

OBJECTIVE:

- To familiarise the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS**12**

Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties -- Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – Design of curved beams – crane hook and ‘C’ frame - Factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations

UNIT II DESIGN OF SHAFTS AND COUPLINGS**12**

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

UNIT III DESIGN OF TEMPORARY AND PERMANENT JOINTS**12**

Threaded fasteners - Design of bolted joints including eccentric loading, Knuckle joints, Cotter joints – Design of welded joints, riveted joints for structures - theory of bonded joints.

UNIT IV DESIGN OF ENERGY STORING ELEMENTS**12**

Design of various types of springs, optimization of helical springs -- rubber springs -- Design of flywheels considering stresses in rims and arms, for engines and punching machines.

UNIT V DESIGN OF BEARINGS AND MISCELLANEOUS ELEMENTS**12**

Sliding contact and rolling contact bearings -- Design of hydrodynamic journal bearings, McKee's Eqn., Sommerfield Number, Raimondi & Boyd graphs, -- Selection of Rolling Contact bearings -- Design of Seals and Gaskets -- Design of Connecting Rod.

TOTAL: 60 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

STANDARDS:

1. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 1 : Construction.
2. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 2 : Friction and Wear.
3. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 3 : Lubrication.

SUBJECT DESCRIPTION AND OBJECTIVE

Objective:

- To familiarise the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components

TEXT BOOKS:

1. Shigley J.E and Mischke C. R., “Mechanical Engineering Design”, Sixth Edition, Tata McGraw-Hill , 2003.
2. Bhandari V.B, “Design of Machine Elements”, Second Edition, Tata McGraw-Hill Book Co, 2007.

REFERENCES:

1. Sundararajamoorthy T. V, Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2003.
2. Orthwein W, “Machine Component Design”, Jaico Publishing Co, 2003.
3. Ugural A.C, “Mechanical Design – An Integral Approach, McGraw-Hill Book Co, 2004.
4. Spotts M.F., Shoup T.E “Design and Machine Elements” Pearson Education, 2004.

LESSON PLAN

WEEK	HRS	LECTURE TOPICS	BOOK
		UNIT I	
I	1	Introduction to the design process - factor influencing machine design,	T1
	2	selection of materials based on mechanical properties	
	3	Preferred numbers, fits and tolerances	T1
	4	Direct, Bending and torsional stress equations	T1
	5		
II	6	calculation of principle stresses for various load combinations	T1
	7		
	8	theories of failure	T1
	9	eccentric loading – Design of curved beams – crane hook and ‘C’ frame -	T1
	10	stress concentration	T1
III	11	Impact and shock loading	T1
	12	design for variable loading – Soderberg, Goodman and Gerber relations	T1
		AV Class	
		UNIT II	
	13	Design of solid and hollow shafts based on strength, rigidity and critical	T1
	14	speed	
	15	Problems	T1
IV	16		
	17	Problems	T1
	18	Design of keys, key ways and splines	T1
	19	Problems	T1
	20	Design of crankshafts	T1
V	21	Problems	T1
	22	Design of rigid and flexible couplings.	T1
	23	Problems	T1
	24	Problems	T1
		AV Class	T1
		UNIT III	
	25	Threaded fastners - Design of bolted joints including eccentric loading	T1
VI	26		
	27	Problems	T1
	28	Knuckle joints	T1
	29		
	30	Problems	T1
VII	31	Cotter joints	T1
	32		
	33	Design of welded joints	T1
	34	Problems	T1
	35	riveted joints for structures	T1
	36	Theory of bonded joints	T1
		AV Class	

	UNIT IV		
VIII	37	Design of various types of springs,	T1
	38		
	39	Problems	T1
	40		
	41	Problems	T1
	42	optimization of helical springs -- rubber springs --	T1
IX	43	Design of flywheels considering stresses in rims and arms, for engines and punching machines.	T1
	44		
	45	Problems	T1
	46		
	47	Problems	T1
	48	Problems	T1
		AV Class	
	UNIT V		
X	49	Sliding contact and rolling contact bearings	T1
	50		
	51	Design of hydrodynamic journal bearings, McKee's Eqn., Sommerfield Number, Raimondi & Boyd graphs,	T1
	52		
	53	Problems	T1
	54	Problems	T1
XI	55	Selection of Rolling Contact bearings	T1
	56		
	57	Problems	T1
	58	Design of Seals and Gaskets	T1
	59	Design of Connecting Rod.	T1
	60	Problems	T1
		AV Class	

PREPARED BY,
K.RAM SANKAR, AP/MECH.