

BVM ENGINEERING COLLEGE [AN AUTONOMOUS INSTITUTION]

2ME09: DESIGN OF MACHINE ELEMENTS

CREDITS - 4 (LTP:3,1,0)

Course Objective:

To apply principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements as per practices and standards.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				
L	T	P		Theory		Practical		Total Marks
			ESE	CE	ESE	CE		
3	1	0	4	60	40	20	30	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	Steady Stresses in Machine Members: Basic Mechanical Property ,Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties - Preferred numbers and standardization, - Direct, Bending and torsional stress equations- Factor of safety - Impact and shock loading - calculation of principle stresses for various load combinations, eccentric loading - Design based on strength and stiffness.	5
2	Design For Fluctuating Loads: Stress Concentration, Endurance limit and Fatigue failure, Factors affecting endurance limit, S-N Diagram Fluctuating stresses: Soderberg, Gerber, Goodman and Modified-Goodman criteria, Combined stresses, Cumulative damage in fatigue.	7
3	Temporary And Permanent Joints: Design of Riveted Joints: Strength and efficiency of joints, Caulking and Fullering, Longitudinal and Circumferential lap joints, Eccentrically loaded riveted joints. Design of Welded Joints: Design for various loading conditions in torsion, shear, or direct load, Eccentrically loaded welded joints. Design of Threaded Joints: Simple and Eccentric loading, Torque requirement for bolt tightening, Elastic analysis of bolted joints. Design of Cotter joints and Knuckle joint.	10
4	Power Screws: Types of power screw threads, Design of screw with different types of threads used in practice, Design of nuts, Design of C-clamp, Design of screw jack, Design of toggle jack, Design of Recirculating Ball Screw for machine tools.	6

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Unit No.	Topics	Teaching Hours
5	Shafts, Keys And Couplings : Design of solid and hollow shaft for transmission of torque, bending moment and axial forces, Design of shaft for rigidity and stiffness. Design of different types of keys, Concept of rigid and flexible couplings, Design of Rigid couplings, Design of Flexible couplings, International Standards used for shaft design, DIN 743-1-2-3.	7
6	Design Of Springs: Classification of springs, Materials standard for springs , Helical Spring: Style of ends, Stresses, Correction Factors and Deflection, Design against static and fluctuating loads, Concentric springs, Surge phenomenon. Helical torsional and Spiral Springs. Design of multi-leaf springs.	7
Total		42

List of References:

1. Bhandari V, “*Design of Machine Elements*”, 4th Edition, Tata McGraw-Hill Book Co, 2016.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “*Mechanical Engineering Design*”, 9th Edition, Tata McGraw-Hill, 2011.
3. Robert C. Juvinall and Kurt M. Marshek, “*Fundamentals of Machine Design*”, 4th Edition, Wiley, 2005.
4. R L Norton, *Machine Design an Integrated Approach*, Prentice Hall, 1998.
5. Spottes, M.F., “*Design of Machine Elements*”, Prentice Hall 1994.
6. DIN/ ISO standard

Course Outcomes (COs):

At the end of this course students will be able to ...

1. Apply various considerations for design of mechanical components.
2. Design mechanical components for variable loads.
3. Design various temporary and permanent joints.
4. Design power screws for various applications.
5. Design shafts, keys and couplings.
6. Design various types of springs.