

Subject Code: 01ME1501

Subject Name: Dynamics of Machine -1

B. Tech. Year - III (Semester - 5)

Type of course : Program Core

Prerequisite : Kinematics of Machines

Rationale : Dynamics of machine -1 is a fundamental course for Mechanical engineers to understand the working principals of different machines. It is essential for mechanical engineers to understand gyroscopic couples, friction devices, and force analysis under static and dynamic conditions.

Course Outcome :

After learning the course, the students will be competent to

1. Identify effect of gyroscopic couples.
2. To determine the forces and power calculations for clutch, brakes and dynamometer
3. Design governor and flywheel for engines and machines.
4. To understand the principal of simple harmonic motion

Teaching and Examination Scheme :

Teaching Scheme			Credits C	Examination Marks					Total Marks
THEORY	TUTORIAL	PRACTICAL		Theory Marks			Practical Marks		
				ESE(E)	IA	CSE	Viva (V)	Term Work (TW)	
3	0	2	5	50	30	20	25	25	150

Content :

Sr. No.	Content	Total Hrs.
1	Gyroscopic Couple and ProceSSIONAL Motion: Concept of Gyroscope, change in the first Euler angle, fundamental of Gyroscopic effect, define active and reactive couple along with axes, Evaluate the effects of gyroscopic couple on ship, airplane, two wheeler and four wheeler, Stability of two and four wheeler exposed to curved path.	14
2	Clutch, Breaks and Dynamometer: Introduction and classification of clutch, pressure and wear theory of clutch, single plate, multi plate and centrifugal plate clutch, equation of energy and thermal aspects in clutch. Introduction and classification of brakes, braking effect, analysis of band, block and combination of band and block brakes, analysis of internal expansion shoe brake. Introduction and classification of dynamometer, analysis of dynamometer: prony	12

	brake, rope break, hydraulic, belt transmission, epicyclical train and bevis-gibson torsion.	
3	Governors: Introduction and classification of governors, governor terminologies, watt governor, porter governor, Proell governor and hartnell governor, governor stability and hunting, introduction to isochronism in governor, sensitivity in governor.	**
4	Turning Moment Diagrams and Flywheel: Introduction to turning moment diagrams and flywheel, turning moment diagrams for IC engine. Speed and energy fluctuation in flywheel, flywheel rim dimensions, flywheel in punching press.	**
5	Simple Harmonic Motion: Introduction to simple harmonic motion (SHM), velocity and acceleration of a particle moving with SHM, differential equation of SHM, simple pendulum, compound pendulum.	06

Distribution of Theory Marks

R Level	U Level	A Level	N Level	E Level	C Level
10	20	25	25	10	10

Legends: R: Remember; **U:** Understand; **A:** Apply; **N:** Analyze; **E:** Evaluate; **C:** Create

List of Experiments :

1. Tutorials on disc type flywheel design.
2. Tutorials on rim type flywheel design.
3. Experiment on porter governor.
4. Experiment on proell governor.
5. Experiment on hartnell governor.
6. Analysis of clutch.
7. Analysis of brake & dynamometer.
8. Experiment on trifler suspension.
9. Experiment on bifilar suspension.
10. Analysis of gyroscopic effect.
11. Radius of gyration of various component.
12. Virtual Lab experiment.

Major Equipment :

1. Universal Governor Apparatus.
2. Motorized Gyroscope Apparatus.

Reference books :

1. S S Rattan 4/e, Theory of Machines, McGraw-Hill.

2. J.Uicker , Gordon R Penstock & J.E. Shigley, Theory of Machines and Mechanisms, Oxford.
3. A G Ambekar, Mechanism and Machine Theory, PHI.
4. R L Norton, Kinematics and Dynamics of Machinery, McGraw-Hill.
5. Kenneth J Waldron, Gary L Kinzel, Kinematics, Dynamics and Design of Machinery, Wiley.
6. Meriam, J L and Kraige, L G, Engineering Mechanics: Dynamics, Wiley.

List of Open Base Software / learning website :

1. nptel.ac.in