EASTERN ARIZONA COLLEGE
Engineering Mechanics II - Dynamics
Course Design
2017-2018

Course Information

Division	Mathematics
Course Number	EGR 215
Title	Engineering Mechanics II - Dynamics
Credits	3
Developed by	Tom Palmer
Lecture/Lab Ratio	2 Lecture/3 Lab

Transfer Status

ASU	NAU	UA
Pending Evaluation	ME 252	AME 250

Activity Course	No
CIP Code	14.0101
Assessment Mode	Pre/Post Test (10 Questions/100 Points)
Semester Taught	Fall
GE Category	None
Separate Lab	No
Awareness Course	No
Intensive Writing Course	No

Prerequisites

EGR 214 with a grade of “C” or higher

Educational Value

This is a required course for Sophomore students in many Engineering disciplines.

Description

Dynamics is the second of two sophomore level courses dealing with engineering mechanics. This class builds on the concepts learned in the first course (Statics) and looks at bodies which are not in equilibrium. A study of the kinematics and kinetics of particle and rigid body motion. Concepts covered include: force and acceleration, work and energy, and impulse and momentum.

Supplies

Scientific Calculator, Engineering Graph Paper, Straight Edge, Mechanical Pencil

Competencies and Performance Standards

1. Use multiple coordinate systems, including rectangular, normal-tangent and cylindrical to solve problems dealing with the kinematics and kinetics of a particle undergoing rectilinear or curvilinear translation.

Learning objectives

As the competency is mastered, student will be able to:

a. Define and differentiate between kinetics and kinematics.

b. Solve problems using Newton's Second Law.

c. Utilize constant acceleration equations to solve problems involving rectilinear acceleration.

d. Utilize a rectangular coordinate system to solve projectile motion problems.

e. Apply knowledge of normal-tangent coordinate system to solve problems involving curvilinear translation of a particle.

f. Apply knowledge of polar and cylindrical coordinate systems to solve problems involving curvilinear translation of a particle.

g. Solve absolute dependent motion analysis of two or more particles.

h. Utilize the equations of motion to solve problems involving curvilinear translation of a particle utilizing rectangular, normal-tangent and cylindrical coordinate systems.

Performance Standards

Competence will be demonstrated:

- through participation in, in-class activities
- as homework is completed
- on an in-class written chapter test
- on a two-hour cumulative final exam

Criteria - Performance will be satisfactory when:

- learner successfully sets up and solves projectile motion problems
- learner solves curvilinear motion problems using normal-tangent coordinate system
- learner solves curvilinear motion problems using cylindrical coordinates

2. Use work and energy concepts to solve problems involving particles undergoing rectilinear or curvilinear translation while being subject to conservative and non-conservative forces.

Learning objectives

As the competency is mastered, student will be able to:

a. Define work and power.

b. Utilize the Principle of Work and Energy to solve problems involving single particles or systems of particles.

c. Solve problems involving power and the efficiency of machines or motors.

d. Apply the concepts of kinetic and potential energy to solve problems using the Conservation of Energy equation.

Performance Standards

Competence will be demonstrated:

- through participation in, in-class activities
- as homework is completed

- o on an in-class written chapter test
- o on a two-hour cumulative final exam

Criteria - Performance will be satisfactory when:

- o learner successfully solves problems involving work and energy
- o learner applies the concept of power and efficiency to solve problems
- o learner solves problems utilizing the conservation of energy equation

3. Solve problems utilizing principles of impulse and momentum, including linear and angular momentum and the conservation of momentum for both particles and rigid bodies.

Learning objectives

As the competency is mastered, student will be able to:

- a. Define and describe linear and angular momentum.
- b. Set up and solve problems involving linear impulse and momentum for single particles or systems of particles.
- c. Apply the concept of conservation of linear momentum to solve problems.
- d. Explain the relation between the moment of a force and angular momentum.
- e. Solve problems utilizing the principle of angular impulse and momentum.

Performance Standards

Competence will be demonstrated:

- o through participation in, in-class activities
- o as homework is completed
- o on an in-class written chapter test
- o on a two-hour cumulative final exam

Criteria - Performance will be satisfactory when:

- o learner successfully solves problems involving linear impulse and momentum
- o learner solves problems by applying the concept of conservation of momentum
- o learner applies the concepts of angular impulse and momentum to solve problems

4. Utilize concepts of kinetics and kinematics to solve problems involving the rectilinear and curvilinear translation and rotation of rigid bodies. Solve problems involving fixed axis rotation and general plane motion.

Learning objectives

As the competency is mastered, student will be able to:

- a. Explain the difference between particle and rigid body kinematics and kinetics.
- b. Set up and solve problems involving rotation about a fixed axis.
- c. Solve absolute and relative motion kinematics problems.
- d. Apply the equations of motion to solve problems dealing with rigid body translation and rotation.

Performance Standards

Competence will be demonstrated:

- o through participation in, in-class activities
- o as homework is completed

- o on an in-class written chapter test
- o on a two-hour cumulative final exam

Criteria - Performance will be satisfactory when:

- o learner successfully solves problems involving rigid body translation and rotation
- o learner solves problems by applying the concepts of absolute and relative motion
- o learner applies the concepts of rotation about a fixed axis to solve problems

5. Use work and energy concepts to solve problems involving rigid bodies undergoing rotation or general plane motion while being subject to conservative and non-conservative forces.

Learning objectives

As the competency is mastered, student will be able to:

a. Utilize the Principle of Work and Energy to solve problems involving rigid bodies.

b. Solve problems dealing with the work due to forces and couple moments.

c. Apply the concepts of linear and angular kinetic energy and potential energy to solve problems using the rigid body Conservation of Energy equation.

Performance Standards

Competence will be demonstrated:

- o through participation in, in-class activities
- o as homework is completed
- o on an in-class written chapter test
- o on a two-hour cumulative final exam

Criteria - Performance will be satisfactory when:

- o learner successfully solves rigid body problems involving work and energy
- o learner interprets given information regarding forces and moments to correctly set up problems involving work
- o learner solves problems utilizing the conservation of energy equation

Types of Instruction

Classroom Presentation

Grading Information

Grading Rationale

Each instructor has the flexibility to develop evaluative procedures within the following parameters.

1. Written exams must represent at least 60% of the final course grade.
2. The final exam must represent at least 20% of the final course grade. The Post Test is to be embedded in the final exam and must represent at least 10% of the final course grade (i.e. 50% of the final exam).
3. Other activities may represent at most 20% of the final course grade.

Grading Scale

A 90%-100%

B 80%-89%

C 70%-79%

D 60%-69%

F Below 60%