Course Name: Engineering Dynamics

Course Number: EGR* E212

Credits: 3

Catalog description: A study of Newtonian mechanics to dynamic forces, translational motion, work, impulse and momentum will be taught. Topics included: kinematics, kinetics of particles and rigid bodies, vibrations, energy and momentum conservation.

Prerequisite: EGR*211 Engineering Statics

General Education Competencies Satisfied:

HCC General Education Requirement Designated Competency Attribute Code(s):

None

Additional CSCU General Education Requirements for CSCU Transfer Degree Programs:
None.

Embedded Competency(ies):
None.

Discipline-Specific Attribute Code(s):

☒ **MATH** **Mathematics elective**

Course objectives:

General Education Goals and Outcomes:

None

Course Specific Objectives:

1. Understand Rectilinear and Curvilinear Motion of Particles
2. Understand and Use Newton's Second Law
3. Understand and Use Kinetics of Particles using Energy and Momentum Methods
4. Understand and Use Kinetics of Systems of Particles

5. Understand and Use Kinematics of Rigid Bodies
6. Understand and Use Forces and Acceleration of Rigid Bodies
7. Use of Energy and Momentum Methods for Rigid Bodies
8. Understand and Use Kinetics of Rigid Bodies in Three Dimensions

Course Content:

A. Kinematics of Particles
    a. Rectilinear Motion of Particles
        i. Position, Velocity, Acceleration
        ii. Uniform Rectilinear Motion
        iii. Uniformly Accelerated Rectilinear Motion
    b. Curvilinear Motion of Particles
        i. Position, Velocity, Acceleration
        ii. Rectangular components of Velocity and Acceleration
        iii. Tangential and Normal Components
        iv. Radial and Transverse Components
B. Kinematics of Particles: Newton's Second Law
    a. Newton's Second Law of Motion
    b. Linear Momentum of a Particle
    c. Equations of Motion
    d. Angular Momentum of a Particle
    e. Motion under Central Force
C. Kinetics of Particles: Energy and Momentum Methods
    a. Principle of Work and Energy
    b. Conservation of Energy
    c. Principle of Impulse and Momentum
    d. Impact
        i. Direct Central Impact
        ii. Oblique Central Impact
D. Systems of Particles
    a. Application of Newton's Second Law
    b. Linear and Angular Momentum
    c. Motion of the Mass Center
    d. Conservation of Momentum of a System of Particles
    e. Work-Energy Principle
    f. Principle of Impulse and Momentum
E. Kinematics of Rigid Bodies
    a. Translation
    b. Rotation about a fixed axis
    c. General Plane Motion

   d. Absolute and Relative Velocity in Plane Motion
   e. Instant Centers
   f. Absolute and Relative Acceleration in Plane Motion
   g. Coriolis Acceleration
F. Plane Motion of Rigid Bodies: Forces and Accelerations
   a. Equations of Motion for a Rigid Body
   b. Angular Momentum of a Rigid Body in Plane Motion
   c. D'Alembert's Principle
   d. Systems of Rigid Bodies
G. Plane Motion of Rigid Bodies: Energy and Momentum Methods
   a. Principle of Work and Energy for a Rigid Body
   b. Kinetic Energy of a Rigid Body in a Plane Motion
   c. Systems of Rigid Bodies
   d. Conservation of Energy
   e. Principle of Impulse and Momentum for the Plane Motion
   f. Conservation of Angular Momentum
   g. Eccentric Impact
H. Kinetics of Rigid Bodies in Three Dimensions
   a. Angular Momentum of a Rigid Body in Three Dimensions
   b. Principle of Impulse and Momentum
   c. Kinetic Energy of a Rigid Body
   d. Motion of a Rigid Body in Three Dimensions

Date Course Created:

Date of Last Revision: 03/03/2017