DESIGN OF MACHINE ELEMENTS – I
B.E, V Semester, Mechanical Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	17ME54	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50(10 Hours per Module)**	**Exam Hours**	**03**
Credits – 04			

Course Objectives:

1. **Able to understand mechanical design procedure, materials, codes and use of standards**
2. **Able to design machine components for static, impact and fatigue strength.**
3. **Able to design fasteners, shafts, joints, couplings, keys, threaded fasteners riveted joints, welded joints and power screws.**

Module - 1

Fundamentals of Mechanical Engineering Design

Mechanical engineering design, Phases of design process, Design considerations, Engineering Materials and their Mechanical properties,Standards and Codes, Factor of safety, Material selection.

Static Stresses: Static loads.Normal, Bending, Shear andCombinedstresses. Theories of failure. Stress concentration and determination of stress concentration factor.

Module - 2

Design for Impact and Fatigue Loads

Impact stress due to Axial, Bending and Torsional loads.

Fatigue failure: Endurance limit, S-N Diagram, Low cycle fatigue, High cycle fatigue, modifying factors: size effect, surface effect. Stress concentration effects, Notch sensitivity, fluctuating stresses, Goodman and Soderberg relationship, stresses due to combined loading, cumulative fatigue damage.

Module - 3

Design of Shafts, Joints, Couplings and Keys

Torsion of shafts, design for strength and rigidity with steady loading, ASME codes for power transmission shafting, shafts under combined loads. Design of Cotter and Knuckle joints, Rigid and flexible couplings, Flange coupling, Bush and Pin type coupling and Oldham's coupling. Design of keys-square, saddle, flat and father.

Module - 4

Riveted Joints and Weld Joints

Rivet types, rivet materials, failures of riveted joints, Joint Efficiency, Boiler Joints, Lozanze Joints, Riveted Brackets, eccentrically loaded joints. Types of welded joints, Strength of butt and fillet welds, welded brackets with transverse and parallel fillet welds, eccentrically loaded welded joints.

Module - 5
Threaded Fasteners and Power Screws Stresses in threaded fasteners, Effect of initial tension, Design of threaded fasteners under static loads, Design of eccentrically loaded bolted joints. Types of power screws, efficiency and self-locking, Design of power screw, Design of screw jack: (Complete Design).
Course outcomes: **1. Describe the design process, choose materials.** **2. Apply the codes and standards in design process.** **3. Analyze the behavior of machine components under static, impact, fatigue loading using failure theories.** **4. Design shafts, joints, couplings.** **5. Design of riveted and welded joints.** **6. Design of threaded fasteners and power screws**
TEXT BOOKS: 1. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007. 2. Mechanical Engineering Design, Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6th Edition, 2009.
Design Data Handbook: 1. Design Data Hand Book, K. Lingaiah, McGraw Hill, 2nd Ed. 2. Data Hand Book, K. Mahadevan and Balaveera Reddy, CBS Publication 3. Design Data Hand Book, S C Pilli and H. G. Patil, I. K. International Publisher, 2010.
REFERENCE BOOKS 1. Machine Design, Robert L. Norton, Pearson Education Asia, 2001. 2. Engineering Design, George E. Dieter, Linda C Schmidt, McGraw Hill Education, Indian Edition, 2013. 3. Design of Machined Elements, S C Pilli and H. G. Patil, I. K. International Publisher, 2017. 4. Machine Design, Hall, Holowenko, Laughlin (Schaum's Outline series) adapted by S.K Somani, tata McGraw Hill Publishing company Ltd., New Delhi, Special Indian Edition, 2008