Engineering 236
Engineering Mechanics-Dynamics
Units: 3
Prerequisites: PHYS 230 and MATH 140
Instructor: Art Gerwig
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TEXT ***Vector Mechanics for Engineers -Dynamics*** Beer, Ferdinand P. Beer and Russell E Johnston, Jr. 8th Edition, New York: McGraw-Hill.

OUTSIDE ASSIGNMENTS
Students are expected to spend a minimum of three hours per unit per week in class and additional time on outside assignments. All assignments are to be completed in a professional and legible manner. The requirement for all homework and test solutions is that it be presented in a clear and sequential format.

QUIZZES
All students must take all examinations. No make up quizzes and/or tests are given. A missed quiz/exam will result in a zero score unless prior arrangements with the instructor, prior to the date of examination, have been approved. A quiz can be expected any time on the material covered.

CALCULATORS
Programming of calculators is encouraged, but only to verify answers obtained doing hand calculation. This, however, is restricted to **working** programs that you have created **yourself**. Programming your calculator with equations and/or problem solutions is not acceptable. You are responsible to show all steps required to solve the assigned problems.

GRADES
Grades are determined by the number of accumulated points earned throughout the semester. Letter grades are based on a curve that fluctuates from quiz to quiz (test), dependent upon the groups' performance.

PROJECT
There will be one project due towards the end of the semester (Due date: TBD). It is weighed as 10% of your final grade for the class. The project will be assigned and completed by groups of (TBD).

ATTENDANCE
Since much of the material on quizzes/tests will come from the lectures, it is essential that lectures be attended. If a lecture is missed, it's your responsibility to obtain the missed

material from a fellow student. If necessary, attendance will ultimately be used to sway a borderline grade. If you know in advance, as a courtesy, drop me an email to let me know you will be out, especially if you will miss more than one class.

COURSE CONTENT
Fundamental principles of bodies in motion; kinetics and kinematics of particles; system of particles; central force; work and energy; linear and angular momentum; moments and products of inertia; vibrations and time response; engineering applications.

COURSE OBJECTIVE
The successful student will be able to

1. Apply the principles and theory of Dynamics to problems and situations that will be encountered in advanced engineering courses as well as the workplace.
2. Correctly solve problems and present the solutions in a concise, precise, and understandable manner.
3. Fabricate simple mechanical models to demonstrate certain key theoretical concepts related to the fundamental principles of Dynamics.

Outline:

Kinematics of Particles

I. Rectilinear motion of particles
II. Uniformly accelerated motion
III. Graphical solutions of rectilinear motion
IV. Curvilinear motion of particles
V. Motion relative to a frame in transition

2. Kinetics of Particles: Newton's Second Law
    1. Equations of motion
    2. Angular Momentum
    3. Central Forces
3. Kinetics of Particles: Energy and Momentum Methods
    0. Work of a force
    1. Kinetic Energy of a particle
    2. Principle of work and energy
    3. Potential energy
    4. Conservative forces
    5. Motion under a conservative central force
    6. Principle of impulse and momentum
    7. Direct central impact
    8. Direct oblique impact
4. Systems of Particles
    0. Applying Newton's Law to a system of particles
    1. Linear momentum of a system of particles
    2. Angular momentum of a system of particles
    3. Conservation of momentum for a system of particles
    4. Kinetic energy for a system of particles

5. Work-energy principle for a system of particles
6. Impulse-momentum principle for a system of particles.

5. Kinematics of Rigid Bodies
    0. Translation
    1. Rotation about a fixed axis
    2. General plane motion
    3. Absolute and relative velocity in plane motion
    4. Instantaneous center of rotation in plane motion
    5. Plane motion of a particle relative to a rotating frame of reference.
6. Plane Motion of Rigid Bodies: Forces and Acceleration
    0. Equations of motion for a rigid body
    1. Angular momentum of a rigid body in plane motion
    2. Plane motion of rigid body
    3. Systems of rigid bodies
7. Plane Motion of Rigid Bodies: Energy and Momentum Methods
    0. Principle of work and energy for a rigid body
    1. Kinetic energy of a rigid body in plane motion
    2. Conservation of energy
    3. Principle of impulse and momentum for the plane motion in a rigid body
    4. Conservation of angular momentum
    5. Impulsive motion
8. Mechanical Vibration
    0. Vibrations of particles and equations of motion
    1. Vibrations of rigid bodies and equations of motion
    2. Energy methods
    3. Forced vibrations
    4. Damped vibrations

FINAL GRADE DETERMINATION

Tests	55%
Final	35%
Quizzes, Project, Homework, Attendance and classroom participation	10%

The instructor reserves the right to change the grading breakdown as needed, as long as this change will not disadvantage any person in the course.

SLO's:
Student learning outcomes (SLOs) are general skills, knowledge, or masteries which students are expected to have after completing a course or program of study at Palomar College. SLOs are developed for every course and program offered at Palomar. The College has also identified a set of General Education/Institutional Learning Outcomes.

SLO's for ENGR 236 ENGINEERING MECHANICS, DYNAMICS
Conservation of angular momentum. Students will be asked to calculate angular velocities of objects before and after collision. Furthermore, they will be asked to present Conservation of Angular Momentum of the system with respect to the origin chosen.

Conservation of linear momentum. Students will be asked to calculate linear velocities of objects before and after collision. Furthermore, they will be asked to present conservation of Linear Momentum of the system in both X and Y directions.

Work-Energy relations. Students will be asked to calculate % mechanical energy lost during the collision.