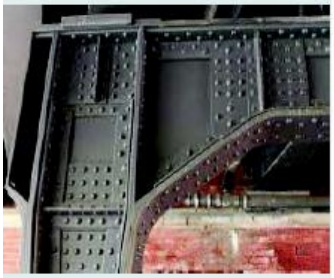

16ME302 DESIGN OF MACHINE ELEMENTS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	20	40	6	5	0	10

Course Description and Objective:

This course deals with the basic engineering design against static and dynamic loading by considering strength and rigidity. The objective of this course is to adress the detailed machine design of various machine elements under various loading and operating conditions.

Course Outcomes:

The student will be able to:

- identify the nature of failures for various machine elements subjected to different loading.
- understand the concept of crack creation, propogation and rupture under cyclic loading.
- determine the stresses induced in bolted and riveted joints.
- identify the strength of different types of welded joints.
- determine the deflection and stresses of various types of springs.

SKILLS:

- ✓ *Select suitable materials for machine elements for an intended application.*
- ✓ *Design the cross sectional area, size and shape of elements under various loading conditions.*
- ✓ *Analyze stress intensity in a riveted, bolted and welded joints under different loading conditions.*
- ✓ *Compute failure stresses in knuckle, socket and spigot joints.*

UNIT - 1 **L-9; T-3**

INTRODUCTION TO DESIGN: Steps involved in conventional design; Engineering Materials Classification, Properties, Specifications; Factor of safety and its importance in design.
CONCEPT OF PRINCIPAL STRESSES: Principal stresses, Principal planes; Mohr's circle.
THEORIES OF FAILURE: Maximum Principal stress theory, Maximum shear stress theory, Distortion energy theory.
DESIGN AGAINST STATIC LOADS: Design of simple Machine components under torsion and bending loads.

UNIT - 2 **L-9; T-3**

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 and Gerber equations for fatigue design.

UNIT - 3 **L-9; T-3**

DESIGN OF BOLTED JOINTS: Joints designed for simple and eccentric loadings.
DESIGN OF RIVETED JOINTS: Lap and butt joint . Failure of riveted joints, Eccentrically loaded riveted joints.

UNIT - 4 **L-9; T-3**

DESIGN OF WELDS: Strength of transverse and parallel fillet welds , Butt welds .Eccentrically Loaded welded joints.
COTTERS AND KNUCKLE JOINTS: Cotter Joints: Socket and Spigot joints , Sleeve and cotter , Gib and Cotter Joints and Knuckle Joints.

UNIT - 5 **L-9; T-3**

DESIGN OF SPRINGS: Introduction to springs, Classification,materials used for springs, Nomenclature in springs, Stresses and deflection of springs, Helical, torsional, Coaxial springs; Laminated springs Stresses and deflection in Leaf springs, Applications.

TEXT BOOKS :

1. J.E. Shigley, "Mechanical Engineering Design", 9th edition, Tata McGraw Hill, 2013.
2. V.B. Bhandari, "Design of Machine Elements", 3rd edition, Tata McGraw Hill, 2010.

REFERENCE BOOKS :

1. Juvinell and Marshell, "Fundamentals of Machine Components", 5th edition, John Wiley and Sons, 2011.
2. R.S. Khurmi and J.K. Gupta, "Machine Design", 14th edition, S.Chand and Co., 2010.
3. R.L.Norton, "Machine Design -An Integrated Approach", 5th edition, Pearson Publications, 2013.

WEB LINKS :

1. http://www.nptel.ac.in/downloads/112105125/
2. http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Machine%20design1/New_index1.html
3. https://www.youtube.com/watch?v=i-sxJBbRyzA
4. https://www.youtube.com watch?v=IDbTUt3OG9sandlist=PLDZRk4L47eOBWjmP4BNKoryruJ-veoLh5.