

DESIGN OF MACHINE ELEMENTS

IV Semester: ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEC14	CORE	L	T	P	C	CIA	SEE	Total
		3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

Prerequisite: Materials and Mechanics of Solids, Kinematics of Machinery, Dynamics of Machinery

I. COURSE OVERVIEW:

Machine design emphasizes for influence the failsafe design in the mechanical systems using different theories of failure modes. The design of machine members focuses mainly on design of machine elements subjected to various types of loads and components include joints; Riveted, Welded, threaded joints, shafts and springs using Design standards, B.I.S codes of steels. The Design philosophy is based on strength, stiffness and material selection for manufacture of machine elements.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The machine element design process that achieves desired constraints for strength, rigidity and reliability.

II. The nature of loading for the application of theories of failure for mechanical machine elements under different loading conditions.

III. The various permanent and temporary joints in engineering applications subjected to various loading conditions.

IV. The design procedure for the various power transmission elements on the basis of strength and rigidity.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO1	Outline the knowledge of design process and design standards, theories of failures, analyses the stresses and strains for various machine elements.	Understand
CO2	Develop the Design procedure of riveted joints and welded joints for engineering applications like boilers, pressure vessels, ships and trusses.	Apply
CO3	Classify various types of keys and cotter joints used to employee secure to gears, pulleys, disc applications.	Understand
CO4	Develop the design procedures of knuckle joint for different loading conditions in propeller applications.	Apply
CO5	Select appropriate design procedures on the basis of strength, tensional rigidity for shafts and Couplings.	Remember
CO6	Evaluate the natural frequency, energy storage, stresses and deflections of helical springs for static and fatigue loadings.	Evaluate

IV. SYLLABUS:

MODULE-I: INTRODUCTION TO THEORY OF FAILURES (12)

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, 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(12)

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.

MODULE –III:DESIGN OF KEYS AND JOINTS (12)

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 (12)

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, and, flexible couplings.

MODULE –V:DESIGN OF SPRINGS (12)

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.

V. TEXTBOOKS

1. P. Kannaiyah, “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.

VI. REFERENCEBOOKS:

1. Richard G. Budynas, J. Keith Nisbett, “Shigley’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.

VII. WEBREFERENCES:

1. [http://nptel.ac.in/courses/Webcourse- contents/IIT%20Kharagpur/Machine%20design1/New_index1.html](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>

VIII. 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>