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

COURSE CONTENT

MACHINE DESIGN								
V Semester: ME								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
AMED20	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	-	-	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes:48**		
Prerequisite: Design of Machine Elements								

I. COURSE OVERVIEW:
Machine design emphasizes the integration of failsafe design concepts into mechanical systems, applying various failure mode theories. The design philosophy concentrates upon strength, stiffness, and material selection for machine elements. The major goal of this course is to offer principles for the design of general-purpose machine elements, such as roller contact and sliding bearings, transmission systems, and engine pistons, which are generally addressed in specialist courses. Students who successfully complete the course will be able to navigate all stages of the design process, with a focus on the detailed embodiment phase, which entails determining shape and proportions.

II. COURSES OBJECTIVES:
The students will try to learn

I. The various types of rolling contact bearings, including their fundamental features, associated terminology, and designations.
II. The ability to choose appropriate rolling contact bearings based on specific applications.
III. The fundamental features of prime movers and the commonly employed means of power transmission in mechanical engineering.
IV. The skills to analyze and design all types of gears for a given application.

III. COURSE OUTCOMES:
At the end of the course students should be able to:

CO 1 Relate bearings and their importance in machinery operation using various modes of lubrication for reducing friction in industrial applications.
CO 2 Build various Internal Combustion Engine Parts for improving the efficiency for automobiles applications.
CO 3 Summarize types of belt drives in order to select suitable belt drives for given loading conditions.
CO 4 Develop design procedure for rope drives and chain drives for improving transmission efficiencies.
CO 5 Apply principles of gear design to various types of gears to meet the industrial application.
CO 6 Outline impact of various stresses acting on screw threads to minimize failure rate for enhancing power transmission systems

IV. COURSE CONTENT:

MODULE – I: BEARINGS

Bearings: Types of journal bearings, basic modes of lubrication, bearing modulus, full and partial bearings, Clearance ratio, Heat dissipation of bearings, bearing materials, Journal bearing design. Ball and roller bearing, Static load-dynamic load, equivalent radial load-design and selection of ball and roller bearings.

Module – II: DESIGN OF IC ENGINE PARTS

Connecting rod: thrust in connecting rod-stress due to whipping action on connecting rod ends-cranks and crank shafts, strength and proportions of over hung and center cranks-crank pins, crank shafts, piston, forces acting on piston-construction design and proportions of piston.

MODULE – III: POWER TRANSMISSION SYSTEMS, PULLEYS

Transmission of power by belt and rope drives, transmission efficiencies, Belts-Flat and V belts.

Ropes-pulleys for belt and rope drives, materials- chain drives.

MODULE – IV: GEARS

Load concentration factor-dynamic load factor, surface compressive strength-bending strength-design analysis of spur gear, check for plastic deformation, check for dynamic and wear considerations. Helical and Bevel Gear Drives: Load concentration factor-dynamic load factor, Analysis of helical and bevel gears, check for plastic deformation, check for dynamic and wear considerations. Design of Worm gears: worm gear-properties of worm gears-selections of materials-strength and wear rating of worm gears-force analysis-friction in worm gears-thermal considerations

MODULE – V: POWER SCREWS

Design of screw, design of nut, compound screw, differential screw, ball screw-possible failures.

V. TEXT BOOKS:

1. Richard G. Budynas, J. Keith Nisbett, "Shiegly's Mechanical Engineering Design", 12th Edition, 2022.
2. P. Kannaiah, "*Machine Design*", Scitech Publications India Pvt. Ltd,5th Edition 2022
3. V.B. Bandari, "A Text Book of Design of Machine Elements", 6rd edition, Tata McGraw hill, 2021.

VI. REFERENCE BOOKS:

1. R.L. Norton, "Machine Design Edition, New Delhi, 2019. An integrated approach", Person Publisher, 2nd Edition 2021.
2. U.C. Jindal, "Machine Design", Pearson, 2nd Edition, 2020.
3. R.S. Khurmi, A. K. Gupta, "Machine Design", S. Chand Co, 4th Edition, 2021.
4. J.A. Williams, Engineering Tribology, Oxford Univ. Press, 2022.

VII. ELECTRONICS RESOURCES:

1. https://archive.nptel.ac.in/courses/112/105/112105125/
2. https://www.machinedesign.com/learning-resources
3. https://akanksha.iare.ac.in/index?route=course/details&course_id=1383
4. https://www.me.iitb.ac.in/~ramesh/courses/ME423/me423.html

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open end experiments

5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper - II
9. Lecture notes
10. E-learning readiness videos (ELRV)
11. Power point presentation