PHYS 141 – Introductory Mechanics

Designation: Required

2009-10 catalog description: A first course in Newtonian mechanics; introduces freshman-level students to the statics and dynamics of point particles, rigid bodies, and fluids. 4 credits.

Prerequisite(s): MATH 124 or MATH 125; Concurrent registration, MATH 129. Credit will be allowed for only one of the following sequences of courses; PHYS 102-103-181-182, 131-132-181-182, 141-142-241-242, 151-152-251-252.

Textbook(s) and/or other materials:
• Sears and Zemansky’s University Physics, 12th Edition (Vol. 1) by H. D. Young & R. A. Freedman (Pearson Addison-Wesley)
• Physics 141 Lab Manual (available at ASUA Bookstore)

Course learning outcomes: A calculus-based introduction to simple motions, mechanical Energy and fluids.

Topics covered:
• Dimensional analysis: one dimensional motion and acceleration
• Vectors; two-dimensional motion; projectile motion
• Circular motion (kinematics); moving reference frames.
• Newton’s Laws and applications.
• Circular motion (dynamics)
• Work; kinetic energy; potential energy
• Conservation of momentum
• One and two dimensional collisions: center of mass
• Motion of a system of particles.
• Angular velocity and acceleration.
• Moments of inertia; torque; rotational energy and rolling motion.
• Angular momentum; conservation of angular momentum.
• Statics
• Simple harmonic oscillator; pendulums.
• Damped and forced oscillators.
• Newton’s Law of Gravity
• Kepler’s Law
• Gravitational energy.
• Fluid statics; fluid dynamics.
• Traveling waves; standing waves; sound.

Class/laboratory schedule: Three 50-minute classes and one 2-hour 50-minute lab session per week.

Contribution to criterion 5 (curriculum):
Math and basic science: 4 units
Engineering topics: 0
General education: 0
Other: 0

Relationship to program outcomes: Department Inputs Data