PHYS 215 – ENGINEERING PHYSICS I | 3 CREDITS

SYLLABUS

CATALOG DESCRIPTION

A calculus level treatment of classical mechanics and waves. Physics principles are emphasized and illustrated by examples and problem practice. Strongly recommended that students have previously taken high school physics or PHYS121. Strongly recommend that this course be taken with PHYS 215L.

Prerequisites: MATH-188 or higher with a minimum grade of C.

Semester Offered: Fall and Spring

Common Student Learning Outcomes

Upon successful completion of San Juan College programs and degrees, the student will demonstrate competency in…

BROAD AND SPECIALIZED LEARNING

Students will actively and independently acquire, apply, and adapt skills and knowledge with an awareness of global contexts.

CRITICAL THINKING

Students will think analytically and creatively to explore ideas, make connections, draw conclusions and solve problems.

CULTURAL AND CIVIC ENGAGEMENT

Students will act purposefully, reflectively, and ethically in diverse and complex environments.

EFFECTIVE COMMUNICATION

Students will exchange ideas and information with clarity in multiple contexts.

INFORMATION LITERACY

Students will be able to recognize when information is needed and have the ability to locate, evaluate, and use it effectively.

INTEGRATING TECHNOLOGIES

Students will demonstrate fluency in the application and use of technologies in multiple contexts.

Student work from this class may be randomly selected and used anonymously for assessment of course, program, and/or institutional learning outcomes. For more information, please refer to the Dean of the appropriate School.

Course Learning Outcomes

Upon successful completion of the course, the student will be able to…

1. The application of basic mathematics in the description of physical systems.
2. Kinematics in one and two dimensions.
3. Newton's three laws.
4. Principle's of conservation of energy and momentum.
5. Rotational Mechanics 6. Waves and wave interference
7. Simple harmonic motion.
8. Fluid mechanics.

Specific Learning Outcomes

Upon successful completion of the course, the student will be able to…

1. Apply dimensional/unit analysis to ascertain the consistency of mathematical expressions used to describe physical systems.
2. Use vectors in describing physical systems.
3. Calculate the magnitude and direction of a vector sum using three different methods. (i.e. graphical addition, trigonometric identities, and component addition.)
4. Evaluate "dot" and "cross" products of vectors and describe the significance role they play in modeling physical systems.
5. Derive the constant acceleration equations of kinematics by applying the principles of calculus.
6. Calculate the position, displacement, and velocity as a function of time for a projectile given its initial conditions.
7. Sketch and interpret the position and velocity versus time graphs for an object undergoing non-uniform acceleration.
8. Identify all the forces and torque's acting on an object and sketch a free body diagram for the object.
9. Calculate the acceleration, velocity, or displacement of an object that results when a constant net force or torque acts on the object.
10. Solve simple one and two dimensional collision problems using conservation of energy and momentum.
11. Distinguish between conservative and non-conservative forces.
12. Apply the work-energy theorem.
13. Evaluate simple line integrals.
14. Explain how the gradient of potential relates to its associated vector field.
15. Explain the difference between transverse and longitudinal waves.
16. Find the wavelength and speed of a wave traveling on a stretched string.
17. Find the resonant frequencies for a standing wave on a sting and for air in a pipe with one end closed.
18. Use a phasor diagram to represent a wave on a string.
19. Apply energy principles to vibrating systems.
20. Locate regions of maximum and minimum interference for two point sources emitting sound waves of equal amplitude and phase.
21. Calculate the doppler shift for a noise source moving toward or away from an observer.
22. Determine the volume of an object using Archimedes' principle.
23. Calculate the hydrostatic pressure on a diver in a static fluid.
24. Apply mass and energy conservation principles to describe the flow of ideal fluids.