JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF MECHANICAL ENGINEERING

II Year - II Semester		L	T	P	C
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DYNAMICS OF MACHINERY					

Course Objectives:

1. To analyze the forces in clutches, brakes and dynamometers involving friction.
2. Understand the effect gyroscopic couple in motor cycles, aeroplanes and ships.
3. To understand the static and dynamic force analysis of four bar and slider crank mechanisms.
4. To study the turning moment diagrams of reciprocating engines and to learn design procedure of a flywheel
5. To learn analytical and graphical methods for calculating balancing of rotary and reciprocating masses
6. Understanding of vibrations and its significance on engineering design.

UNIT – I

FRICTION: Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis: lubricated surfaces, boundary friction, film lubrication.

CLUTCHES: Friction clutches- single disc or plate clutch, multiple disc clutch, cone clutch, centrifugal clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle. General description and operation of dynamometers: Prony, Rope brake, Epicyclic, Bevis Gibson and belt transmission,

UNIT – II

STATIC AND DYNAMIC FORCE ANALYSIS: Dynamic force analysis of four bar mechanism and slider crank mechanism**,** inertia torque, angular velocity and acceleration of connecting rod, crank effort **TURNING MOMENT DIAGRAMS:** Turning moment diagrams

– fluctuation of energy – fly wheels and their design.

UNIT-III

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships.

GOVERNERS: Watt, porter and proell governors, spring loaded governors – Hartnell and Hartung with auxiliary springs. sensitiveness, isochronism and hunting.

UNIT – IV

BALANCING: Balancing of rotating masses single and multiple – single and different planes, use analytical and graphical methods. Primary, secondary, and higher balancing of reciprocating masses. analytical and graphical methods, unbalanced forces and couples – examination of "V" multi cylinder in line and radial engines for primary and secondary balancing, locomotive balancing, hammer blow, swaying couple, variation of tractive effort.

UNIT – V

VIBRATIONS: Free Vibration of spring mass system –Natural frequency-types of damping – damped free vibration, Simple problems on forced damped vibration, vibration isolation and transmissibility transverse loads, vibrations of beams with concentrated and distributed loads. Dunkerly's methods, Raleigh's method, whirling of shafts, critical speeds, torsional vibrations,

two and three rotor systems.

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Text Books:

1. Theory of Machines -S.S Rattan - Mc. GrawHill
2. Theory of Mechanisms and Machines -Dr.JagadishLal - Metropolitan Pvt.Ltd.

References:

1. Mechanism and machine theory - JS Rao & RV Dukkipati - New AgePublishers.
2. Theory of Machines - Shigley – McGrawHillPublishers
3. Theory of Machines - Thomas Bevan - PearsonPublishers

Course outcomes:

1. To compute the frictional losses and transmission in clutches, brakes anddynamometers
2. To determine the effect of gyroscopic couple in motor vehicles, ships andaeroplanes
3. To analyze the forces in four bar and slider crank mechanisms and design aflywheel
4. To determine the rotary unbalanced mass in reciprocatingequipment
5. To determine the unbalanced forces and couples in reciprocating and radialengines
6. To determine the natural frequencies of discrete systems undergoing longitudinal, torsional and transverse vibrations.