

TEACHING PLAN

	Course Title	Semester	Branches	Contact Periods /Week	Academic Year	Date of commencement of Semester
23ME4T03	THEORY OF MACHINES (R23)	IV	Mechanical Engineering & Robotics	6	2025-26	10-12-2025

**COURSE OUTCOMES**

1	Discuss the plane motion mechanism with single degree of freedom. [K2]
2	Analyse velocity and acceleration of different links in a mechanism [K4]
3	Apply the effects of gyroscopic couple in ships, aeroplanes and road vehicles. [K3]
4	Estimate unbalance mass in rotating machines [K3]
5	Analyse free and forced vibrations of single degree freedom systems. [K4]
6	Construction of turning moment diagrams and apply them in designing flywheels. [K3]

UNIT	Out Comes / Bloom's Level	Topics No.	Topics/Activity	Text Book / Reference	Cont act Hour	Delivery Method
<b>Unit-1 Simple Mechanisms</b>						
I	Examine the plane motion mechanism with single degree of freedom	1.1	Classification of mechanisms – Basic kinematic concepts and definitions	T1, R1	2	Chalk and talk /ppt/ /quiz/ PBL/ Videos/ Animation
		1.2	Mobility (Chebychev–Grübler–Kutzbach criterion), inversions	T1, R1	1	
		1.3	Grashof's conditions for 4-bar chain	T1, R1	1	
		1.4	4 bar Mechanisms and its first and second inversions.	T1, R1	1	
		1.5	Third and fourth inversions of 4 bar mechanism	T1, R1	1	
		1.6	Single slider crank chain mechanisms and their first 2 inversions	T1, R1	1	
		1.7	Third and fourth inversions of slider crank chain mechanism	T1, R1	1	
		1.8	Mechanisms with Lower Pair: Pantograph, Exact Straight-Line Mechanisms	T1, R1	2	
		1.9	Peaucellier, Hart and Scott Russell mechanisms	T1, R1	1	
		1.10	Approximate Straight-Line Mechanisms – Grasshopper, Watt, Tchebicheff and Robert Mechanisms Mechanical advantage- Transmission angle	T1, R1	1	
		1.11	Modified Scott Russell mechanism, Hooke's Joint.	T1, R1	1	
Content beyond Syllabus		Linkage 3.10 software for motion generation of various mechanisms		1		
<b>Total</b>					<b>14</b>	

		Unit-2. Plane and motion analysis					
		2.1	Displacement, velocity and acceleration analysis of simple mechanisms	T1	2	Chalk and talk /ppt/ /quiz/ Videos/ Animation	
II	Analyze the velocity of various links in mechanisms using velocity diagrams or instantaneous center method as well as determine the acceleration of links using acceleration diagrams. I	2.2	graphical velocity analysis using instantaneous centers	T1	2		
		2.3	velocity and acceleration analysis using loop closure equations	T1	2		
		2.4	kinematic analysis of simple mechanisms	T1	1		
		2.5	slider crank mechanism dynamics	T1	1		
		2.6	Coincident points and Coriolis component of acceleration.	T1	2		
		2.7	Problems	T1	2		
		Determination of velocity and acceleration by using software					
				Total	13		
III		Unit-3. Gyroscope & Gear Profile					
		3.1	Introduction to Gyroscope, Principle of gyroscope and terminology	R1,T1	1	Chalk and talk /ppt/ /quiz/ PBL/ Videos/ Animation	
		3.2	gyroscopic effect in an aeroplane	T1, T2	1		
		3.3	gyroscopic effect in an ship, car	T1, T2	1		
		3.4	gyroscopic effect in an two wheeler	T1, T2	2		
		3.5	Problems on gyroscope	T1, T2	2		
		3.6	Gear parameters, fundamental law of gearing, Involute and cycloidal gear profiles	R1,T1	2		
		3.7	conjugate action, spur gear contact ratio	T1, T2	1		
		3.8	interference/undercutting	T1, T2	1		
		3.9	helical, bevel, worm, rack & pinion gears,	T1, T2	1		
		3.10	epicyclic and regular gear train kinematics.	R1,T1	2		
Content beyond Syllabus		Modeling of gyroscope					
				Total	15		
IV		Unit-4. Balancing of Rotating masses & Cams					
		4.1	Need for balancing, balancing of single mass using analytical and graphical methods	T1, T2	1	Chalk and talk /ppt/ /quiz/ Videos/ Animation/flipped class	
		4.2	balancing of several masses in different planes, using analytical and graphical methods	T1, T2	2		
		4.3	Classification of cams and followers	T1, T2	1		
		4.4	Terminology and definitions	T1, T2	1		
		4.5	Displacement diagrams, Uniform velocity, parabolic, simple harmonic and cycloidal motions	T1, T2	2		
		4.6	specified contour cams- circular and tangent cams	T1, T2	2		
		4.7	pressure angle and undercutting	T1, T2	1		
Content beyond Syllabus		Auto CAD software for generating cam profiles					
				Total	11		

		Unit 5. Vibrations & Turning Moment Diagrams and Flywheels								
		5.1	Introduction, degree of freedom, types of vibrations	T1, R1	1	Chalk and talk /ppt/ /quiz/ PBL/ Videos/ Animation				
V	Estimate unbalances force in rotating members and reciprocating mechanisms and Solve problems of Governors..	5.2	free natural vibrations, Newton method and energy method for single degree of freedom	T1, R1	2					
		5.3	Damped vibrations- under damped	T1, R1	1					
		5.4	critically damped and over damped systems	T1, R1	1					
		5.5	forced vibrations with and without damping in single degree of freedom	T1, R1	2					
		5.6	Vibration isolation and transmissibility	T1, R1	1					
		5.7	Turning moment diagrams for steam engine	T1, R1	1					
		5.8	I.C engine and Multi Cylinder Engine.	T1, R1	1					
		5.9	Crank effort – coefficient of fluctuation of energy	T1, R1	1					
		5.10	Fly Wheel and their design, fly wheels for punching press.	T1, R1	2					
		Content beyond Syllabus			Modal analysis by using ansys software	1				
						<b>Total</b> 14				
<b>CUMULATIVE PROPOSED PERIODS</b>						<b>67</b>				

#### Text Books:

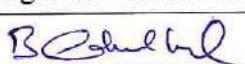
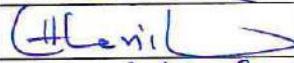
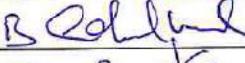
S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
1	S. S. Rattan ,Theory of Machines, fifth edition ,TMH,2019
2	R.K. Bansal,J.S. Brar Theory of Machines, fifth edition, Laxmi Publications (P)Ltd,2016

#### Reference Books:

S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
1	R. S. Khurmi, J. K. Gupta, Theory of Machines, 15 edition, S. Chand,2012
2	V.P. Singh, Theory of Machines, 6 edition ,Dhanpat Rai & Co. (P) Limited,2017

#### Web Details

1	<a href="http://mechanicalexpressions.com/explore/kinematics">http://mechanicalexpressions.com/explore/kinematics</a>
2	<a href="http://vlabs.iitkgp.ernet.in/mr">http://vlabs.iitkgp.ernet.in/mr</a>
3	<a href="https://www.youtube.com">https://www.youtube.com</a>

		Name	Signature with Date
i.	Faculty	Mr. B MAHESH KRISHNA	
ii.	Faculty II (for common Course)	Mr. CH HARISH KUMAR	
iii.	Course Coordinator	Mr. B MAHESH KRISHNA	
iv.	Module Coordinator	Dr.M FRANCIS LUTHER KING	
v.	Programme Coordinator	Dr.M FRANCIS LUTHER KING	

  
Principal