# MACHINE DESIGN

| VI Semester: ME | | | | | | | | |
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| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AME015 | **Core** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: 15** | **Practical Classes: Nil** | | | | **Total Classes:  60** | | |

## OBJECTIVES:

**The course should enable the students to:**

I.   Ability to identify design variables and performance factors in the study of journal bearings.
II.  Ability to identify different types of rolling contact bearings, their basic features, related terminology and designations
III. Ability to select rolling contact bearings for a given application
IV.  Awareness of the basic features of prime movers and the means of power transmission commonly used in mechanical engineering
V.   Ability to analyze and design all types of gears for given application

## COURSE OUTCOMES (COs):

CO1 Understand various design variables and factors in the study of bearings
CO2 Ability to analyze and design of I.C Engines components.
CO3 Identify the various power transmission systems
CO4 Analyze of forces and design of various gears.
CO5 Ability to identify the different types screws and its terminology.

## COURSE LEARNING OUTCOMES (CLOs):

1.  Understand various design variables and factors in the study of  bearings
2.  Explain various lubrication process
3.  Illustrate various parts of bearing
4.  Analyze heat dissipation in bearings
5.  Select the lubricants for various applications
6.  Discuss types of bearings for required application.
7.  Describe static and dynamic rating of roller bearings
8.  Explain various parts of connecting Rod
9.  Illustrate about thrust acting on a connecting Rod
10. Categorize & Describe about stresses induced and find  suitable cross section
11. Classify the various types of Crankshafts.
12. Calculate the sizes of different parts of crankshaft and crank pin
13. Explain the various parts of the piston and forces acting on each of these parts
14. Construct the piston diagram and generate formulae
15. Describe the various types of belt drives and transmission power and V.R
16. Describe the construction of ropes
17. Define  the efficiency of power transmission and explain factors effecting efficiency
18. Distinguish different pulleys for belt and rope drives
19. Describe load transmission between gear teeth and Illustrate dynamic load factors
20. Compare the equations for compressive and bending strength
21. Explain the Procedure design of spur gears
22. Describe the governing equation and find the dynamic and wear strength

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| 23. Explain Procedure for design of helical and bevel gears<br>24. Describe the terminology of power screws<br>25. Describe construction and explain failure mechanism | |

| UNIT I | BEARINGS | Classes: 09 |
|---|---|---|
| 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. | | |

| UNIT II | DESIGN OF IC ENGINE PARTS | Classes: 09 |
|---|---|---|
| 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. | | |

| UNIT III | POWER TRANSMISSION SYSTEMS, PULLEYS | Classes: 09 |
|---|---|---|
| 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. | | |

| UNIT IV | SPUR GEAR | Classes: 09 |
|---|---|---|
| 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 | | |

| UNIT V | DESIGN OF POWER SCREWS | Classes: 09 |
|---|---|---|
| Design of screw, design of nut, compound screw, differential screw, ball screw-possible failures | | |

**Text Books:**

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

**Reference Books:**

1. Shigley, J.E, (2011), Mechanical Engineering Design, 9th Edition, Tata McGraw-Hill, New Delhi, India.
2. S. M.D. Jalaludin, (2011), Machine Design, 3rd Edition, Anuradha Publishers, Kumbakonam, Chennai, India.
3. R. L. Norton (2006), Machine Design (An Integrated approach), 2nd edition, Pearson Publishers, Chennai, India.
4. R.S. Khurmi, A. K. Gupta, "Machine Design", S. Chand & Co, New Delhi, 1st Edition, 2014.
5. PSG College, "Design Data: Data Book of Engineers", 1st Edition, 2012.

**Web References:**

1. http://www.uobabylon.edu.iq/uobColeges/ad_downloads/4_1293_515.pdf
2. http://ebooks.library.cornell.edu/k/kmoddl/toc_heywood1.html

**E-Text Books:**

1. https://drive.google.com/file/d/0B7raaoEF40D7eEJIR1VoODJodFE/edit.
2. http://royalmechanicalbuzz.blogspot.in/2015/04/appliedthermodynamics-by-vganesan-ebook-pdf.html.
3. https://docs.google.com/file/d/0B5dLUIZfysmqMXBhakRyODhublU/edit.
4. https://archive.org/details/appliedthermodynamics00mckarich.