

ME309: MACHINE DESIGN
CREDITS = 5 (L=3, T=0, P=2)

Course Objective:

To design mechanical systems.

Teaching and Assessment Scheme:

Teaching Scheme			Credits	Assessment Scheme				Total Marks
L	T	P		Theory		Practical		
			ESE	CE	ESE	CE		
3	0	2	5	70	30	30	20	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	<p><u>Gear Design:</u></p> <p>Classification of gears, Selection of type of gears, Law of Gearing, Gear terminology, Standard system of gear tooth, force analysis, Interference and undercutting, number of teeth, gear tooth failures, selection of material. Spur and Helical Gears: Stress in gear tooth: Lewis formula, AGMA bending stress equation and AGMA pitting resistance formula, Gear quality and selection aspects. Bevel and Worm gears: Specifications and design of bevel and worm gears.</p>	11
2	<p><u>Concept of Speed reducer and gear box:</u></p> <p>Comparison and Choice of progression, General design procedure, Determination and fixation of spindle speeds, Selection of the best structure diagram, Selection of gear layout and ray diagram, Determination of number of teeth on gears. Harmonic drives: Design Principle and applications.</p>	05
3	<p><u>Journal Bearings:</u></p> <p>Classification of bearings. Journal bearing Types, Types of lubrication, Lubricants, Effect of pressure and temperature on viscosity, Stable lubrication, Thin and thick film lubrication. Hydrostatic Bearing: Viscous flow through rectangular slot, Step bearing, Energy losses. Hydrodynamic Bearing: Lubrication theory, Petroff's Equation, Reynolds' Equation, Design of bearings with Raimondi and Boyd method, power loss and heat generation, Bearing materials.</p>	05

Unit No.	Topics	Teaching Hours
4	<u>Rolling Contact Bearings:</u> Classification, Static load carrying capacity, Stribeck's equation, Dynamic load carrying capacity, Equivalent bearing load, Load-Life relation, Selection of bearing life, Load factor, Selection of bearing from catalogue, Design for cyclic loads and speeds, Bearing with probability of survival other than 90%, Selection of ball bearings and taper roller bearing, Bearing failure, Lubrication of rolling contact bearing.	04
5	<u>Design of I.C. Engine Components:</u> Design of cylinder and Cylinder head, Design of piston, Design of connecting rod, Design of crankshaft and Design of valve-gear mechanism.	11
6	<u>Design of Material Handling Equipment:</u> Design of lifting equipment: wire rope, Crane hook, Hoisting tackle, drums and buckets. Design of conveying equipment: Belt conveyers, Screw conveyers and vibratory conveyers.	06
TOTAL		42

List of References:

1. V B Bhandari, Design of Machine Elements, 3/e, Tata McGraw Hill.
2. P. C. Sharma & D. K. Agrawal, Machine Design, S. K. Sakaria & Sons, 2010
3. R L Norton, Machine Design an Introduction, Pearson.
4. R G Budynas, and K J Nisbett, Shigley's Mechanical Engineering Design, McGraw-Hill
5. R C Juvinall, Fundamentals of Machine Component Design, 4/e, Wiley.
6. N. K. Mehta, Machine Tool Design, Tata McGraw Hill
7. K Hoga, B Dondlinger, Vehicular Engine Design, Springer
8. Design Data, PSG College of Technology, Kalaikathir Achchagam, 2012
9. V B Bhandari, Machine Design Data Book, McGraw Hill

Course Outcomes (COs):

At the end of this course students will be able to ...

1. Design various types of gears.
2. Design speed reducers.
3. Design journal bearings.
4. Select rolling contact bearings.
5. Design IC Engine components.
6. Design material handling equipment.