Approved in the BOS meeting held on 10.10.23 &
Academic Council meeting held on 20.10.23

23CE12T1 ENGINEERING MECHANICS

(Common to Civil, Mechanical Engineering & Allied branches)

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture – Tutorial –Practical**	3-0-0
Prerequisite	-	**Sessional Evaluation**	30
		Semester End Exam. Evaluation	70
		Total Marks	100

Course Objectives	To get familiarized with different types of force systems.	
	To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces.	
	To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies.	
	To apply the Work-Energy method to particle motion.	
	To understand the kinematics and kinetics of translational and rotational motion of rigid bodies.	
Course Outcomes	CO1	Understand the fundamental concepts in mechanics and determine the frictional forces for bodies in contact.
	CO2	Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments.
	CO3	Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.
	CO4	Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.
	CO5	Solve the problems involving the translational and rotational motion of rigid bodies.
Course Content	**UNIT I** **Introduction to Engineering Mechanics** – Basic Concepts. Scope and Applications **Systems of Forces:** Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems. **Friction:** Introduction**,** limiting friction and impending motion, Coulomb's laws of dry friction, coefficient of friction, Cone of Static friction.	

	UNIT II **Equilibrium of Systems of Forces:** Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses. Principle of virtual work with simple examples **UNIT III** **Centroid:** Centroids of simple figures (from basic principles) – Centroids of Composite Figures **Centre of Gravity:** Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems. **Area Moments of Inertia:** Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, Mass Moment of Inertia of composite bodies. **UNIT IV** **Rectilinear and Curvilinear motion of a particle**: Kinematics and Kinetics –D'Alembert's Principle - Work Energy method and applications to particle motion- Impulse Momentum method. **UNIT V** **Rigid body Motion:** Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.
Textbooks and Reference books	**TEXTBOOKS:** 1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., *Engineering Mechanics*, McGraw Hill Education, 5th edition. 2. Hibbeler R.C., *Engineering Mechanics: Statics and Dynamics*, Pearson Education, Inc., New Delhi, 14th edition, 2022. **REFERENCE BOOKS**: 1. Rogers and M A. Nelson., *Engineering Mechanics, Statics and Dynamics*,

	McGraw Hill Education 1st edition, 2009. 2. I.H. Shames, *Engineering Mechanics, Statics and Dynamics*, 4th edition, PHI, 2002. 3. Dynamics, J. L. Meriam and L.G. Kraige., *Engineering Mechanics, Volume-I: Statics, Volume-II:* John Wiley, 6th edition, 2008. 4. R.C. Hibbler., *Engineering Mechanics: Principles of Statics and Dynamics*, Pearson Press, 2006. 5. Andy Ruina and Rudra Pratap., *Introduction to Statics and Dynamics*, Oxford University Press, 2011.

CO-PO Mapping: 3-High Mapping, 2-Moderate Mapping, 1-Low Mapping, - -Not Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	-	-	1	2	1	1	-	-	-	1	1	1	-
CO2	3	3	2	1	1	1	1	-	-	-	1	1	1	2	-
CO3	3	2	2	-	1	-	1	-	-	-	-	1	2	2	1
CO4	3	3	2	2	2	-	1	-	-	-	-	2	2	2	1
CO5	3	2	2	2	2	-	1	-	-	-	1	2	2	3	1