DESIGN OF MACHINE ELEMENTS

VI Semester: ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AMEB23	Core	2	1	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES

The students will try to learn

I. The machine element design process that achieves desired constraints for strength, rigidity andreliability.
II. The nature of loading for the application of theories of failure for mechanical machine elementsunder different loading conditions.
III. The various permanent and temporary joints in engineering applications subjected to various loadingconditions.
IV. The design procedure for the various power transmission elements on the basis of strength andrigidity.

COURSE OUTCOMES

At the end of the course students are able to

CO 1 : **Outline** the knowledge of design process and design standards, B.I.S codes of steels for various machine elements.
CO 2: **Select** suitable materials and significance of tolerances and fits in critical design applications.
CO 3 : **Explain** theories of failures such as maximum principal stress theory, maximum shear stress theory and distortion energy theory with their applications for brittle and ductile materials.
CO 4 : **Apply** the concepts of principal stresses, theories of failure, stress concentration and fatigue loading for analyze the stresses and strains induced in a machine element.
CO 5: **Classify** the various riveted joints, lap and butt joints for engineering applications.
CO 6 : **Explain** the Design procedure of riveted joints and strength equations for engineering applications like boilers, pressure vessels, ships and trusses
CO 7 : **Indentify** the design considerations of welded joints and strength equations for butt welds, parallel and transverse fillet welds for maximum shear stress.
CO 8 : **Analyze** permanent joints (riveted, welded) under concentric and eccentric loading conditions for engineering applications.
CO 9 : **Develop** the design procedures of simple machine parts including cotter joints and knuckle joint for respective applications.
CO 10 : **Classify** types of keys, couplings (rigid and flexible) and their parametric design procedures for different loading conditions.
CO 11 :**Develop** the design procedures of shafts on the basis of strength, torsinal rigidity, and ASME Code for effective power transmission systems.
CO 12 :**Analyze** of concentric springs, optimum design of helical spring, surge in spring, helical torsion and spiral spring.
CO 12 :**Identify** the energy absorbing mechanical components such as springs (compression, tension, torsion) for the specified loading conditions.
CO 13 :**Identify** the energy absorbing mechanical components such as springs (compression, tension, torsion) for the specified loading conditions.

MODULE-I	INTRODUCTION TO THEORY OF FAILURES	Classes: 09
Introduction: General considerations in the design of engineering materials and their properties, selection, manufacturing consideration in design, tolerances and fits, BIS codes of steels; Theories of failures, factor of safety design for strength and rigidity, preferred number; Fatigue loading : Stress concentration, theoretical stress concentration factor, fatigue stress concentration factor, notch sensitivity, design for fluctuating stresses, endurance limit, estimation of endurance strength, Goodman‟s life, Soderberg‟s line.		
MODULE-II	**DESIGN OF FASTENERS**	**Classes: 09**
Design of fasteners: Riveted joints, methods of failure of riveted joints, strength equations, efficiency of riveted joints, eccentrically loaded riveted joints; Welded Joints: Design of fillet welds, axial loads, circular fillet welds, bending, bolts of uniform strength.		
MODULE-III	**DESIGN OF KEYS AND JOINTS**	**Classes: 09**
Keys, cotters and knuckle joints: Design of keys, stress in keys, cotter joints, spigot and socket. Sleeve and cotter, jib and cotter joints, Knuckle joints.		
MODULE-IV	**DESIGN OF SHAFTS**	**Classes: 09**
Design of Shafts: Design of solid and hollow shafts for strength and rigidity, design of shafts for complex loads, Shaft sizes, BIS code, design of shafts for gear and belt drives; Shaft couplings: Rigid couplings, muff, Split muff and flange couplings, flexible couplings, pin, bush coupling.		
MODULE-V	**DESIGN OF SPRINGS**	**Classes: 09**
Mechanical Springs: Stresses and deflections of helical springs, extension compression springs, springs for static and fatigue loading, natural frequency of helical springs, energy storage capacity, helical torsion springs, co-axial springs.		

Text Books:

1. P. Kannaiah, “Machine Design”, 2nd Edition, Scitech Publications India Pvt. Ltd, New Delhi, 2012.
2. V.B. Bandari, “A Text Book of Design of Machine Elements”, 3rd edition, Tata McGraw hill, 2011.

Reference Books:

1. Richard G. Budynas, J. Keith Nisbett, “Shiegly‟s Mechanical Engineering Design”, 10th Edition, 2014.
2. R.L. Norton, “Machine Design-An Integrated approach”, Person Publisher, 2nd Edition, 2006.
3. U.C. Jindal, “Machine Design”, Pearson, 1st Edition, 2010
4. R.S. Khurmi, A. K. Gupta, “Machine Design”, S. Chand & Co, New Delhi, 1st Edition, 2014.

Web References:

1. http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Machine%20design1/New_index1.html
2. http://nptel.ac.in/downloads/112105125/
3. http:/alljntuworld.in/download/design-machine-members-1-dmm-1-materials-notes/
4. http:/scoopworld.in/2015/03/design-of-machine-members-dmm-mech.html

E-Text Books:

1. http://faadooengineers.com/threads/26687-Machine-design-by-shigley-ebook-download-pdf
2. http://freepdfbook.com/design-of-machine-elements-by-v-b-bhandari/
3. http:/only4engineer.com/2014/10/a-textbook-of-machine-design-by.html
4. http:/engineering108.com/Data/.../Handbooks/machine_design_databook.pdf