3/4 B.Tech. FIFTH SEMESTER

ME5T3 DESIGN OF MACHINE MEMBERS–I Credits: 4

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

Objectives:

1. To acquire the basics of design for mechanical systems and components.
2. Compute the static and fatigue strengths using basics of mechanics of solids for safety design.
3. Implement basic principles to design fasteners and Springs

Learning outcomes:

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

1. Implement design process for industries and manufacturing methods considering design factors
2. Evaluate the stress distribution and analyze the failure criterion of mechanical parts under static and fatigue loads
3. Design and select suitable joint for different mechanical applications
4. Compute the stresses in springs used in mechanical components and machines

Pre-Requisites:
Mechanics of Solids

UNIT - I
DESIGN BASICS:
Phases of design, Types of designs, standardization in design, preferred numbers and significance.

UNIT - II
DESIGN FOR STATIC STRENGTH:
Simple Stresses - Combined stresses - Torsion and bending stresses - stress strain relation, various theories of failure - Factor of safety and its importance in design.

UNIT - III
DESIGN FOR FATIGUE STRENGTH:
Stress concentration - Theoretical stress concentration factor - Fatigue stress concentrations factor, Design for fluctuating stresses, Fatigue strength and endurance limit, Goodman diagram, Soderberg line, Endurance limit - Approximate estimation.

UNIT - IV
SPRINGS:
Introduction, Types of springs, Helical springs under axial load, Fatigue loading, leaf springs.

UNIT – V
RIVETED JOINTS:
Types of riveted joints, efficiency of riveted joint, eccentrically loaded riveted joints.

UNIT - VI
WELDED JOINTS:
Types of welded joints, Strength of welded joints, eccentrically loaded welded joints.

UNIT - VII
BOLTED JOINTS:
Load on bolt due to initial tightening, external loading, combined loading, Design of bolted joints under eccentric loading

UNIT – VIII
COTTER JOINTS:
Types of cotter joints, Design of Socket and Spigot Joint, Sleeve and Cotter Joint, Gib and Cotter Joint

Learning resources

TEXT books:

1. Design of Machine Elements, (3^{ed} Edition) by V.B. Bhandari, Tata McGraw Hill Publishers, New Delhi, 2010.
2. D A Textbook of Machine Design (SI Units) (12^{th} Edition) by P. C. Sharma, Dr. D. K. Aggarwal, S. K. Kataria & Sons, New Delhi.

Reference books:

1. Design of Machine Elements, by C. S. Sharma, Kamlesh Purohit, Prentice Hall of India Private Limited (PHI), New Delhi, 2009.
2. Machine Design an Integrated Approach, (2^{nd} Edition) Robert L. Norto, Pearson Publishers, New Delhi, 2002.
3. Mechanical Engineering Design, (6^{th} Edition) by Joseph Shigley, Charles Mischke, , , Tata McGraw Hill Publishers, New Delhi, 2003.
4. Design of Machine Elements, (2^{nd} edition) by P. Kannaiah, Scitech Publications India Private Limited, Chennai, 2009.

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. Design Data Hand Book, (First Edition), S. Md. Jalaluddin, Anuradha Publications, Chennai, 2009.