ENGR 47: DYNAMICS

Foothill College Course Outline of Record

Heading	Value
Units:	5
Hours:	5 lecture per week (60 total per quarter)
Prerequisite:	ENGR 35.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- Students should be able to analyze kinematics of rigid bodies in three dimensions.
- Students should be able to model the relationship between forces and acceleration and energy and momentum.

Description

Intended for engineering majors planning to transfer to four-year institutions. It covers the fundamentals of kinematics and kinetics of particles and rigid bodies. Topics include general and relative motion, force and acceleration, work and energy, and impulse and momentum analyzed in two and three dimensions. Provides an introduction to vibrations and oscillations.

Course Objectives

The student will be able to:
A. Objects as particles: Derive and apply the relationships between position, velocity, and acceleration of a particle in rectilinear and curvilinear motion.
B. Objects as rigid bodies: Derive relations defining the velocity and acceleration of any particle on a rigid body for translation, rotation and general plane motion.
C. Newton's second law: Apply Newton's second law to analyze the motion of both a particle in rectilinear or curvilinear translation acted upon by forces and a rigid body in plane motion acted upon by forces and moments.
D. Work and energy: Apply the method of work and energy to engineering problems modeled as a single particle, a system of particles, or a rigid body in plane motion.
E. Impulse and momentum: Apply the method of impulse and momentum to engineering problems modeled as a single particle, as system of particles, or a rigid body in plane motion.
F. Coriolis acceleration: Recognize situations in which Coriolis acceleration in plane motion is applicable.
G. Impact: Describe the difference between direct and oblique central impact and eccentric impact.

Course Content

A. Objects as particles
1. Derive relationships between position, velocity, and acceleration
2. Apply equations describing position, velocity, and acceleration in rectilinear and curvilinear motion
3. Identify situations in which these equations are appropriate and situations when inappropriate
B. Objects as rigid bodies
1. Derive relations defining the velocity and acceleration for translation
2. Derive relations defining the velocity and acceleration for rotation
3. Derive relations defining the velocity and acceleration for general plane motion
4. Apply equations describing position, velocity, and acceleration
5. Identify situations in which these equations are appropriate and situations when inappropriate
C. Newton's second law
1. Analyze the motion of a particle in rectilinear or curvilinear translation acted upon by forces
2. Analyze the motion of a rigid body in plane motion acted upon by forces and moments
3. Identify situations in which these equations are appropriate and situations when inappropriate
D. Work and energy
1. Apply work and energy relations to single particle
2. Apply work and energy relations to a system of particles
3. Apply work and energy relations to a rigid body in plane motion
4. Identify situations in which these equations are appropriate and situations when inappropriate
E. Impulse and momentum
1. Apply impulse and momentum equations to a single particle
2. Apply impulse and momentum equations to a system of particles
3. Apply impulse and momentum equations to a rigid body in plane motion
4. Identify situations in which these equations are appropriate and situations when inappropriate
F. Coriolis acceleration
1. Present the equation for Coriolis acceleration
2. Discuss situations where Coriolis acceleration is important
G. Impact
1. Present the concepts of direct and oblique central impact
2. Analyze situations of direct and oblique central impact using the appropriate equations
3. Present the concept of eccentric impact

Lab Content

Not applicable.

Special Facilities and/or Equipment

When taught online, on-going access to computer with email software and hardware; email address.

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

A. Written homework, including applying equations to engineering problems
B. Discussions on the relevance and appropriate use of the equations presented in the class
C. In-class individual assessments which may include pop-quizzes and scheduled exams
D. In-class group assessments and activities
E. Comprehensive written final exam

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

A. Lecture
B. Discussion
C. Group problem-solving activities
D. Individual problem-solving activities
E. Reading texts (about 90-100 pages per week) and/or watching videos

Representative Text(s) and Other Materials

Beer, Johnston, and Cornwell. Vector Mechanics for Engineers: Dynamics. 12th ed. The McGraw-Hill Companies, 2018.

Hibbler, Russell C. Engineering Mechanics: Dynamics. 14th ed. Pearson, 2016.

Meriam and Kraige. Engineering Mechanics: Dynamics. 8th ed. Wiley, 2016.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Homework assignments: Problem sets require application of concepts and equations from class.

B. Text: Careful and regular reading and rereading of the text and lecture notes.

C. Online supplemental materials: provided by the instructor for review, which showcase more challenging concepts and aid in comprehension.

Discipline(s)

Engineering