DYNAMICS

Course Code:	28567
Credits:	4
Course Type:	Theoretical
Prerequisites:	Statics
Corequisite:	Differential Equations
Course Length:	68 hours

Outline:

1- Introduction To Dynamics

Applications of Dynamics, Newton's Second Law and Inertia Reference Frame, Absolute and Relative Gravity Acceleration (1 Session)

2- Kinematics of Particles:

Rectilinear Motion, Plane Curvilinear Motion, Rectangular Coordinate, Normal-Tangential Coordinates, Polar Coordinates (3 Sessions), Space Curvilinear Motion (Cartesian, Cylindrical and Spherical Coordinates) (2 Session), Relative motion (1 Session), Constrained Motion of Connected Particles (1 Session).

3- Kinetics of Particles:

Force, Mass, and Acceleration based on Newton's Second law in Rectilinear and Curvilinear Motion (2 Sessions), Work, Work and Kinetic Energy Relation, Conservative Force and Potential Energy, Power (2 Sessions), Linear and Angular Momentum, Impulse and Momentum (2 sessions), Impact (1 Session).

4- Kinetic of Systems of Particles.

Definitions of The Center of Mass, Generalization of Newton's Second Law for Systems of Particles, Definition of Kinetic Energy and Development of Work and Kinetic Energy Relation for Systems of Particles (1 Session), Definition Of Linear and Angular Momentum for Systems of Particles (1 Session), Conservation of Energy, Linear and Angular Momentum Conservation (2 Sessions)

5- Plane Kinematics of Rigid Bodies.

Translational, Rotational and General Plane Motion of Rigid Body (1 Session), Defenition of Angular Velocity and Angular Acceleration of Rigid Body in Plane Motion, Relationship between Velocity/Acceleration of Two Points of Rigid Body (2 Sessions), Instantaneous Center of Rotation and Rolling Kinematics (1 Session), Relative Motion to Moving and Rotating Coordinate Axes (2 Sessions)

6- Plane Kinetics of Rigid Bodies:

Kinetics of Rigid Body in Plane Motion, General Equation of Motion, Translation (1 session), Pure Rotational Motion (1 Session), General Plane Motion (1 session), Work and Kinetic Energy for a Rigid Body in Planar Motion (1 Session), Linear and Angular Momentum, Momentum-Impulse Relations for a Rigid Body in Plane Motion (1 Session), Conservation of Energy, Linear and Angular Momentum, and Angular Momentum (1 Session).

7- Three – Dimensional Dynamics of Rigid Bodies

Kinematics of a Rigid Body in Three-Dimensional Motion, Velocity and Angular Acceleration of a Rigid Body in Three-Dimensional Motion, Velocity and Acceleration of Points on a Rigid Body (1 Session), Kinetics of a Rigid Body in Three-Dimensional Motion, Angular Momentum, Torque-Momentum, Newton-Euler Equations, Kinetic Energy and Work-Energy (2 Sessions)

References:

1 . Meriam, J. L., & Kraige, L. G., Bolton, J.N. (2015). Engineering mechanics: dynamics (Vol. 2). John Wiley & Sons.

- 2. R. C. Hibbeler, Engineering Mechanics: Dynamics, Twelfth Edition, Prentice Hall
- 3. Jerry Ginsberg, Engineering Dynamics, 2008