

MEPC3001 DESIGN OF MACHINE ELEMENTS-II (3-0-0)

Course Objectives:

This course focuses on advanced machine element design, covering stress analysis, fatigue failure theories, and component design (cylinders, pistons, gears). Students will learn to design power transmission elements (belts, chains, clutches, brakes) and apply engineering principles to solve practical problems using design handbooks and failure criteria (Goodman, Soderberg).

Module-I: (06 Hours)

Review of axial, bending and torsional stresses in machine parts; Theories of Failure, Applications in practical problems. Variables stresses (Fatigue), Endurance limit, S-N curve, Fatigue stress concentration factor, Goodman, Gerber and Soderberg criteria, Application to design and practical problems.

Module-II: (06 Hours)

Design of cylinder, piston, connecting rod, flywheel, crank shaft and valve.

Module-III: (06 Hours)

Design of clutches (friction and centrifugal type), Brakes (block, band brakes and internal expanding brake).

Module-IV: (06 Hours)

Design of belts (flat and V-belt), rope and chain drives.

Module-V: (06 Hours)

Design of straight and helical spur gears, bevel gears and worm gears.

Course Outcomes:

- CO1: Remembering (Knowledge): Recall fundamental principles of stress analysis (axial, bending, torsional) and theories of failure (Goodman, Gerber, Soderberg) for machine components.
- CO2: Understanding (Comprehension): Explain the design considerations for cylinders, pistons, gears, and power transmission elements (belts, chains, clutches, brakes) based on load and fatigue analysis.
- CO3: Applying (Application): Design machine elements (e.g., gears, flywheels, brakes) using standard design handbooks and failure criteria to meet functional requirements.
- CO4: Analyzing (Analysis): Evaluate the impact of variable stresses, fatigue, and stress concentration factors on the performance and lifespan of machine components.
- CO5: Creating (Synthesis): Develop integrated solutions for real-world mechanical systems by combining multiple machine elements (e.g., gear drives with shafts) and optimizing designs for safety and efficiency.

Design Data Hand Books:

1. Design Hand Book by S. M. Jalaluddin; Anuradha Agencies Publications
2. P. S. G. Design Data Hand Book, PSG College of Tech Coimbatore
3. Machine Design Data Book, K. Lingaiah, Tata McGraw Hill

Reference Books:

1. Design of Machine Elements, V. B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition
2. Mechanical Engineering Design, J. E. Shigley, C. R. Mischke, R. G. Budynas and K. J. Nisbett, Tata Mc Graw-Hill, 11th Edition, 2020
3. Design of Machine Elements, M. F. Spotts
4. Machine Design, P. C. Sharma and D. K. Agrawal, S. K. Kataria & Sons
5. Machine Design, Robert L. Norton, Pearson Education Asia, 2001.
6. Fundamentals of Machine Component Design, Robert C. Juvinall and Kurt M Marshek, Wiley India Pvt. Ltd., New Delhi, 3rd Edition, 2007
7. Machine Design, P. Kanaiah, SciTech Publications.