

**DESIGN OF MACHINE ELEMENTS**

<b>Course Code</b>	23ME3503	<b>Year</b>	III	<b>Semester</b>	I
<b>Course Category</b>	Professional Core	<b>Branch</b>	ME	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Prerequisites</b>	Mechanics of Solids
<b>Continuous Internal Evaluation:</b>	30	<b>Semester End Evaluation:</b>	70	<b>Total Marks:</b>	100

<b>Course Outcomes</b>		<b>Blooms Level</b>
Upon successful completion of the course, the student will be able to		
CO1	Design the machine members subjected to static and dynamic loads.	<b>L4</b>
CO2	Learn how to design bolted and welded joints.	<b>L4</b>
CO3	Design shafts and couplings for power transmission	<b>L4</b>
CO4	Know the design procedures of clutches, brakes and springs.	<b>L4</b>
CO5	Design bearings and gears.	<b>L4</b>

<b>Contribution of Course outcomes towards achievement of programme outcomes &amp; Strength of correlations(High:3, Medium: 2, Low:1)</b>													
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	1						1	2	3	1
CO2	3	3	1	1						1	2	3	1
CO3	3	3	1	1						1	2	3	1
CO4	3	3	1	1						1	2	3	1
CO5	3	3	1	1						1	2	3	1

Unit	Contents	Mapped CO
I	<b>INTRODUCTION, DESIGN FOR STATIC AND DYNAMIC LOADS</b> <b>MECHANICAL ENGINEERING DESIGN:</b> Design process, design considerations, codes and standards of designation of materials, selection of materials. <b>Design for Static Loads:</b> Modes of failure, design of components subjected to axial, bending, and torsional loads. Theories of failure for static loads. <b>Design for Dynamic Loads:</b> Endurance limit, fatigue strength under axial, bending and torsion, stress concentration, notch sensitivity. Types of fluctuating loads, fatigue design for infinite life. Soderberg, Goodman and modified Goodman criterion for fatigue failure.	CO1
II	<b>DESIGN OF BOLTED AND WELDED JOINTS</b> <b>DESIGN OF BOLTED JOINTS:</b> Threaded fasteners, preload of bolts, various stresses induced in the bolts. Torque requirement for bolt tightening, gasketed joints and eccentrically loaded bolted joints. <b>Welded Joints:</b> Strength of lap and butt welds, Joints subjected to bending and torsion. Eccentrically loaded welded joints.	CO2
III	<b>POWER TRANSMISSION SHAFTS AND COUPLINGS</b> <b>POWER TRANSMISSION SHAFTS:</b> Design of shafts subjected to bending, torsion and axial loading. Shafts subjected to fluctuating loads using shock factors. <b>Couplings:</b> Design of muff, split muff, flange couplings	CO3
IV	<b>DESIGN OF CLUTCHES, BRAKES AND SPRINGS</b> <b>FRICTION CLUTCHES:</b> Torque transmitting capacity of disc and centrifugal clutches. Uniform wear theory and uniform pressure theory. <b>Brakes:</b> Different types of brakes. Concept of self-energizing and self-locking of brake. Band and block brakes, disc brakes. <b>Springs:</b> Design of helical compression, tension, and leaf springs.	CO4
V	<b>DESIGN OF BEARINGS AND GEARS</b> <b>DESIGN OF SLIDING CONTACT BEARINGS:</b> Lubrication modes, bearing modulus, McKee's equations, design of journal bearing. Bearing Failures. <b>DESIGN OF ROLLING CONTACT BEARINGS:</b> Static and dynamic load capacity, Stribeck's Equation, equivalent bearing load, load-life relationships, load factor, selection of bearings from manufacturer's catalogue. <b>DESIGN OF SPUR GEARS:</b> Spur gears, beam strength, Lewis equation, design for dynamic and wear loads.	CO5

**Note: Data book is allowed**

Learning Resources
<b>Text Book(s):</b> 1. R.L. Norton, Machine Design an Integrated approach, 2/e, Pearson Education, 2004. 2. V.B.Bhandari, Design of Machine Elements, 3/e, Tata McGraw Hill, 2010. 3. Dr. N. C. Pandya & Dr. C. S. Shah, Machine design, 17/e, Charotar Publishing House Pvt. Ltd, 2009.
<b>References:</b> 1. R.K. Jain, Machine Design, Khanna Publications, 1978.

2. J.E. Shigley, Mechanical Engineering Design, 2/e, Tata McGraw Hill, 1986.
3. M.F.Spotts and T.E.Shoup, Design of Machine Elements, 3/e, Prentice Hall (Pearson Education), 2013.
4. Design Data Hand Book by S. Md. Jalaluddin, First Edition, Anuradha Publications, Chennai, 2009.

**Online Learning Resources:**

- <https://www.yumpu.com/en/document/view/18818306/lesson-3-course-name-design-ofmachine-elements-1-nptel>
- <https://www.digimat.in/nptel/courses/video/112105124/L01.html>
- <https://dokumen.tips/documents/nptel-design-of-machine-elements-1.html>
- <https://archive.nptel.ac.in/courses/112/105/112105125/>
- <https://www.coursera.org/learn/machine-design1>