SCHEME OF COURSE WORK (R-2020)

Course Details:

Course Title	**ENGINEERING MECHANICS**		
Course Code	22ME1103	L T P C	3 0 0 3
Program:	B.Tech.		
Specialization:	Mechanical Engineering		
Semester	III		

Course Out comes(COs):

At the end of the course the student will be able to:

CO1	explain free body diagrams and analyze forces and couples in mechanical systems.
CO2	analyze ideal trusses and analyze mechanical systems with friction
CO3	determine the center of gravity and moment of inertia for various geometric shapes
CO4	analyze motion of bodies from the kinematic perspective
CO5	apply Newton's laws and principles of energy and momentum to dynamic systems

Program Outcomes (POs):

A graduate of mechanical engineering will be able to

PO1	Apply the knowledge of mathematics, science, engineering fundamentals to solve complex mechanical engineering problems.
PO2	Attain the capability to identify, formulate and analyse problems related to mechanical engineering.
PO3	Design solutions for mechanical system components and processes that meet the specified needs with appropriate consideration for public health and safety.
PO4	Conduct experiments, perform analysis and interpretation of data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions.
PO5	Select and apply appropriate techniques from the available resources and current mechanical engineering and software tools.
PO6	Carry out their professional practice in mechanical engineering by appropriately considering and weighing the issues related to society.
PO7	Understand the impact of the professional engineering solutions on environmental safety and legal issues.
PO8	Transform into responsible citizens by resorting to professional ethics and norms of the engineering practice.
PO9	Function effectively in individual capacity as well as a member in diverse teams and in multidisciplinary streams.
PO10	Communicate fluently with the engineering community and society, and will be able to prepare reports and make presentations effectively.
PO11	Apply knowledge of the engineering and management principles to managing projects and finance in multidisciplinary environments.
PO12	Engage themselves in independent and life-long learning to continuing professional practice in their specialized areas of mechanical engineering.

Course Outcome Versus Program Outcomes:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO-1	**3**	**2**	1									
CO-2	**3**	**2**	1									
CO-3	**3**	**2**	1									

CO-4	**3**	**2**	1									
CO-5	**3**	**2**	1									

1: Slight(low), 2 –Moderate (Medium), 3- Substantial(high), Blank - No correlation

Programme Specific Objectives (PSOs):

The students must attain the knowledge and skills to

PSO-1	Design, analyze and optimize mechanical systems along with control mechanisms
PSO-2	Manufacture mechanical components by selecting effective processing methods and efficient tools
PSO-3	Design, analyze evaluate thermal systems

Course Outcomes Versus Program Specific Outcomes:

Cos	PSO1	PSO2	PSO3
CO-1	3		
CO-2	3		
CO-3	3		
CO-4	3		
CO-5	3		

1: Slight(low), 2 –Moderate (Medium), 3- Substantial(high), Blank - No correlation

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Wee k	**TOPIC/CONTENTS**	**CO**	**Sample questions**	**Teaching - Learnin g Strategy**	**Assessm ent Method & Schedul e**
1	Parallelogram law, forces and components, Resultant of coplanar concurrent forces	CO1	1. Find the magnitude and direction of concurrent force system (L3) 2. Resolve the given force into components along the directions shown. Find the moment of all the forces shown about the given moment-center (L4) 3. Determine the support reaction so the body shown (L3)	i. Lecture ii. Discussion iii. Problem solving	Quiz-I Assignme nt-I Mid-I
2	Components of forces in space, moment of force, principle of moments, coplanar applications, couple, resultant if any force system(coplanar con current cases only)	CO1		i. Lecture ii. Discussion iii. Problem solving	
3	Equilibrium of force systems: Free body dia gram, equations of equilibrium, equilibrium of planar systems,	CO1		i. Lecture ii. Discussion iii. Problem solving	
4	Analysis of structures- method of joints, method of sections	CO2	1. Determine the axial forces in all the members of the given truss	i. Lecture ii. Discussion iii.	

			2. Determine the magnitude of the couple M required to maintain the equilibrium of the mechanism. 3. State the laws of friction. Determine the forces in a tie rod connecting two bodies on rough plane when motion 4. Determine the forces developed in a wedge-block system	Problem solving	
5	Principle of Virtual Work	CO2		i. Lecture ii. Discussion iii. Problem solving	
6	Theory of friction, angle of friction, laws of friction, static friction, kinetic friction. Friction in bodies moving up or down on an inclined plane	CO2		i. Lecture ii. Discussion iii. Problem solving	
7	Wedge friction	CO2		i. Lecture ii. Discussion iii. Problem solving	
8	Center of gravity of flat plate, centroids of areas and lines, importance of centroids of areas and lines, importance of centroids and	CO3	1. Calculate the coordinates of the centroid of the given plane area 2. Apply Pappus Theorem sto calculate the surface area and volume of the solid of revolution shown 3. Determine the area moment of inertia of the plane area about the given x-, y-,and polar axes	i. Lecture ii. Discussion iii. Problem solving	Quiz-I Assignment-I Mid-I
9	Centroids determined by integration, centroids of composite figures, theorem of Pappus, center of gravity of bodies	CO3		i. Lecture ii. Discussion iii. Problem solving	
10	Definition of moment of inertia, polar moment of inertia , ,radius of gyration, parallel axis theorem , moments of inertia by integration ,moments of inertia for composite areas	CO3		i. Lecture ii. Discussion iii. Problem solving	
11.	**MID-I Examination on CO1, CO2 and CO3**				
12	Introduction ,radius of gyration ,parallel axis theorem, mass moments of inertia by integration ,moments of inertia of composite bodies	CO3	4.Determine the mass moment to inertia of the given body about the given x-, y-,and polar axes	i. Lecture ii. Discussion iii. Problem solving	Quiz-II Assignment-II Mid-II
13	Motion of a particle ,rectilinear motion ,rectangular components of curvilinear motion, normal and tangential components of acceleration	CO4	1. Determine the velocity and acceleration after 5seconds for a particle moving on curve shown 2. Crank OA rotates at 60 r.p.m. in clockwise sense. In the position o shown q= 40 determine angular velocity of AB and velocity of B which is constrained to move in a horizontal cylinder.	i. Lecture ii. Discussion iii. Problem solving	Quiz-II Assignment-II Mid-II
14	Kinetic of rigid bodies ,Rotation about fixed axis rotation ,Kinematics of plane motion	CO4		i. Lecture ii. Discussion iii. Problem solving	
15	Kinetics– De-Alembert's principle, Fixed axis rotation, Work- energy equation for translation, interpretation and	CO5	1. Block A has a mass of 2 kg and has a velocity of 5 m/s up the plane shown in . Use the principle of work energy;	i. Lecture ii. Discussion iii. Problem solving	Quiz-II Assignment-II Mid-II

	computation of work, work- Energy applied to particle motion,		locate the rest position of the block.		
16	Ideal System – Principle of conservation of energy , power, linear and angular momentum, impulse and momentum	CO5	2. Two particles of masses 10 kg and 20 kg are moving along a straight line towards each other at velocities of 4 m/s and 1 m/s, respectively, as shown in . If e = 0.6, determine the velocities of the particles immediately after their collision. Also find the loss of kinetic energy.	i. Lecture ii. Discussion iii. Problem solving	
18	MID-II Examination on CO3, CO4 and CO5				