

**III B.TECH - I SEMESTER  
DESIGN OF MACHINE MEMBERS-I**

**Course code: ME5T5**

**Lecture: 3 periods/week**

**Tutorial: 1 period/week**

**Credits: 3**

**Internal assessment: 30 marks**

**Semester end examination: 70 marks**

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**COURSE OBJECTIVES:**

- To introduce the fundamental knowledge of design, which deals about the shape, size and material of a particular machine element.
- To implement the failure theory in designing and predicting the behavior of machine components.
- To introduce the basic principles for design of some machine elements such as riveted joints, welded joints, bolted joints, cotter joint and springs.

**COURSE OUTCOMES**

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

1. Describe the Design Procedure and evaluate the size of simple mechanical components subjected to static loads considering theories of failure
2. Apply knowledge in designing mechanical components subjected to stress concentration and Fatigue loads
3. Design and analyze permanent joints such as riveted and welded joints under loading conditions
4. Design and analyze temporary joints such as bolted and cotter joints under loading conditions
5. Design and Analyze springs for the given loading

**Pre Requisites:** Mechanics of Solids

**UNIT I**

**DESIGN FOR STATIC STRENGTH:**

Basic Procedure of Machine Design, Classifications of Machine design, Factors to be considered in Machine Design, Preferred numbers and significance.

Simple Stresses - Combined stresses - Torsion and bending stresses - stress strain relations, Theories of elastic failure – Maximum Principle stress theory, maximum shear stress theory, Distortion energy theory

**UNIT II**

**DESIGN FOR FATIGUE STRENGTH:**

Fluctuating Stresses, Fatigue Failure, Fatigue strength and endurance limit, Endurance limit - Approximate estimation, Stress concentration – theoretical stress concentration factor – Reduction of Stress Concentration, Fatigue stress concentrations factor, Design for fluctuating stresses – Gerber Method, Goodman Method, Soderberg Method.

### **UNIT III**

#### **RIVETED JOINTS:**

Types of riveted joints, Types of Failure, efficiency of riveted joint, Design of Joints for boiler Shell, eccentrically loaded riveted joints.

#### **WELDED JOINTS:**

Types of welded joints, Strength of Parallel Fillet welds, Strength of Transverse Fillet welds, Axially Loaded Unsymmetrical welded Joints, eccentrically loaded welded joints.

### **UNIT IV**

#### **BOLTED JOINTS:**

Load on bolt due to initial tightening, external loading, combined loading, Eccentrically loaded bolted joints in shear, Eccentric load perpendicular to axis of bolt

#### **COTTER JOINTS:**

Types of cotter joints, Design of Socket and Spigot Joint, Design of Sleeve and Cotter Joint, Design of Gib and Cotter Joint, kunekle joint

### **UNIT V**

#### **SPRINGS:**

Types of springs, Terminology of Helical Springs, Styles of End, Stress and Deflection Equations, Series and parallel Connections, Design of Helical springs, Design against Fluctuating load

Leaf springs, Design of Leaf spring, nipping of Leaf Spring

### **Learning Resources**

#### **Text books:**

1. Design of Machine Elements, (3<sup>rd</sup> Edition) by V.B. Bhandari, Tata McGraw Hill Publishers, New Delhi, 2014.
2. Machine Design an Integrated Approach, (5<sup>th</sup> Edition) Robert L. Norton, Pearson Education Limited, New Delhi, 2013.

#### **Reference books:**

1. A Textbook of Machine Design (SI Units) (12<sup>th</sup> Edition) by P. C. Sharma, Dr. D. K. Aggarwal, S. K. Kataria & Sons, New Delhi, 2012.
2. Mechanical Engineering Design, (8<sup>th</sup> Edition) by Joseph Shigley, Charles R Mischke, Tata McGraw Hill Publishers, New Delhi, 2008.
3. Design of Machine Elements, by C. S. Sharma, Kamlesh Purohit, Prentice Hall of India Private Limited (PHI), New Delhi, 2009.
4. A Textbook of Machine Design by R S Khurmi, J K Guptha, S Chand & Company Ltd., New Delhi., (25<sup>th</sup> Edition), 2005.
5. Design of Machine Elements, (2<sup>nd</sup> Edition) by P. Kanniah, Scitech Publications India Private Limited, Chennai, 2009.

#### **DATA BOOKS TO BE ALLOWED IN EXAMINATION:**

- 1 Design data hand book by K Mahadevan & K Balaveera Reddy, (4<sup>th</sup> Edition), CBS Publishers, 2013.
- 2 Design Data Hand Book by S. Md. Jalaluddin, First Edition, Anuradha Publications, Chennai, 2009.