MET-1621: TECHNICAL DYNAMICS

Cuyahoga Community College

Viewing: MET-1621 : Technical Dynamics

Board of Trustees:

January 2023

Academic Term:

Fall 2023

Subject Code

MET - Mech Eng/Manuf Ind Eng Tech

Course Number:

1621

Title:

Technical Dynamics

Catalog Description:

Study of motion and forces on rigid members. Includes plane and curvilinear motion, kinetics, work, energy, power, efficiency, impact and momentum. Introduction to balancing and vibrations.

Credit Hour(s):

3

Lecture Hour(s):

3

Lab Hour(s):

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Requisites

Prerequisite and Corequisite

MET-1601 Technical Statics.

Outcomes

Course Outcome(s):

Compute displacement, velocity, and acceleration for an object.

Objective(s):

1. Distinguish between distance, displacement, speed and velocity.
2. Solve for displacement, velocity, and acceleration for objects in motion, including projectile motion.

Course Outcome(s):

Calculate acceleration caused by a force.

Objective(s):

1. Solve problems involving plane motion.
2. Solve for forces and acceleration of linear motion.
3. Calculate torque and acceleration for angular motion.

Course Outcome(s):

Use energy methods to find power requirements and efficiency.

Objective(s):

1. Calculate the work of constant and variable forces.

2. Calculate power and efficiency.

Course Outcome(s):

Compute the frequency for a spring-mass system.

Objective(s):

1. Calculate the vibration frequency and time-behavior of an unforced spring-mass-damper system.
2. Calculate a spring-mass system in equilibrium (A), compressed (B) and stretched (C) states.

Course Outcome(s):

Compute angular displacement, velocity, and acceleration for an object in rotation.

Objective(s):

1. Solve for values of angular motion.
2. Calculate values of tangential acceleration, normal acceleration, and total acceleration.
3. Solve for linear values of displacement, velocity, or acceleration in either absolute or relative terms.
4. Use instantaneous centers to determine both linear and angular velocities of various mechanisms.
5. Explain linear and angular momentum.

Methods of Evaluation:

a. Weekly assignments
b. Periodic quizzes
c. Final examination

Course Content Outline:

a. Kinematics of particles
    i. Types of motion
    ii. Displacement
    iii. Velocity
    iv. Acceleration
    v. Projectile motion
b. Kinematics of rigid bodies
    i. Pure rotation
    ii. Angular displacement, velocity, and acceleration
    iii. Relationship between linear and angular motion
    iv. Normal and tangential components of acceleration
    v. Plane motion
    vi. Rolling wheel
    vii. Instantaneous center of rotation
c. Kinetics of force and motion
    i. Loss of motion
    ii. Particle motion
    iii. The inertia force method
    iv. Rigid body translation
    v. Angular motion
    vi. An inertia force in gear and belt drives
d. Work, energy, and power
    i. Work of a variable force
    ii. Springs
    iii. Torque and couples
    iv. Energy
    v. Plant and rotating motion
    vi. Power and efficiency
e. Impulse and momentum

      i. Linear impulse and momentum
     ii. Angular impulse and momentum
    iii. Conservation of linear and angular momentum
    iv. Elastic impact
  f. Mechanical vibrations
      i. Periodic motion
     ii. Harmonic motion
    iii. Mass and spring system

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Resources

Bedford, Anthony and Wallace Fowler. *Engineering Mechanics Dynamics.* 5th Ed. Upper Saddle River, NJ., 2008.

Bedford, Anthony and Wallace Fowler. *Engineering Mechanics Statics and Dynamics.* 5th Ed. Upper Saddle River, NJ., 2008.

Levinson, Irving J. *Introduction to Mechanics.* 2nd ed. Upper Saddle River, NJ., 1968.

Hibbeler, Russell. *Principles of Statics and Dynamics.* 15th Ed. Upper Saddle River, NJ., 2022.

Meriam, James L., L.G. Kraige, and J.N. Bolton. *Engineering Mechanics: Dynamics*. 9th ed. Wiley, 2018.

Plesha, Michael, Gary Gray, Robert J. Witt, and Francesco Costanzo. *Engineering Mechanics Statics and Dynamics*. 3rd ed. McGraw Hill, 2023.

Elsevier. "Journal of Applied Mechanics" Monthly. 2007-11-01 00:00:00.0.

Resources Other
  a. Calculator.

Top of page
Key: 2894