

DYNAMICS OF MACHINERY

V Semester: ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AME011	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45		Tutorial Classes: 15		Practical Classes: Nil			Total Classes: 60	
<p>OBJECTIVES:</p> <p>The course should enable the students to:</p> <ol style="list-style-type: none"> I. Understand the concept of equilibrium of a body subjected to static and dynamic forces.. II. Apply the phenomenon of friction for automobile application. III. Analyze the significance of governors and its application in turning moment diagram. IV. Determine the fundamental frequency of mechanical systems. <p>COURSE OUTCOMES (COs):</p> <p>CO1: Understand the equilibrium of a body subjected to static and dynamic forces of various mechanisms. CO2: Understand the concept of gyroscopic effect in aero-planes, ships and automobiles for stabilization. CO3: Explore the concept of friction in various contacts of bodies. CO4: Understand the significance of energy storage devices by studying the TMD. CO5: Explore the equations of motion of various degree of freedom systems.</p> <p>COURSE LEARNING OUTCOMES (CLOs):</p> <ol style="list-style-type: none"> 1. Understand dynamic analysis like gyroscopic forces and moments, rotation of rigid bodies. 2. Understand the gyroscopic effect on ships, planes and road vehicles. 3. Understand static force analysis of mechanisms. 4. Understand dynamic force analysis of mechanisms. 5. Determine the dynamic behavior principle and operations of clutches, brakes, dynamometers. 6. Compute frictional losses, torque transmission of mechanical systems such as clutches, brakes. 7. Compute frictional losses, torque transmission of mechanical systems such as dynamometers. 8. Understand the design of centrifugal governors. 9. Determine the dynamic behavior principles and operations of flywheels and governors. 10. Understand dynamic balancing of point masses. 11. Understand dynamic balancing of rotating masses. 12. Understand the torque calculations in turning moment diagrams. 13. Understand dynamic balancing of reciprocating parts. 14. Understand how to determine the natural frequencies of continuous systems starting from the general equation of displacement. 15. Apply the different methods to solve the equation of motion in damped forced vibrations. 16. Understand the concepts of free and forced vibrations of single degree freedom systems. 17. Remember the concepts of vibration modes and natural frequencies and their measurement and estimation for multi-degree-of-freedom systems. 18. Interpret the behavior of vibrating systems through an understanding of basic principles and the role of mass, stiffness and damping. 19. Develop the equations of motion for free and forced vibration of simple systems. 20. Explore the use of modern engineering tools, software and equipment to prepare for competitive exams, higher studies etc. 								

UNIT-I	PRECESION, STATIC AND DYNAMIC FORCE ANALYSIS OF PLANAR MECHANISMS	Classes: 09
<p>Precession: Gyroscopes, effect of processional motion on the stability of moving vehicles such as motor car, motor cycle, aero-planes and ships, static and dynamic force analysis of planar mechanisms: (Neglecting friction), Introduction to free body diagrams, conditions of equilibrium, two and three force members, inertia forces and D'Alembert's principle, planar rotation about a fixed centre.</p>		
UNIT -II	CLUTCHES, BRAKES AND DYNAMOMETERS	Classes: 09
<p>Clutches: Friction clutches, Single disc or plate clutch, multiple disc clutches, cone clutch and centrifugal clutch; Brakes and dynamometers: Simple block brakes, internal expanding brake, band brake of vehicle; Dynamometers absorption and transmission types, general description and method of operation.</p>		
UNIT -III	TURNING MOMENT AND GOVERNORS	Classes: 09
<p>Turning moment diagrams and flywheels: turning moment: Inertia torque, angular velocity and acceleration of connecting rod, crank effort and torque diagrams, fluctuation of energy; Design of flywheels. Governors: Watt, Porter and Proell governors, spring loaded governors, Hartnell and Hartung with auxiliary springs, sensitive ness, isochronism and hunting</p>		
UNIT -IV	BALANCING OF ROTATORY AND RECIPROCATING MASSES	Classes: 09
<p>Balancing: Balancing of rotating masses, single and multiple-single and different planes-balancing of reciprocating masses, primary and secondary balancing-analytical and graphical methods; unbalanced forces and couples: Balancing of V-engines, multi cylinder, inline and radial engines for primary, secondary balancing and locomotive balancing.</p>		
UNIT -V	MECHANICAL VIBRATIONS	Classes: 09
<p>Vibrations: Free vibration of mass attached to a vertical spring, simple problems on forced damped vibration; Vibration isolation and transmissibility, whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems.</p>		
Text Books:		
<ol style="list-style-type: none"> 1. Thomas Bevan, "Theory of Machines", Pearson Education, 3rd Edition, 2009. 2. S.S Ratan, "Theory of Machines", Tata McGraw-Hill, 4th Edition, 2014. 3. R. L. Norton, "Kinematics and Dynamics of Machinery", McGraw-Hill, 1st Edition, 2009. 4. P.L. Balleny, "Theory of Machines and Mechanisms", Khanna publishers, 2013. 		
Reference Books:		
<ol style="list-style-type: none"> 1. J. S. Rao, R.V. Dukkupati, "Mechanism and Machine Theory", New Age Publication, 1st Edition, 2013. 2. Uiker, Penock, Shigley, "Theory of Machines and Mechanisms", Oxford University Press, 4th Edition, 2013. 3. R.S. Khurmi, Gupta, "Theory of Machines", S.Chand & Co, New Delhi, 14th Edition, 2013 		
Web References:		
<ol style="list-style-type: none"> 1. http://www.uobabylon.edu.iq/uobcolleges/ad_downloads/4_1293_515.pdf 2. http://ebooks.library.cornell.edu/k/kmoddl/toc_hartenberg1.html 		
E-Text Books:		
<ol style="list-style-type: none"> 1. https://drive.google.com/file/d/ob7raaoEF40D7eEJIR1voODJodFE/edit 2. http://royalmechanicalbuzz.blogspot.in/2015/04/theory-of-machines-by-rs-khurmi-ebook-pdf.html 		