MOHAMMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

LESSON PLAN

Department of Mechanical Engineering

Name of the Subject	Dynamics of Machinery	Name of the handling Faculty	Dr. A. Saravanan
Subject Code	ME8594	Year / Sem	3rd / 5th
Acad Year	2022-2023	Batch	2020-2024

Course Objective

To understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.

To understand the undesirable effects of unbalances resulting from prescribed motions in mechanism.

To understand the effect of Dynamics of undesirable vibrations and its significance on engineering design.

To understand the principles in mechanisms used for speed control and stability control.

Course Outcome

CO1: Calculate static and dynamic forces of mechanisms. Analyze dynamic forces of slider crank mechanism and design of flywheel

CO2: Calculate the balancing masses and their locations of reciprocating and rotating masses.

CO3: Compute the frequency of free vibration

CO4: Compute the frequency of forced vibration and damping coefficient.

CO5: Calculate the speed and lift of the governor and estimate the gyroscopic effect on automobiles, ships and airplanes and Analyze stabilization of sea vehicles, aircrafts and automobile vehicles.

Lesson Plan

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-FORCE ANALYSIS							
1	Dynamic force analysis	R3	1	BB/PPT	L3	CO1	PO1,PO2,PO3
2	Inertia force and Inertia torque	R3	1	BB/PPT	L3	CO1	PO1,PO2,PO3
3	D Alembert's principle	R3	1	BB/PPT	L3	CO1	PO1,PO2,PO3
4	Dynamic Analysis in reciprocating engines	R3	1	BB/PPT	L4	CO1	PO1,PO2,PO3,PO4
5	Gas forces – Inertia effect of connecting rod	R3	1	BB/PPT	L3	CO1	PO1,PO2,PO3
6	Bearing loads	R3	1	BB/PPT	L2	CO1	PO1,PO2,PO3
7	Crank shaft torque	R3	1	BB/PPT	L2	CO1	PO1,PO2,PO3
8	Turning moment diagrams	R3	1	BB/PPT	L2	CO1	PO1,PO2,PO3
9	Fly Wheels	R3	1	BB/PPT	L2	CO1	PO1,PO2,PO3,PO4
10	Flywheels of punching presses	R3	1	BB/PPT	L4	CO1	PO1,PO2,PO3,PO4

11	Dynamics of Cam- follower mechanism.	T3	1	BB/PPT	L4	CO1	PO1,PO2,PO3
12	Tutorials	T3, R3	2	Open Book	L4	CO1	PO1,PO2,PO3,PO4 ,PO5.PO7,PO12

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 by online screening through viva voice,marks were

UNIT II-BALANCING

13	Static balancing	R3	1	BB/PPT	L2	CO2	PO1,PO2,PO3
14	dynamic balancing	R3	1	BB/PPT	L2	CO2	PO1,PO2,PO3
15	Balancing of rotating masses	R3	1	BB/PPT	L4	CO2	PO1,PO2,PO3
16	Balancing a single cylinder engine	R3	1	BB/PPT	L4	CO2	PO1,PO2,PO3
17	Balancing of Multi-cylinder inline	R3	1	BB/PPT	L4	CO2	PO1,PO2,PO3
18	Balancing of V-engines	R3	1	BB/PPT	L4	CO2	PO1,PO2,PO3
19	Partial balancing in engines	R3	1	BB/PPT	L4	CO2	PO1,PO2,PO3
20	Partial balancing in engines	R3	1	BB/PPT	L4	CO2	PO1,PO2,PO3
21	Balancing of linkages	R3	1	BB/PPT	L3	CO2	PO1,PO2,PO3
22	Balancing machines	R3	1	BB/PPT	L2	CO2	PO1,PO2,PO3
23	Field balancing of discs and rotors.	T3	1	BB/PPT	L2	CO2	PO1,PO2,PO3
24	Tutorials	T3, R3	2	Open Book	L5	CO2	PO1,PO2,PO3

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

Evaluation method
* Quiz are evaluated by online.

UNIT III-FREE VIBRATION

25	Basic features of vibratory systems	R3	1	BB/PPT	L1	CO3	PO1,PO2,PO3
26	Degrees of freedom – single degree of freedom –	R3	1	BB/PPT	L2	CO3	PO1,PO2,PO3
27	Free vibration– Equations of motion	R3	1	BB/PPT	L3	CO3	PO1,PO2,PO3
28	Natural frequency of free undamped vibn	R3	1	BB/PPT	L4	CO3	PO1,PO2,PO3
29	Types of Damping	R3	1	BB/PPT	L2	CO3	PO1,PO2,PO3
30	Natural frequency of free undamped vibn	R3	1	BB/PPT	L4	CO3	PO1,PO2,PO3
31	Damped vibration	R3	1	BB/PPT	L4	CO3	PO1,PO2,PO3
32	Torsional vibration	R3	1	BB/PPT	L2	CO3	PO1,PO2,PO3
33	Torsional vibration of shaft – Critical speeds of shafts –	R3	1	BB/PPT	L4	CO3	PO1,PO2,PO3

34	Two and three rotor torsional systems	R3	1	BB/PPT	L4	CO3	PO1,PO2,PO3
35	Two and three rotor torsional systems	T3	1	BB/PPT	L4	CO3	PO1,PO2,PO3
36	Tutorials/case study in MATLAB	T3, R3	2	Open Book	L5	CO3	PO1,PO2,PO3

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

Evaluation method: Evalution of Case studies report.

UNIT IV-FORCED VIBRATION

37	Equation of motion for forced vibration	R3	1	BB/PPT	L2	CO4	PO1,PO2,PO3
38	Response of one degree freedom systems to periodic forcing	R3	1	BB/PPT	L2	CO4	PO1,PO2,PO3
39	Response of one degree freedom systems to periodic forcing	R3	1	BB/PPT	L2	CO4	PO1,PO2,PO3
40	Harmonic disturbances	R3	1	BB/PPT	L2	CO4	PO1,PO2,PO3
41	Disturbance caused by unbalance	R3	1	BB/PPT	L3	CO4	PO1,PO2,PO3
42	Support motion	R3	1	BB/PPT	L3	CO4	PO1,PO2,PO3
43	Displacement –transmissibility	R3	1	BB/PPT	L3	CO4	PO1,PO2,PO3
44	Force–transmissibility	R3	1	BB/PPT	L3	CO4	PO1,PO2,PO3
45	Vibration isolation	R3	1	BB/PPT	L3	CO4	PO1,PO2,PO3
46	Vibration isolation	R3	1	BB/PPT	L3	CO4	PO1,PO2,PO3
47	vibration measurement.	T3	1	BB/PPT	L4	CO4	PO1,PO2,PO3
48	Tutorial/ case study in MATLAB	T3, R3	2	Open Book	L5	CO4	PO1,PO2,PO3

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any

Evaluation method

UNIT V-MECHANISM FOR CONTROL

49	Governors Introduction	R3	1	BB/PPT	L2	CO5	PO1,PO2,PO3
50	Types – Centrifugal governors	R3	1	BB/PPT	L2	CO5	PO1,PO2,PO3
51	Gravity controlled governors	R3	1	BB/PPT	L2	CO5	PO1,PO2,PO3
52	spring controlled centrifugal governors	R3	1	BB/PPT	L2	CO5	PO1,PO2,PO3
53	Characteristics, Effect of friction	R3	1	BB/PPT	L2	CO5	PO1,PO2,PO3
54	Controlling force curves.	R3	1	BB/PPT	L4	CO5	PO1,PO2,PO3
55	Gyroscopes	R3	1	BB/PPT	L2	CO5	PO1,PO2,PO3

56	Gyroscopic forces and torques	R3	1	BB/PPT	L2	CO5	PO1,PO2,PO3
57	Gyroscopic stabilization	R3	1	BB/PPT	L2	CO5	PO1,PO2,PO3
58	Gyroscopic effects in ships and airplanes	R3	1	BB/PPT	L4	CO5	PO1,PO2,PO3
59	Gyroscopic effects in Automobiles	T3	1	BB/PPT	L4	CO5	PO1,PO2,PO3
60	Tutorials	T3, R3	2	Open Book	L5	CO5	PO1,PO2,PO3

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

Evaluation method

* MCQ marks were given based on the students answer to the question

Content Beyond the Syllabus Planned

1	
2	

Text Books	
1	1. F. B. Sayyad, "Dynamics of Machinery", McMillan Publishers India Ltd., Tech-Max Educational resources, 2011.
2	2. Rattan, S.S, "Theory of Machines", 4th Edition, Tata McGraw-Hill, 2014.
3	3. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", 4th Edition, Oxford University Press, 2014.

Reference Books	
1	1. Cleghorn. W. L, "Mechanisms of Machines", Oxford University Press, 2014
2	2. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines", 3rd Edition Affiliated East-West Pvt. Ltd., New Delhi, 20
3	3. Khurmi, R.S.,"Theory of Machines", 14th Edition, S Chand Publications, 2005.

Website / URL References	
1	https://nptel.ac.in/courses/112/104/112104114/
2	https://www.btechguru.com/engineering-videos--mechanical-engineering--computer-aided-design-and-manufactur
3	https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-07-dynamics-fall-2009/lecture-notes/MIT16_07F09_

Blooms Level				
Level 1 (L1) : Remembering	Lower Order Think	Fixed Hour Exa	**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	FORCE ANALYSIS	8	9	6	4	1	0	23	5	28
Unit 2	BALANCING	6	6	8	7	1	0	20	8	28
Unit 3	FREE VIBRATION	5	4	8	7	1	0	17	8	25
Unit 4	FORCED VIBRATION	11	11	8	2	1	0	30	3	33
Unit 5	MECHANISM FOR CONTROL	9	9	4	4	1	0	22	5	27

Total	39	39	34	24	5	0	112	29	141
Total Percentage	27.7	27.7	24.1	17	3.55	0	79.43	20.5674	100

CO PO Mapping

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

Justification for CO-PO mapping

CO1	**Engineering Knowledge is very much required, problem analysis is also needed, design and development is also introduced**
CO2	**Engineering Knowledge is very much required, problem analysis is also needed, design and development is also introduced**
CO3	**Engineering Knowledge is very much required, problem analysis is also needed, design and development is also introduced**
CO4	**Engineering Knowledge is very much required, problem analysis is also needed, design and development is also introduced**
CO5	**Engineering Knowledge is very much required, problem analysis is also needed, design and development is also introduced**

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

Name & Sign of Faculty Incharge : Dr. A.Saravanan, Asso. Professor

Name & Sign of Subject Expert   :

Head of the Department   :

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