Cape Cod Community College

Departmental Syllabus

Prepared by the Department of Engineering Sciences and Applied Technology
Date of Departmental Approval: August 28, 2017
Date approved by Curriculum and Programs: October 11, 2017 **Effective: Fall 2018**

1. **Course Number: ENR202**
   Course Title: Dynamics

2. **Description:** Learn about the branch of applied mathematics concerned with the study of forces and torques, and their effect on motion. The course focuses on kinematics, vector descriptions of a point, vector equations related to velocity and acceleration, Newton's Law for a particle, angular velocity and acceleration, moment of inertia of a rigid body, parallel axis theorem, work/energy for a particle and a rigid body, and conservation of momentum and angular momentum.

3. **Student Learning Outcomes** (instructional objectives, intellectual skills)**:**
   Upon successful completion of this course, students are able to do the following.
   - Demonstrate an understanding of rectilinear kinematics (position, velocity, acceleration) of a point.
   - Determine vector definitions and descriptions of a point or two points.
   - Calculate vector equations for velocity or acceleration of two points on a rigid body.
   - Analyze the motion of single rigid bodies in a general plane motion.
   - Analyze a slider/crank mechanism.
   - Demonstrate an understanding of Newton's Law for a Particle and its extension to a system of particles and rigid bodies.
   - Determine the vector definition of angular velocity and acceleration.
   - Calculate M = I alpha for a rigid body in planar motion.
   - Demonstrate an understanding of rolling/sliding/gears.
   - Calculate the moment of inertia of a rigid body, the application of the parallel axis theorem and the calculation of composite bodies.
   - Explain work/energy for a particle and for a rigid body.
   - Explain the effect of internal forces on work and kinetic energy.
   - Demonstrate an understanding of the conservation of momentum and the angular momentum of a rigid body.

4. **Credit(s):** 3 credits

5. **Satisfies General Education Requirement:** No

6. **Prerequisite(s):** ENR201 (Statics); MAT250 (Calculus II)

7. **Semester(s) Offered:** Varies

8. **Suggested General Guidelines for Evaluation:** The course grade is based on homework assignments; class work and participation; one-hour exam(s); and a final examination.

9. **General Topical Outline** (Optional)**:**
   1. Rectilinear kinematics (position, velocity, acceleration) of a point.
   2. Vector definition of position, velocity, and acceleration of a point.
   3. Vector description of normal and tangential acceleration of a point.
   4. Vector description of relative position, velocity, and acceleration of two points.
   5. Vector equation relating velocity of two points on a rigid body.
   6. Vector equation linking the acceleration of two points on a rigid body.
   7. Analysis of the motion of single rigid bodies in general plane motion.
   8. Analysis of a slider/crank mechanism.
   9. Review of Newton's Law for a particle.
   10. Review of rationalized systems of units.
   11. Extension of Newton's Law to a system of particles and rigid bodies.
   12. Emphasize the cancellation aspect of internal forces.
   13. Vector definition of angular velocity and acceleration.

14. M = I alpha for a rigid body in planar motion.
15. Characteristics of rolling/sliding gears.
16. Calculation of the moment of inertia of a rigid body, application of the parallel axis theorem and calculation of composite bodies.
17. Review of work/energy for a particle and for a rigid body.
18. Emphasis that internal forces can do work, have no effect on momentum, but can affect kinetic energy.
19. Conservation of momentum and angular momentum of a rigid body.