COURSE CONTENT

Design of Machine Elements

IV Semester: ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
2540322	Foundation	3	0	0	3	40	60	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

Prerequisites: Engineering mechanics and Theory of machines.

Course Overview:

The course on Machine Design provides a comprehensive understanding of fundamental concepts and design processes essential in engineering applications. It begins with the design process, emphasizing material selection, loading conditions, and failure theories. Students explore the design of temporary and permanent joints like riveted, welded, cotter, and knuckle joints, with a focus on modelling components. The course covers energy- storing elements, such as springs and flywheels, analyzing their design parameters. Lastly, students learn to design shafts and couplings under various loads, ensuring strength and rigidity. Through this course, students develop practical skills to apply design theories in engineering software.

Course Objectives:

1. Designing machine members subjected to static and variable loads.
2. Designing shafts and couplings for various applications.
3. Analyzing bolted and welded joints for various kinds of loads.
4. Designing helical and leaf springs for various applications.
5. Analyzing Riveted and cotter joints for various kinds of loads.

Course Outcomes: After Completion of the Course, Students should be able to

1. Understand and apply the design process, material selection, and failure theories in mechanical components.
2. Design and evaluate riveted, welded joints, and power screws under various loading conditions.
3. Analyze the stresses in keys, cotter, and knuckle joints, applying design principles effectively.
4. Design springs and flywheels, addressing energy fluctuations and stress analysis in practical mechanical systems.
5. Design solid and hollow shafts, couplings, and axles, ensuring strength, rigidity

UNIT - I: Simple and Variable stresses:Simple stress in machine parts: Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties - Preferred numbers- Direct, Bending and torsional loading - Factor of

safety – Combined loads – Principal stresses – Eccentric loading –theories of failure –

Variable stress in Machine parts**:** Design based on strength and stiffness – stress concentration – Fluctuating stresses – Endurance limit- Gerber's curve– Goodman's line– Soderberg's line. – Design for finite and infinite life under variable loading.

UNIT - II: Temporary joints -I:

Riveted Joints**:** Riveted joints- methods of failure of riveted joints-strength equations-efficiency of riveted joints-eccentrically loaded riveted joints.

Welded joints-Design of fillet welds-axial loads-circular fillet welds under bending, torsion. Welded joints under eccentric loading.

UNIT-III: Temporary joints -II

Keys, Cotters and Knuckle Joints: Design of keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter, Gib and cotter joints-Knuckle joints.

UNIT - IV: Energy Storage Elements: Springs**:** Types of springs, design of helical and concentric springs–surge in springs, Design of laminated springs.

Flywheel: coefficient of fluctuation of speed – Fluctuation of Energy – Maximum Fluctuation energy - coefficient of Fluctuation energy – energy stored in a flywheel - Flywheels considering stresses in rims and arms.

UNIT - V: Shafts and Couplings: Shafts: Shafts and Axles - Design of solid and hollow shafts based on strength, rigidity and critical speed.

Coupling: Rigid coupling- Muff, Clamp and Flange couplings and flexible couplings -Bushed Pin.

TEXT BOOKS:

1. P. Kannaiah, "Machine Design", 2nd Edition, Scitech Publications India Pvt. Ltd, New Delhi, 2012 .
2. V.B. Bandari, "A Text Book of Design of Machine Elements", 3rd edition, Tata McGraw Hill, 2011

REFERENCE BOOKS:

1. R.S. Khurmi and J.K. Gupta, "A Textbook of Machine Design", Eurasia Publishing House, New Delhi, 2005.
2. Joseph Edward Shigley, Charles R. Mischke, and Richard G. Budynas, "Mechanical Engineering Design", 8th Edition, McGraw-Hill, New York, 2008.
3. M.F. Spotts, T.E. Shoup, and L.E. Hornberger, "Design of Machine Elements", 8th Edition, Pearson Education, New Delhi, 2004.
4. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Component Design", 5th Edition, Wiley, New Delhi, 2012.

ELECTRONIC RESOURCES:

1. https://en.pdfdrive.to/dl/design-of-machine-elements-10
2. **https://repositori.mypolycc.edu.my/handle/123456789/5350**
3. **https://www.researchgate.net/publication/328926726_Design_of_Machine_Elements?utm_source=chatgpt.com**

MATERIALS ONLINE:

1. Course template
2. Tech talk and Concept Video topics
3. Open-ended experiments
4. Definitions and terminology
5. Assignments
6. Model question paper – I
7. Model question paper – II
8. Lecture notes
9. E-Learning Readiness Videos (ELRV)