization methods.

Unit 4

Cost Evaluation, Legal, Ethical and Economical issues in Design: Methods of developing cost estimates, make buy Decision, design to cost, manufacturing cost models, life cycle costing, origin of laws, type of contracts, liabilities, product liability, protecting intellectual property, codes of ethics, solving ethical conflicts, mathematics of time value of money, cost comparisons, depreciation, taxes, profitability of investments, inflation, sensitivity and Break Even analysis, uncertainty in economic analysis, benefit cost analysis.

Unit 5

Review of Machine element design based on Strength and Distortion Criterion: review of choice of materials and their treatment; Effect of lubrication in mechanical design. Designing for wear and corrosion; Designing for fatigue, creep; Design criterion for fracture; Application of advanced design criterion to machine elements (like shafts, spur / bevel / worm gears); Design of structures, machines and equipment; Dynamic Modeling of mechanical systems; Introduction to machine element design based on vibration failures.

Text Books

1. Kevin Otto and Kristin Wood, “Product design”- Pearson, 2004

2. David G. Ullman, "The Mechanical Design Process" – McGraw Hill, 2003
3. Karl T. Ulrich and Steven D. Eppinger, "Product Design and Development" TMH, 2007
4. George E. Dieter, "Engineering Design" – McGraw Hill, 2013

Reference Books:

1. Engineering Design Principles, Ken Hurst, Elsevier, 1999.
2. Engineering Design 3rd Ed. Pahl, W Beitz J Feldhusun, K G Grote Springer 2007
3. Richard G Budynas, J Keith Nisbett, Shigley's Mechanical Engineering Design - SIE