3PE01: DESIGN OF MACHINE ELEMENTS
CREDITS – 4 (LTP: 3,0,1)

Course Objective:
To impart principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements as per practices and standards.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	CE	ESE	CE	150
3	0	2	4	60	40	20	30	

Course Contents:

Unit No.	Topics	Teaching Hours
1	**Design for Static load and Fluctuating Load** Machine design, Basic procedure of Machine design, Basic requirements of machine elements, Selection of materials based on mechanical properties, Preferred numbers, Types of load and stresses, Modes of failure, Factor of safety, Aesthetic and ergonomic considerations in design, Stress Concentration, Fluctuating stresses, Fatigue failure and Endurance limit, Notch sensitivity, Factors affecting endurance limit, Design for reversed stresses and cumulative damage, Gerber line, Soderberg line and Goodman line, Modified-Goodman diagram, Combined stresses. Design of levers.	08
2	**Design of Fasteners** Design of Riveted Joints: Types of riveted joints, Failures of a riveted joints, Strength and efficiency of a riveted joints, design of riveted joints: longitudinal butt joint and circumferential lap joint, Eccentrically loaded riveted joints. Design of welded Joints: Types of welded joints, design of welded joints for various loading conditions, Eccentrically loaded welded joints. Design of Cotter joints. Design of Knuckle joint.	09
3	**Design of Shafts, Keys and Couplings** Design of solid and hollow shaft subjected to various loading conditions, Design of shaft for rigidity and stiffness Types of keys, design of keys Types of coupling-rigid and flexible, Design of Rigid couplings, Design of Flexible couplings.	06
4	**Design of Clutches** Types of clutches, design of friction clutches **Design of Brakes** Types of brakes, design of single block brake, pivoted block brake, double block, simple band brake, simple band brake, differential band brake, band &block brake and internal expanding brake.	06

Unit No.	Topics	Teaching Hours
5	**Design of spring** Types of springs, terminology of helical spring, design of helical spring, design against fluctuating load, multileaf spring, nipping. **Design of power screw** Types of power screw threads, design of screw with different types of threads used in practice, design of screw jack.	07
6	**Design of Gears** Classification of gears, gear terminology, law of gearing, conjugate action, gear tooth profiles, standard systems of gear tooth, interference and undercutting, backlash, Force analysis of spur gear, gear tooth failures, number of teeth, face width, Beam strength of gear tooth-Lewis equation, Wear strength of gear tooth-Buckingham's equation.	06
	Total	**42**

List of References:

1. V B Bhandari, "*Design of Machine Elements*", Fourth edition, Mc Graw Hill Education
2. Richard Budynas, "*Shingley's Mechanical System Design*", Mc Graw Hill Education
3. V B Bhandari, "*Machine Design Data Book*", Mc Graw Hill
4. Sadhu Singh, "*Design of Machine Elements*", Khanna Publishers
5. P C Sharma & D K Aggarwal, "*Machine Design*", S.K. Kataria & Sons
6. Robert L Norton, "*Machine Design*", Pearson

Course Outcomes (COs):

At the end of this course students will be able to ….

1. Understand the customer need, formulate the problem and design the machine elements subjected to static and fluctuating loads.
2. Design the riveted joints, welded joints, cotter joints and knuckle joints.
3. Design the shafts, keys, couplings, levers, clutches and brakes.
4. Design the spring, power screw.
5. Design the gears based on the given conditions.
6. Use design data books in designing various machine components.