

III Year B.Tech. Mechanical Engg. I - Semester

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### ME317 DESIGN OF MACHINE ELEMENTS - I

#### **Course Description & Objectives:**

To impart knowledge of the basic engineering design against static and dynamic loading by considering strength and rigidity. To train individual components design methodology and selection procedure for various industrial applications.

#### **Course Outcomes:**

1. Designing the components against static loading.
2. Designing the components against cyclic loading.
3. Designing the fasteners like rivets, bolts and cotter joints.
4. Designing power transmission shafts and couplings.

#### **UNIT - I Introduction to Design :**

Steps involved in conventional design – Preferred numbers and significance.  
 Engineering Materials – Classification – Properties – Specifications.  
 Principal stresses - Principal planes - Mohr's circle  
 Theories of failure - Maximum Principal stress theory - Maximum shear stress theory - Distortion energy theory.  
 Factor of safety and its importance in design – design for static strength - rigidity.

#### **UNIT - II Design for Fatigue Strength:**

Stress concentration - Methods to reduce stress concentration – Fluctuating stresses – Fatigue failure – Endurance limit – Factors influencing fatigue strength – Fatigue stress concentration – Notch sensitivity. Low cycle and high cycle fatigue – Cumulative fatigue – Design for finite and infinite life – Soderberg, Goodman, Gerber equations for fatigue design.

#### **UNIT - III Design of Fasteners:**

Design of Bolted Joints : Joints designed for simple and eccentric loadings.  
**Design of Riveted Joints :** Lap and butt joint . Failure of riveted joints – Design of boiler joints – Joints of Uniform strength – Eccentrically loaded riveted joints.

**UNIT - IV Design of Welds:**

Strength of transverse and parallel fillet welds – Butt welds - Eccentrically Loaded welded joints.

**Keys, Cotters and Knuckle Joints :** Types of Keys - Stresses in Keys - Cotter Joints - Socket and Spigot joints - Sleeve and cotter - Gib and Cotter Joints - Knuckle Joints.

**UNIT - V Design of Shafts:**

Materials used for shafts – Stresses in shafts – Shafts subjected to fluctuating loads – Combined bending , twisting and axial loads – Design for strength and rigidity.

**Design of couplings:** Muff, split muff, flanged and bushed pin coupling, Modified Flange Coupling, Oldham Coupling, Universal coupling.

**TEXT BOOKS :**

1. J.E. Shiegly, "Mechanical Engineering Design", 9<sup>th</sup> ed., Tata McGraw Hill, 2013.
2. V.B. Bhandari, "Design of Machine Elements", 3<sup>rd</sup> ed., Tata McGraw Hill, 2010.

**REFERENCE BOOKS :**

1. Juvinell, Marshall, "Fundamentals of Machine Components", 5<sup>th</sup> ed., John Wiley & Sons, 2011.
2. R.S. Khurmi and J.K. Gupta, "Machine Design", 14<sup>th</sup> ed., S.Chand & Co., 2010.
3. R.L. Norton, "Machine Design - An Integrated Approach", 5<sup>th</sup> ed., Pearson Publication, 2013.