

AMTD07 DYNAMICS

UNIT-1 INTRODUCTION TO DYNAMICS AND BASIC

- 1.1 Introduction, Mechanics , History Of Mechanics , Basic Concepts And Principles , Laws Of Mechanics , Units And Dimensions ,
- 1.2 Scalars And Vectors, Basic Vector Operations , Vectorial Representation Of Forces, Vectorial Representation Of Moments, Procedure For Solving Problems In Mechanics

UNIT-2 KINETICS OF PARTICLES

- 2.1 Rectilinear Motion Of Particles- Displacement, Velocity And Acceleration, Determination Of The Motion Of A Particle,
- 2.2 Uniform Rectilinear Motion, Uniformly Accelerated Rectilinear Motion, Relative Motion, Curvilinear Motion, Position Vector,
- 2.3 Velocity And Acceleration, Derivatives Of Vector Functions, Rectangular Components Of Velocity And Acceleration

UNIT-3 KINETIC OF PARTICLES: NEWTON'S SECOND LAW

- 3.1 Newton's Second Law Of Motion, Equation Of Motion, Angular Momentum Of A Particle,
- 3.2 Equations Of Motion In Terms Of Radial And Transverse Components, Motion Under A Central Force Conservation Of Angular Momentum

UNIT-4 KINETICS OF PARTICLE: ENERGY & MOMENTUM METHODS

- 4.1 Work of a force, kinetic energy of a particle: principle of work and energy, Power and efficiency, potential energy, conservative forces,
- 4.2 Conservation of energy, motion under a conservative central force – application to space mechanics,
- 4.3 Principle of impulse and momentum, impulsive motion, impact of elastic bodies, direct center impact, oblique central impact

UNIT-5 SYSTEM OF PARTICLES

- 5.1 Application Of Newton's Laws To The Motion Of A System Of Particles, Linear Angular Momentum Of A System Of Particles,
- 5.2 Motion Of The Mass Centre Of A System Of Particles, Conservation Of Momentum For A System Of Particles,
- 5.3 Work-Energy Principle: Conservation Of Energy For A System Of Particles, Principle Of Impulse And Momentum For A System Of Particles

UNIT-6 KINETICS OF RIGID BODIES

- 6.1 Definition Of Terms, Translation Fixed Rotation, Equations Defining The Rotation Of Rigid Body About A Fixed Axis- Velocity And Acceleration,
- 6.2 Absolute And Relative Motion Methods For Plane Motion Analysis, Relative Velocity In Plane Motion,

- 6.3 Instantaneous Centre Of Rotation In Plane Motion, Relative Acceleration In Plane Motion, Rate Of Change Of A Vector With Respect To A Rotating Frame,
6.4 Plane Motion Of A Particle Relative To A Rotating Frame – Coriolis Acceleration

UNIT-7 KINETICS OF RIGID BODIES

- 7.1 Equation of motion for a rigid body, moment of momentum equations, plane motion of rigid body- D’alembert’s principle, systems of rigid bodies,
7.2 Constrained plane motion and rotational of rigid body, work of forces active on rigid body, kinetic energy of a rigid body in plane motion,
7.3 Principle of work and energy for a rigid body, systems of rigid bodies

UNIT-7 IMPACT OF TWO BODIES

- 7.1 Concepts Of Impact, Coefficient Of Restitution, Observations And Calculations,
7.2 Plane Central Collision, Collision Of A Small Body With A Massive Body

UNIT-8 CENTRE FORCE MOTION

- 8.1 Basic Concepts, Acceleration Due To Gravity, Trajectories For Central Force Motion, Parabolic Trajectory, Elliptical Orbit, Hyperbolic Trajectory,
8.2 Energy Expended For Different Trajectories Launching Of Satellites At An Angle, Astronomical Facts And Laws Of Kepler.

Reference books:

1. Advanced Dynamics of Mechanical Systems Book by Federico Cheli and Giorgio Diana
2. Dynamics of Structures Book by Joseph Penzien and Ray William Clough
3. Advanced Dynamics: Analytical and Numerical Calculations with MATLAB Book by Dan B Marghitu and Mihai Dupac.