MOHAMMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

LESSON PLAN

Department of Mechanical Engineering

Name of the Subject	Design of Machine Elements	Name of the handling	D. Sakthivel
Subject Code	ME8593	Year / Sem	III / V
Acad Year	2022-2023	Batch	2020-2024

Course Objective

To familiarize 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

Course Outcome

CO1: Explain the influence of steady and variable stresses in machine component design.

CO2: Apply the concepts of design to shafts, keys and couplings.

CO3: Apply the concepts of design to temporary and permanent joints.

CO4: Apply the concepts of design to energy absorbing members, connecting rod and crank shaft.

CO5: Apply the concepts of design to bearings.

course summery

Sl. No.	Topic(s)	T / R* Book	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)	Blooms Level (L1-L6)	CO	PO
UNIT I-STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS							
1	Introduction to the design process factors influencing machine design selection of materials	T1	1	PPT	L1	CO1	PO1
2	Preferred numbers, fits and tolerances	T1	1	PPT	L2	CO1	PO1
3	Direct, Bending and torsional stress equations Impact and shock loading	T1	1	PPT	L2	CO1	PO1, PO2, PO10
4	Calculation of principle stresses for various load combinations, eccentric loading	T1	1	BB	L3	CO1	PO1, PO2, PO10
5	Curved beams – crane hook and ‘C’ frame	T1	2	BB	L3	CO1	PO1, PO2, PO10
6	Factor of safety - theories of failure	T1	1	PPT	L2	CO1	PO1
7	Design based on strength and stiffness stress concentration	T1	1	BB	L3	CO1	PO1, PO2, PO3
8	Design for variable loading.	T1	1	BB	L3	CO1	PO1, PO2, PO3

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any
*** Tuorial given to the students**

Evaluation method
*** Tuorial are evaluated marks were given based on the students answer to the question.**

UNIT II-SHAFTS AND COUPLINGS

9	Design of solid shafts based on strength	T1	2	PPT	L3	CO2	PO3, PO10
10	Design of solid shafts Based on rigidity and critical speed	T2	1	BB	L3	CO2	PO3, PO11
11	Design of hollow shafts based on strength,Based on rigidity and critical speed	T1	1	BB	L3	CO2	PO3, PO10
12	Design of Keys, keyways, splines	T1	2	PPT	L3	CO2	PO3, PO10
13	Design of Rigid couplings	T1	2	PPT	L3	CO2	PO3, PO10
14	Design of Flexible couplings	T2	1	BB	L3	CO2	PO3, PO11

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any
*** Assignment given to the students**

Evaluation method
*** assignments are evaluated and marks were given based on the students answer to the question.**

UNIT III-TEMPORARY AND PERMANENT JOINTS

15	Threaded fastners	T1	1	PPT	L1	CO3	PO1, PO10
16	Bolted joints including eccentric loading	T1	2	BB	L2	CO3	PO2, PO10
17	Knuckle joints	T1	1	BB	L3	CO3	PO3,PO10
18	Cotter joints	T1	1	BB	L3	CO3	PO3,PO10
19	Welded joints	T1	2	BB	L3	CO3	PO3,PO10
20	Riveted joints for structures	T1	1	PPT	L3	CO3	PO3,PO10
21	Theory of bonded joints	T1	1	PPT	L1	CO3	PO3,PO10

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any
*** Quiz counduct to the students**

Evaluation method
*** Quiz Counducted and marks are given to team members based on the students answer to the question.**

UNIT IV-ENERGY STORING ELEMENTS AND ENGINE COMPONENTS

22	Various types of springs	T1	2	PPT	L1	CO4	PO1, PO10

23	Optimization of helical springs	T1	2	BB	L3	CO4	PO3, PO10
24	Rubber springs	T1	1	PPT	L2	CO4	PO3, PO10
25	Flywheels considering stresses in rims and arms for engines and punching machine	T1	2	BB	L3	CO4	PO3, PO10
26	Connecting Rods and crank shafts	T1	2	BB	L3	CO4	PO3,PO2, PO10

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any
*** Assignment given to the students**

Evaluation method
*** assignments are evaluated marks were given based on the students answer to the question.**

UNIT V-BEARINGS

28	Sliding contact bearing	T1	2	BB	L3	CO5	PO3, PO10
29	Rolling contact bearings	T1	2	BB	L3	CO5	PO3,PO10
30	Hydrodynamic journal bearings	T1	2	BB	L3	CO5	PO3,PO10
31	Sommerfeld Number,	T1	1	PPT	L3	CO5	PO2,PO10
32	Raimondi and Boyd graphs	T1	1	PPT	L2	CO5	PO2,PO10
33	Selection of Rolling Contact bearings	T1	1	PPT	L2	CO5	PO1, PO3,PO10

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any
*** Assignment given to the students**

Evaluation method
*** assignments are evaluated marks were given based on the students answer to the question.**

Content Beyond the Syllabus Planned

1	Design philosophy and Fundamentals of machine design

Text Books

1	Bhandari V, “Design of Machine Elements”, 4th Edition, Tata McGraw-Hill Book Co, 2016.
2	Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “Mechanical Engineering Design" 9th Edition, Tata M

Reference Books

1	Alfred Hall, Halowenko, A and Laughlin, H., “Machine Design”, Tata McGraw-Hill BookCo. (Schaum's Outline), 2010
2	Ansel Ugural, “Mechanical Design – An Integral Approach", 1st Edition, Tata McGraw-Hill Book Co, 2003.
3	P.C. Gope, “Machine Design – Fundamental and Application”, PHI learning private ltd, New Delhi, 2012.
4	R.B. Patel, “Design of Machine Elements”, MacMillan Publishers India P Ltd., Tech-Max Educational resources, 2011.
5	Robert C. Juvinall and Kurt M. Marshek, “Fundamentals of Machine Design”, 4th Edition, Wiley,2005
6	Sundararajamoorthy T. V. Shanmugam .N, “Machine Design”, Anuradha Publications, Chennai, 2015.

Website / URL References

1	https://nptel.ac.in/courses/112/105/112105124

Blooms Level									
Level 1 (L1) : Remembering	Lower Order Thinking	Fixed Hour Exams	**Level 4 (L4) : Analysing**		Higher Order Thinking	Projects / Mini Projects
Level 2 (L2) : Understanding			**Level 5 (L5) : Evaluating**			
Level 3 (L3) : Applying			**Level 6 (L6) : Creating**			

Mapping syllabus with Bloom's Taxonomy LOT and HOT										
Unit No	**Unit Name**	**L1**	**L2**	**L3**	**L4**	**L5**	**L6**	LOT	HOT	**Total**
Unit 1	**Steady Stresses And Variable Stresses In Machine Members**	1	3	4	0	0	0	8	0	8
Unit 2	**Shafts And Couplings**	0	0	6	0	0	0	6	0	6
Unit 3	**Temporary And Permanent Joints**	2	1	4	0	0	0	7	0	7
Unit 4	**Energy Storing Elements And Engine Components**	1	1	3	0	0	0	5	0	5
Unit 5	**Bearings**	0	2	4	0	0	0	6	0	6
Total		4	7	21	0	0	0	32	0	32
Total Percentage		12.5	21.9	65.625	0	0	0	100	0	100

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**1**							**1**			**3**	
CO2	**1**	**2**	**3**							**1**			**3**	
CO3	**1**	**2**	**3**							**1**			**3**	
CO4	**1**	**2**	**3**							**1**			**3**	
CO5	**1**	**2**	**3**							**1**			**3**	
Avg	**1**	**2**	**3**							**1**			3	

Justification for CO-PO mapping

CO1	Strongly mapped with PO1: Applying the knowledge of engineering fundamentals such as stress, strain, true stress, true strain, ductile, brittle properties will help to solve stressstain behaviour of materials. Modrately mapped with PO2: identifying and analysis the existing problem, Low level mapped with PO10: clear instruction can be given and received by using effective communication for problem solving.
CO2	Strongly mapped with PO3: Design and Development of the identified problem, Moderately mapped with PO2:identify and formulate the given engineering problem, Low level mapped with PO1: Applying the knowledge of engineering fundamentals for identfy the problem PO10: clear instruction can be given and received by using effective communication for solving problems.
CO3	Strongly mapped with PO3: Design and Development of the identified problem, Moderately mapped with PO2:identify and formulate the given engineering problem, Low level mapped with PO1: Applying the knowledge of engineering fundamentals for identfy the problem PO10: clear instruction can be given and received by using effective communication for solving problems.

CO4	Strongly mapped with PO3: Design and Development of the identified problem, Moderately mapped with PO2:identify and formulate the given engineering problem, Low level mapped with PO1: Applying the knowledge of engineering fundamentals for identfy the problem PO10: clear instruction can be given and received by using effective communication for solving problems.
CO5	Strongly mapped with PO3: Design and Development of the identified problem, Moderately mapped with PO2:identify and formulate the given engineering problem, Low level mapped with PO1: Applying the knowledge of engineering fundamentals for identfy the problem PO10: clear instruction can be given and received by using effective communication for solving problems.

3	**High level**	**2**	**Moderate level**	**1**	Low level

Name & Sign of Faculty Incharge : D SAKTHIVEL

Name & Sign of Subject Expert :

Head of the Department :

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