4/4 B.Tech. SEVENTH SEMESTER

ME7T5A ADVANCED MACHINE DESIGN Credits: 4

Lecture:- 4 periods/week - Internal assessment: 30marks
Tutorial : 1 periods/week Semester end examination: 70 marks

Objectives:

1. Introduce fundamental Knowledge about the design of Brakes and Clutches
2. Acquire the Knowledge to design IC engine components
3. Evaluate different types the flywheel
4. Design the mechanical power drives by considering the stresses and interrelationships among the elements.
5. Introduce concept of optimization in machine design

Learning outcomes:

At the end of course the students will be able to:

1. Analyze and Design the various types of Brakes and Clutches
2. Evaluate the sizes and stresses in IC Engine Components
3. Determine the stresses induced in flywheel and propose the type of flywheel for rotating system
4. Compute the strength of different gear teeth used for power transmission system
5. Design and select the wire rope and chain drive for different applications
6. Implement the optimization techniques for different bars

Pre-Requisites:

Design of Machine Members-1, Dynamics of Machinery

UNIT - I
BRAKES:
Introduction to Brakes, Types, Analysis and design of block brakes, band brakes, block and band brakes, Internal shoe brakes, external shoe brakes, pivoted shoe brakes, Temperature rise.

UNIT - II
CLUTCHES:
Analysis and design of simple and multiple disc clutches, cone clutches and centrifugal clutches, friction materials, comparison of brakes and clutches.

UNIT – III
I. C. ENGINE COMPONENTS:
Introduction, Design of trunk type piston, connecting rod and crankshaft.

UNIT - IV
FLYWHEEL:
Introduction, construction, Torque analysis, solid flywheel, Rimmed flywheel, stresses in rimmed flywheel, Design of flywheel.

UNIT – V
BEVEL GEARS:
Terminology, force analysis, Beam Strength of bevel gears, wear strength. Lewis Equation.

UNIT - VI
WORM GEARS:
Terminology, Force analysis, Strength rating of worm gears, Wear rating of worm gears.

UNIT - VII
CHAIN DRIVES & WIRE ROPES:
Introduction, Chain drives, Advantages of chain drives over belt drives, Polygonal effect, Selection of roller chains. Wire ropes Classification, Designation, Selection of wire ropes, Design procedure.

UNIT - VIII
OPTIMUM DESIGN:
Optimization function of single variable and multi variables, optimization techniques, Interval halving and Golden section methods, optimum design of tension bar for minimum deflection, cost and weight, Torsion member for minimum deflection, cost and weight.

Learning resources

Text books:

1. B. Bhandari, Design of Machine Elements, Third Edition, Tata McGraw Hill Publishers, New Delhi, 2010.
2. Dr. P. C. Sharma, Dr. D. K. Aggarwal, A Textbook of Machine Design (SI Units), Twelfth Edition, S. K. Kataria & Sons, New Delhi.

3. Singeresu S. Rao, Engineering Optimization - Theory and Practice, Revised Third Edition, New Age International Publishers, New Delhi, 2008.

Reference books:

1. Robert L. Norton, Machine Design an Integrated Approach, Second Edition, Pearson Publishers, New Delhi, 2002.
2. Joseph Shigley, Charles Mischke, Mechanical Engineering Design, Sixth Edition, Tata McGraw Hill Publishers, New Delhi, 2003.
3. R.K. Jain, Machine Design (Mechanical Engineering Design), Seventh Edition, Khanna Publishers, New Delhi, 1999.

DATA BOOKS TO BE ALLOWED IN EXAMINATION:

1. Design Data (Data Book of Engineers), P.S.G. College of Technology, Revised Edition, Coimbatore, 2004.
2. S. Md. Jalaluddin, Design Data Hand Book, First Edition, Anuradha Publications, Chennai, 2009.