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

Textbook: Engineering Mechanics: Dynamics by Hibbeler, 14th Edition in SI Units

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

14 **Chapter 22**: Mechanical Vibrations