

Subject Code:01ME0501
Subject Name: Dynamics of Machine -1
B.Tech. III Year – (Sem-5) Mechanical
Type of course: Progame Core

Prerequisite: KOM

Rationale:- Dynamics of Machine-I is a fundamental course. It is essential for mechanical engineer to understand motion of machine elements and force analysis of static and dynamic reciprocating parts

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Evaluation Scheme					Total Marks
				Theory Marks			Practical Marks		
Theory	Tutorial	Practical		ESE (E)	IA	CSE	Viva (V)	Term Work (TW)	
4	---	2	5	50	30	20	25	25	150

COURSE OUTCOME

Students will be able to

1. Identify the fundamental of dynamics of machine along with associated terminologies.
2. Distinguish static and dynamic condition of machine.
3. Evaluate the different harmonic motion of machine.
4. Design and development of Flywheel for IC engine
5. Static and dynamic force analysis of machine components

SR No	CONTENTS	TOTAL HOURS	WEIGHTAGE
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	28%
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 break, Introduction and classification of dynamometer, analysis of	8	16%

	dynamometer: prony 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	6	12%
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	**	4%
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, center of percussion, bifilar suspension and trifler suspension	8	16%
6	Force Analysis of Reciprocating Parts: Introduction, resultant of forces in system, two force and three force systems, force and couple, free body diagrams, static force analysis of mechanisms, D'Alembert's principle, velocity and acceleration of the reciprocating parts, Klein's construction, ritterhaus's construction, Bennett's construction, velocity and acceleration of piston and connecting rod –Approximate analytical approach, forces acting on reciprocating parts of an engine. Dynamically equivalent and non-equilibrium system, correction couple, analytical method for inertia torque	12	24%

**** Should be covered during practical session only.**

Distribution of Theory Marks

R Level	U Level	A Level	N Level	E Level
10	25	30	20	15

Legends: R: Remembrance; **U:** Understanding; **A:** Application, **N:** Analyze, **and E:** Evaluate

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 Experiments:

1. Performance analysis of governors.
2. Flywheel design for IC engine and punching press.
3. Analysis of gyroscopic effect.
4. Analysis of clutch.

5. Analysis of brakes
6. Static force analysis of reciprocating parts.
7. Dynamic force analysis of reciprocating parts.
8. Measurement of mass, moment of inertia
9. Radius of gyration of various component
10. Study of flywheel

List of Open Source Software/learning website:

1. <http://nptel.iitm.ac.in>