



## 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
I	Examine the plane motion mechanism with single degree of freedom	<b>Unit-1 Simple Mechanisms</b>				
		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					
Content beyond Syllabus						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		
Content beyond Syllabus		3.10 epicyclic and regular gear train kinematics.					
		Modeling of gyroscope				1	
						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				1	
						Total 11	

		Unit 5. Vibrations & Turning Moment Diagrams and Flywheels							
V	Estimate unbalances force in rotating members and reciprocating mechanisms and Solve problems of Governors.	5.1	Introduction, degree of freedom, types of vibrations	T1, R1	1	Chalk and talk /ppt/ /quiz/ PBL/ Videos/ Animation			
		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	LC 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			
					Total	14			
CUMULATIVE PROPOSED PERIODS						67			

**Text Books:**

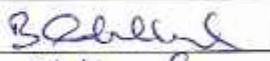
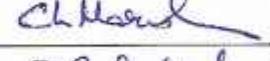
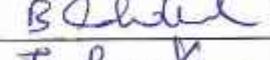
S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
1	S. S. Rattan ,Theory of Machines, fifth edition ,TMH,2019
2	R.K. Bansal,J.S. Brar Theory of Machines, fifth edition, Laxmi Publications (P)Ltd,2016

**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

