ME 242  DYNAMICS

Instructor:  Fazıl Önder Sönmez
Class hours:  Mondays 15–17 (M 1100), Wednesdays 14–15 (M 1100)
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Prerequisite:  ME 241 Statics
Prerequisites by topic:  Statics (free body diagrams and vector algebra) and differential calculus
Catalog Description:  Dynamics of particles: Rectilinear and curvilinear motion. Newton’s laws, momentum and angular momentum methods. Work and energy. Systems of particles. Dynamics of rigid bodies; kinematics, Euler’s Laws, angular momentum. Work and energy methods for rigid bodies. Introduction to mechanical vibrations
Course objectives:
• Improve understanding of the fundamental notions and principles of dynamics.
• Find the relation between displacement, velocity, acceleration, and time for particles and rigid bodies without reference to the cause of the motion (kinematics).
• Determine the relation between the forces acting on particles and rigid bodies and their motion (kinetics).
• Develop the ability to formulate and systematically solve problems in dynamics.
Grading:  Quizzes 24 % (Quiz problems will be similar to the quiz assignment problems)
          Midterms 39 %
          Final 37 %
          Attendance ±2 %

Tentative Course Schedule:
Week  Topics
1  Introduction
   A. Dynamics of Particles
      Chapter 12: Kinematics of Particles
      1  Rectilinear motion of particles  (Ch.12.1-3)
      1-2 Curvilinear motion of particles  (Ch.12.4-8)
      2 Relative and dependent motion  (Ch.12.9-10)
      Quiz 1
      Chapter 13: Kinetics of Particles: Force and Acceleration
      3-4 Newton’s second law of motion for a single particle and systems of particles (Ch. 13.1-6)
      Quiz 2
      Midterm 1
Chapter 14: Kinetics of Particles: Work and Energy
4-5 Principle of work and energy for a single particle and systems of particles, power and efficiency, conservative forces and potential energy, conservation of energy (Ch. 14)
  Quiz 3

Chapter 15: Kinetics of Particles: Impulse and Momentum
6-7 Principle of linear impulse and momentum for a single particle and systems of particles, conservation of linear momentum, impact, principle of angular impulse and momentum (Ch.15.1-7)
  Quiz 4

Midterm 2

B. Dynamics of Rigid Bodies

Chapter 16: Planar Kinematics of Rigid Bodies
7-8 General plane motion: Translation and rotation, relative motion (Ch. 16)
  Quiz 5

Chapter 17: Planar Kinetics of Rigid Bodies: Force and Acceleration
8-10 Equations for motion in a plane, translation and rotation (Ch.17)
  Quiz 6

Midterm 3

Chapter 18: Planar Kinetics of Rigid Bodies: Work and Energy
10-12 Principle of work and energy, conservation of energy (Ch. 18)
  Quiz 7

Chapter 19: Planar Kinetics of Rigid Bodies: Impulse and Momentum
12-13 Linear and angular momentum of rigid bodies, principle of impulse and momentum, conservation of momentum, eccentric impact (Ch. 19)
  Quiz 8

Chapter 22: Mechanical Vibrations