INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

DESIGN OF MACHINE ELEMENTS								
IV Semester: ME								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
AMED11	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes:45**		
Prerequisite: Solid Mechanics								

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. COURSES 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:
At the end of the course students should be able to:

CO 1 Outline the knowledge of design process and design standards, theories of failures, analyses the stresses and strains for various machine elements.
CO 2 Develop the Design procedure of riveted joints and welded joints for engineering applications like boilers, pressure vessels, ships and trusses.
CO 3 Classify various types of keys and cotter joints used to employee secure to gears, pulleys, disc applications.
CO 4 Develop the design procedures of knuckle joint for different loading conditions in propeller applications.
CO 5 Select appropriate design procedures on the basis of strength, tensional rigidity for shafts and Couplings.
CO 6 Evaluate the natural frequency, energy storage, stresses and deflections of helical springs for static and fatigue loadings.

IV. COURSE CONTENT:
MODULE – I: INTRODUCTION TO THEORY OF FAILURES (10)

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 (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.

MODULE – III: DESIGN OF KEYS AND JOINTS (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 (10)
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 (10)
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. Kannaiah, "Machine Design", 4th Edition, Scitech Publications India Pvt. Ltd, New Delhi, 1st edition, 2014.
2. B. Bandari, "A Textbook of Design of Machine Elements", 3rd edition, Tata McGraw hill, 2011.

VI. 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.

VII. ELECTRONIC RESOURCES:

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

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech-talk topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. PowerPoint presentation
11. E-Learning Readiness Videos (ELRV)