

# COURSE OUTLINE

ENES-130

Dynamics

3 Credits

## HOWARD COMMUNITY COLLEGE

### Description

This course will enable the student to acquire knowledge dealing with systems of heavy particles and rigid bodies in motion. In order to study such systems, it is necessary to learn force, acceleration, work, energy and impulse-momentum relationships. In addition, material will be discussed which covers motion of one body relative to another in a plane and in space. Prerequisite: ENES-120 and MATH-150 or MATH-182. (2 hours lecture, 2 hours lab)

### Overall Course Objectives

Upon completion of this course, the student will be able to:

1. Analyze various motions of a particle.
2. Compute the displacement, velocity and acceleration of a moving particle.
3. Predict the trajectory of a projectile.
4. Determine the relative velocity and acceleration of two particles in motion.
5. Explain Newton's Laws of Motion.
6. Apply the Work/Energy principle to solve problems involving particles in motion.
7. Apply the Impulse/Momentum principle to solve problems involving particles in motion.
8. Describe the stages of impact when two bodies collide.
9. Solve problems involving the principle of Conservation of Energy.
10. Analyze the motion of a rigid body.
11. Determine the relative motion of two rigid bodies in translation.
12. Locate the instantaneous center of zero velocity for a rotating body.
13. Analyze rotational motion using the instantaneous center of zero velocity.
14. Compute the moment of inertia of a body about an axis of rotation.
15. Calculate the acceleration of a body rotation about a fixed axis.
16. Calculate the acceleration of a body which is both in translation and rotation.
17. Apply the principle of Conservation of Energy to solve problems involving rigid bodies in general motion.
18. Apply the principle of Conservation of Momentum to analyze the motion of rigid bodies.

### Major Topics

- I. Kinematics and Kinetics of a Particle
  - A. Curvilinear Motion
  - B. Motion of a Projectile
  - C. Dependent Motion and Relative Motion
  - D. Newton's Laws of Motion

- II. Work/Energy and Impulse/Momentum Relations for a Particle
  - A. Work and Kinetic Energy
  - B. Conservation of Energy
  - C. Impulse and Linear Momentum
  - D. Conservation of Linear Momentum
  - E. Impact
  - F. Angular Momentum and Angular Impulse
  
- III. Kinematics and Kinetics of a Rigid Body
  - A. Rigid-Body Motion
  - B. General Plane Motion and Relative Motion
  - C. Instantaneous Center of Zero Velocity
  - D. Moment of Inertia and Planar Kinetics
  - E. Rotation and the General Plane Motion
  
- IV. Work/Energy and Impulse/Momentum Relations for a Rigid Body
  - A. Kinetic Energy and Conservation of Energy
  - B. Linear and Angular Momentum, and Impulse
  - C. Conservation of Momentum
  - D. Eccentric Impact

### **Course Requirements**

Grading/exams: Grading procedures will be determined by the individual faculty member but will be based on homework, quizzes, unit tests, writing assignments and a final exam.

Writing: Specific writing assignments will be determined by the individual faculty member but will require at least 500 words. The writing assignments will deal with procedures for solving problems in Dynamics.

### **Other Course Information**

This course is an Arts and Sciences elective.