SILVER OAK UNIVERSITY

Engineering and Technology (Diploma)
Department ME/ Civil/ Chem./ Petro. Chem.
Subject Name: Engineering Mechanics
Semester: 2

Prerequisite: zeal to learn the subject

Objective:
1. To apply the Principles of Mechanics to practical engineering problems.
2. To identify appropriate structural system for studying a given problem and isolate it from its environment.
3. To carry out kinematic and kinetics analysis of particle and system of particles
4. To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Evaluation Scheme				Total Marks
				Internal		External		
L	T	P	C	Th	Pr	Th	Pr	
3	0	2	4	40	50	60	-	150

Content:

Unit No.	Course Contents	Teaching Hours	Weightage %
1	**Basics of mechanics and force system** Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units. Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification. Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem. Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.	7	15
2	**Equilibrium of rigid body** Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analyzing equilibrium Lami's Theorem – statement and explanation, Application for various	7	15

	engineering problems. Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple), Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load. Beam reaction graphically for simply supported beam subjected to vertical point loads only.		
3	**Centroid and centre of gravity** Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle) Centroid of composite figures composed of not more than three geometrical figures Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere) Centre of Gravity of composite solids composed of not more than two simple solids.	5	12
4	**Friction** Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction. Equilibrium of bodies on level surface subjected to force parallel and inclined to plane. Equilibrium of bodies on inclined plane subjected to force parallel to the plane only.	8	20
5	**Kinematics and Kinetics of Particle** **Kinematics of Particle:** Velocity & acceleration in terms of rectangular co-ordinate system, Rectilinear motion, Motion along plane curved path, Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves), Projectile motion, Relative velocities. **Kinetics of a Particle:** Force and Acceleration: - Introduction to basic concepts, D'Alemberts Principle, Equations of dynamic equilibrium, Newton's Second law of motion. Principle of Work and Energy, Law of Conservation of Energy. **Impulse and Momentum:** Principle of Linear Impulse and Momentum. Law of Conservation of momentum. Impact and collision.	12	23
6	**Simple lifting machine** Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio, efficiency of machines, law of machine. Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block	6	15

Course Outcome:

Sr. No.	CO statement	Unit No
CO-1	Ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration	1,5
CO-2	Ability to analyze the forces in any structures.	1,2
CO-3	Ability to solve rigid body subjected to dynamic forces.	1,2,6
CO-4	Evaluate the properties of surfaces and solids	3
CO-5	Determine the friction and its effect by the law of friction	4

Teaching & Learning Methodology:-

The various methods or tools follows by the faculties to teach the above subject are:
- Chock and Board
- PPT
- Flip Class Room
- Video Animations

List of Experiments/Tutorials:
1. Estimate the resultant force and Prove the Law of Parallelogram, Polygon Law of Forces and Lami's Theorem
2. Authenticate reactions in beam through Graphical & analytical method
3. Compute Centroid of lamina and Centroid of different sections
4. Enumerate Coefficient of Sliding Friction for different surfaces–Wood, Glass.
5. Work-out M.A & Efficiency of Simple purchase crab, simple wheel and axle and simple screw-jack

Major Equipment:
1. Apparatus for Law of Parallelogram, Lami's theorem and law of Polygon.
2. Apparatus for determination of coefficient of friction.
3. Apparatus to determine CG of Lamina.
4. Beam apparatus to find reactions
5. Simple purchase crab, simple wheel and axle, simple screw-jack.

Books Recommended:-
1. Engineering Mechanics by Vera Murali, OXFORD University Press (2010)
2. Engineering Mechanics by R S Khurmi S CHAND Publications
3. Engineering Mechanics by D S Kumar, S K Kataria and Sons Publication
4. Engineering Mechanics by Bear and Jonstan, newmedia Publication
5. Applied Mechanics by H J Shah and Junarkar, CHAROTAR Publication.
6. Engineering Mechanics Statics and Dynamics Rajasekaran S and Sankarasubramanian, 3rd edition, Vikas Publishing House Pvt.Ltd. 2005.
7. Engineering Mechanics Statics and Dynamics by Irvin H Shames and Krishna Mohana Rao. G., 4th addition, Pearson Education 2006.
8. Engineering Mechanics Statics and Dynamics by Hibbeller, R.C. and Ashok Gupta, 11th addition, Pearson Education 2010.

List of Open Source Software/learning website:

- Video Lectures on Applied Mechanics by Prof. S K. Gupta, Department of Applied Mechanics, IIT Delhi.
- http://silveroakuni.ac.in/video-lecture
- https://nptel.ac.in/