Applied Mechanics-II
BEG_____

Year: I **Semester: II**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
3	3	3	-	40	-	3	60	-	-	100

Course Objective:

The purpose of the course is to provide basic knowledge of engineering mechanics dynamics portion to the students such that they can understand the basics of kinematics and kinetics for both particles and rigid bodies and their motion.

Detailed Course Contents:

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Introduction	1.1	Definition, branches, importance of dynamics	✓								1	
2	Rectilinear Motion of Particles	2.1	Position, velocity and acceleration		✓						✓	4	
		2.2	Determination of motion of particles			✓					✓		
		2.3	Uniform rectilinear motion			✓					✓		
		2.4	Uniformly accelerated rectilinear motion			✓					✓		
		2.5	Motion of several particles		✓						✓		

		2.6	Graphical solution of rectilinear motion problems		✓		✓						
3	Curvilinear Motion of Particles	3.1	Position vector, velocity and acceleration		✓							4	
		3.2	Derivative of vector function			✓							
		3.3	Rectangular components of velocity and acceleration		✓								
		3.4	Motion relative to a frame in translation		✓								
		3.5	Tangential and normal components of velocity and acceleration			✓					✓		
		3.6	Radial and transverse components of velocity and acceleration			✓					✓		
4	Kinetics of particles: Newton's Second law	4.1	Newton's second law of motion	✓	✓							6	
		4.2	Linear momentum and rate of change	✓		✓							
		4.3	System of units	✓									
		4.4	Equations of motion and dynamic equilibrium	✓	✓		✓						
		4.5	Angular momentum and rate of change	✓		✓					✓		
		4.6	Equations of motion-radial and transverse components	✓		✓					✓		

		4.7	Motion due to a central force-conservation of momentum			✓								
		4.8	Newton's law of gravitation			✓								
		4.9	Applications to space mechanics	✓		✓					✓			
5	Kinetics of Particles: Energy and Momentum Methods	5.1	Work done by a force	✓		✓						6		
		5.2	Kinetic energy of a particle	✓		✓								
		5.3	Principles of work and energy: application	✓		✓			✓		✓			
		5.4	Power and efficiency	✓										
		5.5	Potential energy	✓										
		5.6	Conservation of energy	✓		✓					✓			
		5.7	Principle of impulse and momentum	✓		✓					✓			
		5.8	Impulsive motion and impact	✓		✓					✓			
		5.9	Direct central impact	✓		✓					✓			
		6	Oblique impact	✓		✓					✓			
		6.1	Introduction to system of particles	✓										
6	Kinematics of Rigid Bodies	6.1	Introduction	✓								7		
		6.2	Translation	✓			✓							
		6.3	Rotation	✓			✓							
		6.4	General plane motion	✓			✓							

		6.5	Absolute and relative velocity in plane motion	✓										
		6.6	Instantaneous center of rotation	✓	✓							✓		
		6.7	Absolute and relative Frame; Coriolis acceleration in plane motion	✓		✓								
		6.8	Rate of change of a general vector with respect to a rotating Frame; Coriolis acceleration	✓										
		6.9	Motion about a fixed point	✓	✓									
		6.10	General motion	✓	✓							✓		
		6.11	Three dimensional motion of a particle relative to a rotating frame: Coriolis Acceleration	✓										
7	Plane Motion of Rigid Bodies: Forces, Moments and Accelerations	7.1	Equations of motion for a rigid body	✓			✓						6	
		7.2	Angular momentum for a rigid body in plane motion	✓			✓							
		7.3	Plane motion of a rigid body; D. Alembert's principle	✓		✓	✓					✓		
		7.4	Application of rigid body motion in the plane							✓				

		7.5	Constrained motion in the plane	✓										
8	Plane Motion in Rigid Bodies: Energy and Momentum methods	8.1	Principles of work and energy for a rigid Body	✓									6	
		8.2	Work done by external forces	✓						✓				
		8.3	Kinetic energy for a system	✓						✓				
		8.4	Conservative and non-conservative system	✓						✓				
		8.5	Works-energy applications						✓		✓			
		8.6	Impulse and momentum for systems of rigid bodies		✓									
		8.7	Conservation of angular and linear momentum		✓									
		8.8	Impulsive motion and eccentric impact								✓			
9	Vibrations	9.1	Undamped free vibrations of particles and rigid bodies: simple harmonic motion, frequency and period of oscillation			✓							5	
		9.2	Steady harmonic forcing of undamped systems			✓								
		9.3	Introduction to structural vibration	✓					✓		✓			

Note: Define(SD), Description (D), Derive (D), Illustration (I), Explanation (E), Application (A), Explanation (Ex), Numerical (N)

Final Examination Scheme:

Chapters	Marks	Remarks
1	1	Th
2	4	Th/N
3	5	Th/N
4	10	Th+N
5	10	Th+N
6	8	Th+N
7	8	Th + N
8	8	Th + N
9	6	Th + N
Total	60	

Note: There might be minor deviation in mark distribution.
Mandatory: Marks should be evaluated based on solving steps.

References:

1. Beer F.P., & Johnston, E.R. (1987). *Mechanics for Engineers-Statics and Dynamics.* 4th edition, Mcgraw-Hill
2. Chopra, A.K. (2017). *Dynamics of Structures-Theory and Applications to Earthquake Engineering.* 5th edition. Pearson Education
3. Hibbeler, R.C, & Gupta, A. (2009). *Engineering Mechanics-Statics and Dynamics.* 11th edition. Pearson Education
4. Shames, I.H. (1990). *Engineering Mechanics-Statics and Dynamics.* 3rd edition. Prentice Hall of India.