

COURSE CODE	DESIGN OF MACHINE ELEMENTS	L	T	P	C
1151ME111		2	2	0	3

1. Preamble

This course provides an introduction to the design procedure for various mechanical components. It introduces the concepts associated with stress and torque calculations of various machine elements such as fasteners, welded joints, shafts and couplings. Apart from this it also gives a detailed view of design of springs, design of flywheel and design of bearings.

2. Prerequisite

Strength of Materials 1151ME106

3. Links to other courses

1	Design of Transmission Systems	1151ME105
2	Industrial Tribology	1152ME109

4. Course Educational Objectives

Students undergoing this course will be able to

- Understand the various steps involved in designing machine components using standard data and practice.
- Create confidence to solve complex problems in the design for various types of fasteners, joints, shafts-keys, couplings, springs flywheels and bearings.

5. Course Outcomes

The students would be benefitted with the following outcomes:

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Describe the fundamentals of design for static and variable loading.	K2
CO2	Solve the numerical problems in threaded fasteners and welded joints.	K3
CO3	Apply the design procedure for shafts and couplings.	K3
CO4	Solve the numerical problems associated with design of springs and flywheel.	K3
CO5	Apply the design procedure for solving the numerical problems in bearings.	K3

(K3 – Apply)

6. Correlation of COs with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	M	L									L	M	L
CO2	H	M	L									L	M	L
CO3	H	M	L									L	M	L
CO4	H	M	L									L	M	L
CO5	H	M	L									L	M	L

H- High; M-Medium; L-Low

7. COURSE CONTENT

Required PSG design data book

UNIT I FUNDAMENTALS OF DESIGN

L-6 T-6

Introduction to the design process - Phases of Design - Factors influencing machine design - Selection of materials based on mechanical properties. Direct, Bending and shear stresses – Impact and shock loading - theories of failure – Stress concentration - Calculation of principle stresses for various load combinations, eccentric loading –Design for variable loading – understanding manual drawings – fits and tolerances

UNIT II FASTENERS AND JOINTS

L-6 T-6

Design of Threaded fasteners - Design of bolted joints - Design of welded joints - theory of bonded joints.

UNIT III SHAFTS AND COUPLINGS

L-6 T-6

Design of solid and hollow shafts based on strength, rigidity and critical speed-Design of keys and key ways - Design of rigid and flexible couplings

UNIT IV SPRINGS AND FLYWHEELS

L-6 T-6

Design of helical, leaf, springs under constant loads and varying loads – Concentric torsion springs. Design of flywheel involving stresses in rim and arm.

UNIT V DESIGN OF BEARINGS

L-6 T-6

Types of bearing- sliding and rolling. Roller and ball bearing – Basic dynamic load rating - Cubic mean load-life in million hours. Design of journal bearings – Mc Kees equation – Lubrication in journal bearings – calculation of bearing dimensions.

TOTAL: 30+30 = 60 periods

8. Text Books

1. Shigley J., "Mechanical Engineering Design", Mc Graw Hill, 2010.
2. Bhandari V.B, "Design of Machine Elements", Tata McGraw-Hill Book Co, 2010

9. References

1. Juvinall R.C, Marshek K.M, "Fundamentals of Machine Component Design", JohnWiley&Sons, 5th Edn, 2011.
2. Orthwein W, "Machine Component Design", Jaico Publishing Co, 2006.
3. Ugural A.C, "Mechanical Design – An Integral Approach, McGraw-Hill Book Co, 2004.
4. Khurmi R.S, "Machine Design", Norton R.L, "Design of Machinery", Tata McGraw-Hill Book Co, 2014
5. Spotts M.F., Shoup T.E "Design and Machine Elements" Pearson Education, 2004.