Machine Design - I

Objectives :

To study the basic design principles and apply the principles to the design of various elements encountered in Mechanical machines and structures.

Outcomes :

To determine the strength of the components

To determine the failure conditions and apply them to real life Problems To design simple joints, fasteners, levers and springs.

Mechanical Engineering design - Design considerations, Design Procedure Material selection Modes of failure - Theories of failure , causes of stress concentration; stress concentration in tension, bending and torsion; reduction of stress concentration, theoretical stress concentration factor, notch sensitivity, fatigue stress concentration factor, cyclic loading, endurance limit, S-N Curve, loading factor, size factor, surface factor. Design consideration for fatigue, Goodman and modified Goodman's diagram, Soderberg equation, Gerber parabola, design for finite life, cumulative fatigue damage

Design of Fasteners : Design of cotter and knuckle joints.. Fasteners and keys , Design of welded joints , Fillet and butt welds , Design of riveted joints. Design of bolted joints . Power screws .

Selection & Design of bearings : Reynold's equation, stable and unstable operation, heat dissipation and thermal equilibrium, boundary lubrication, dimensionless numbers, Design of journal bearings, Rolling-element Bearings*:* Types of rolling contact bearing, bearing friction and power loss, bearing life; Radial, thrust & axial loads; Static & dynamic load capacities; Selection of ball and roller bearings; lubrication and sealing.

Design of Springs : Design of helical compression & tension spring , design of leaf spring & torsion springs , fatigue loading of springs ,surge in springs ,spiral springs .

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

References :

1 Robert C Juvinal, Kurt M Marshek Machine Component design Wiley Student edition

2 C S Sharma & Kamlesh Purohit , Design of machine elements PHI

3 Sharma & Agarwal Machine design .

4 Pandya & Shah , Charottar .

5 J E Shingley Machine design Mc Graw Hills

6 Gope P C , Machine Design , PHI Learning . 2015

7 P Kannaiah , Machine Design , SCITECH .

8 Nortan RL , Machine Design , Pearson , Fifth Edition.