

Course Code	18ME52	Course Title	Dynamics of Machines	Semester	V
Credits	4	L – T – P –TL*	4 – 1 – 0 – 5	Teaching Hrs	56
Total Marks	100	CIE*	40	SEE*	60
*NOTE: L – Lecture; T – Tutorial; P – Practical; TL – Total; CIE – Continuous Internal Evaluation; SEE – Semester End Examination					
Course Learning Objectives: This course will enable students to;					Teaching, Hrs
<ul style="list-style-type: none"> • Understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms. • Study the undesirable effects of unbalances resulting from prescribed motions in mechanism. • Explain the principles in mechanisms used for speed control and stability control. • Understand the principles in engine torque and turning moment diagram. • Analyze and design different types of Cams. 					
Module-1					
Static force Analysis: Static equilibrium. Equilibrium of two and three force members. Members with two forces and torque, Free body diagrams, Static force analysis of four bar mechanism and Slider-crank mechanism with and without friction.					12
Dynamic force Analysis: D'Alembert's principle, Inertia force, Inertia torque. Dynamic force analysis of four-bar mechanism and Slider crank mechanism without friction, numerical problems.					
Module-2					
Fly wheel: Engine output torque, Flywheel design for I.C. Engine and size for punching press, typical applications of Fly wheel, Fly wheel for energy storage, Coefficient for speed fluctuations and energy.					10
Turning moment diagrams : I.C. Engines and multi cylinder Engine, Maximum Fluctuation of Energy.					
Module-3					
Balancing of Rotating Masses: Static and dynamic balancing, balancing of single rotating mass by balancing masses in same plane and in different planes. Balancing of several rotating masses by balancing masses in same plane and in different planes.					12
Balancing of Reciprocating Masses: Inertia effect of crank and connecting rod, Single cylinder engine, balancing in multi cylinder-inline engine (primary and secondary forces), numerical problems.					
Module-4					
Governors: Types of governors, force analysis of Porter and Hartnell governors. Controlling force, Stability, Sensitiveness, Isochronisms, Effort and Power.					12
Analysis of Cams: Analysis of Tangent cam with roller follower and Circular arc cam operating flat faced and roller followers. Undercutting in Cams.					

Module-5	10
<p>Gyroscope: Vectorial representation of angular motion, Gyroscopic couple. Effect of gyroscopic couple on plane disc, aero plane, ship, stability of two wheelers and four wheelers, numerical problems.</p> <p>Vibrations: Introduction, Definitions, Types of vibrations, Simple Harmonic Motion (SHM), Work done by harmonic force, Principle of super position applied to SHM.</p>	
<p>Course outcomes: By the end of the course the student shall be able to</p> <p>CO1: Carry out graphical and analytical analysis of Static and Dynamic forces on Mechanisms.</p> <p>CO2: Analyze the function, design and control of flywheels.</p> <p>CO3: Do Balancing of rotating masses and reciprocating masses using graphical and analytical methods.</p> <p>CO4: Calculate the speed and lift of the governor and analysis of different types of Cams.</p> <p>CO5: Estimate the gyroscopic effect on automobiles, ships and airplanes.</p>	
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question will be for 20 marks. • There will be two full questions (with a maximum of four sub- questions) from each module. • Each full question will have sub- question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. 	
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Thomas Bevan., Theory of Machines, C.B.S Publishers, 2005. ISBN-8123908741. 2. Rattan S.S., Theory of Machines, TMH , Third Edition, 2011. ISBN-13:978-0-07-0144774. <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Shigley. J. V. and Uickers, J. Theory of Machines & Mechanisms TMH, 6th Edition, 2003. ISBN-04718-0237-9, ISBN-019515598X. 2. Theory of Machines by Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd. 2nd edition 2007. 3. Mechanism and Machine Theory, A.G.Ambekar, PHI, 2007 4. P.L. Ballaney, Theory of Machines & Mechanisms, Khanna Publishers, 25th edition edition, 2005. ISBN: 9788174091222. 	