

COURSE TITLE	DYNAMIC OF MACHINE-1
COURSE CODE	01ME1501
COURSE CREDITS	4

Objective:

- 1 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.
- 2 it is essential for mechanical engineer to understand motion of machine elements and force analysis of static and dynamic reciprocating parts.

Course Outcomes: After completion of this course, student will be able to:

- 1 Analyze and identify the effects of gyroscopic couples on various mechanical systems.
- 2 Determine forces and power associated with clutches, brakes, and dynamometers effectively.
- 3 Design governors for engines and apply principles of simple harmonic motion to analyze and evaluate their dynamic performance.
- 4 Design flywheels for engines and machinery, and analyze and evaluate their performance based on energy regulation principles.

Pre-requisite of course:Kinematics of Machines

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
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

Contents : Unit	Topics	Contact Hours
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, equation of energy and thermal aspects in clutch. Introduction and classification of brakes, braking effect, analysis of band, Introduction and classification of dynamometer, analysis of dynamometer: prony brake, rope break, hydraulic, belt transmission, epicyclical train and bevis-gibson torsion.	12
3	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.	6
4	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
5	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
Total Hours		42

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Tutorials on disc type flywheel design Tutorials on disc type flywheel design	2
2	Tutorials on rim type flywheel design Tutorials on rim type flywheel design	2
3	Experiment on porter governor. Experiment on porter governor.	2
4	Experiment on porter governor. Experiment on porter governor.	2
5	Experiment on hartnell governor. Experiment on hartnell governor.	2
6	Analysis of clutch Analysis of clutch	2
7	Analysis of brake & dynamometer Analysis of brake & dynamometer	2
8	Experiment on trifler suspension. Experiment on trifler suspension.	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
9	Analysis of gyroscopic effect. Analysis of gyroscopic effect.	2
10	Radius of gyration of various component. Radius of gyration of various component.	2
11	Virtual Lab experiment. Virtual Lab experiment.	2
12	Experiment on bifilar suspension. Experiment on bifilar suspension.	2
Total Hours		24

Textbook :

- 1 A Textbook Of Theory Of Machines: (In S.I. Units), R.K. Bansal, J.S. Brar , khanna publisher , 2016
- 2 Theory of Machines , S S Rattan , McGraw-Hill. , 2019

References:

- 1 Kinematics, Dynamics and Design of Machinery , Kinematics, Dynamics and Design of Machinery , Kenneth J Waldron, Gary L Kinzel , Wiley, 2016
- 2 Kinematics and Dynamics of Machinery , Kinematics and Dynamics of Machinery , R L Norton, , McGraw-Hill. , 2009
- 3 Mechanism and Machine Theory , Mechanism and Machine Theory , A G Ambekar , PHI, 2007
- 4 Engineering Mechanics: Dynamics,, Engineering Mechanics: Dynamics,, James L. Meriam, L. G. Kraige, J. N. Bolton, Wiley, 2018
- 5 Theory of Machines and Mechanisms , Theory of Machines and Mechanisms , J.Uicker , Gordon R Penstock & J.E. Shigley , Oxford University Press, 2014

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
0.00	0.00	40.00	25.00	25.00	10.00

Instructional Method:

- 1 ICT and Problem based teaching learning

Supplementary Resources:

- 1 <https://archive.nptel.ac.in/courses/112/104/112104114/>
- 2 <https://www.youtube.com/watch?v=oZhR1HPdvR4&t=2821s>
- 3 <https://archive.nptel.ac.in/courses/112/105/112105125/>