

B.E Semester: 7 Mechanical Engineering
Subject Name: Design of Machine Elements (ME701-N)

A. Course Objective:

- To develop a solution oriented approach by in depth knowledge of Design of Machine Component(s).
- To address the underlying concepts and methods to analyze different Machine Component(s).

B. Teaching / Examination Scheme:

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
4	0	2	6	5	3	70	30	20	30	150

C. Detailed Syllabus:

Unit No.	Details
1	Gear Design: Recitation: 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
2	Design of Gear Box for Machine Tools: Comparison and Choice of progression (Arithmetic, Geometric, Harmonic and Logarithmic), 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.
3	Journal Bearings: Classification of bearings. Journal bearing Types, Lubrication: 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 and heat generation, bearing materials.
4	Rolling Contact Bearings: 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 taper roller bearing, Bearing failure, Lubrication of rolling contact bearing.

5	IC Engine Components: Design of cylinder and Cylinder head, Design of piston, Design of connecting rod, Design of crankshaft and Design of valve-gear mechanism.
6	Design of Cranes: Basic objectives of material handling system, Types of load, Classification and application of various Material handling equipment, Basic principles in selection of material handling system, Classification of cranes, Stress analysis and selection of Hooke (IS 15560, 2005), Pulley System (hoisting tackle analysis), Steel Wire ropes: Classification and coding, stress analysis and selection, Design of Sheave and drums.

Total hours (Theory):64
Total hours (Practical):32
Total hours:96

D. Lesson Planning:

Sr. No.	Date/Week	Unit No.	Weight age	Topic No
1	1 ST , 2 ND , 3 RD , 4 TH , 5 TH , 6 TH	1,2	30%	1,2
2	7 TH , 8 TH , 9 TH	3,4	20%	3,4
3	10 TH , 11 TH , 12 TH	5	30%	5
4	13 TH , 14 TH , 15 TH	6	20%	6

E. Instructional Method & Pedagogy

1	At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2	Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal Weight age should be given to all topics while teaching and conduction of all examinations.
3	Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4	One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5	Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6	Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the over all internal evaluation.
7	The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures. Suggested list of experiment is given below

F. List of Practical:

1	Design of Different Type of Gear and its Application
2	Design of Gear Box
3	Design of Journal Bearing.

4	Design of Rolling contact Bearing.
5	Design of various I.C. Engine components.
6	Design of Cranes.
7	Preparation of Design report consisting of one of the problems along with Preparation of Detail and Assembly Drawing

G. Students Learning Outcomes:

1	The student can identify different areas of Design of Machine Elements.
2	Can find the applications of all the areas in day to day life.

H. Text Books & Reference Books:

1	Machine Design – by P C Sharma, Agarwal
2	Mechanical Engineering Design by Josheph shighly, McGraw Hill Book Co.
3	Design of Machine Elements by V.B. Bhandari, McGraw Hill Publishing Co.
4	Design of Machine Elements by M.F.Spotts, T.E.Shoup, L.E.Hornberger, S.R.Jayaram and C.V. Venkatesh Pearson Education.
5	Design of Machine Elements by C.S.Sharma & Kamlesh Purohit, Prentice Hall of India Pvt. Ltd.
6	Mechanical System Design II & III by Farazdak Haideri Nirali Prakashan.
7	Machine Design by U.C. Jindal Pearson Education.
8	Engineering Design a material and processing approach/ George Dieter/ McGraw Hill international book company 1983