PHYS G120: ALGEBRA BASED PHYSICS: MECHANICS

Item	Value
Curriculum Committee Approval Date	10/19/2021
Top Code	190200 - Physics, General
Units	4 Total Units
Hours	108 Total Hours (Lecture Hours 54; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)
Local General Education (GE)	• Area 5 Natural Sciences (GB1)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5A Physical Science (5A) • Cal-GETC 5C Laboratory Activity (5C)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5A Physical Science (5A) • IGETC 5C Laboratory Activity (5C)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B1 Physical Science (B1) • CSU B3 Laboratory Activity (B3)

Course Description

This course is an algebra/trigonometry based study of mechanics, heat, and sound. Topics include force, motion, energy, heat transfer, effects of heat, and the nature and properties of waves. PREREQUISITE: MATH G120 or achieve qualifying score on Math Placement. Transfer Credit: CSU; UC: Credit Limitation: PHYS G120, PHYS G125 and PHYS G185, PHYS G280, PHYS G285 combined: maximum credit, 1 series - deduct credit for duplication of topics. C-ID: PHYS 105, 100S. **C-ID:** PHYS 105, 100S.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Demonstrate problem solving skills involving constant acceleration equations and Newton's Laws.
3. Solve problems involving energy, energy transfer, and momentum.
4. Apply algebra to solve problems involving fluid dynamics and thermodynamics.

Course Objectives

- 1. Solve problems using constant acceleration equations.
- 2. Demonstrate the use of vectors to describe quantities that have both a magnitude and a direction.
- 3. Use Newton's laws to predict the motion of objects.
- 4. Apply Newton's Law of Universal Gravitation to predict the motion of objects under the influence of the gravitational force.
- 5. Calculate the work done by a force and use the Law of Conservation of Energy to solve problems.
- 6. Explain conservation of momentum and apply it to the solution of problems involving motion.
- 7. Explain conservation of angular momentum and apply it to the solution of problems involving motion.
- 8. Solve problems involving fluid dynamics.
- 9. Describe simple harmonic motion, wave motion, reflection, refraction, and standing waves and solve problems involving these concepts.
- 10. Define temperature, use the Kinetic-Molecular Theory, and solve problems involving heat.
- 11. Recall the First and Second Laws of Thermodynamics and use them to solve problems.

Lecture Content

Mechanics Scalars and Vectors Statics and Equilibrium Forces and Torques Kinematics (the description of motion) Position, velocity, acceleration Vector nature of these quantities Special case of motion with constant acceleration Projectile motion Dynamics (the causes of motion) Newton's three laws of motion Newton's Law of Universal Gravitation Energy and its conservation Kinetic Potential Impulse, Momentum, and Conservation of Linear Momentum Rotational Motion Fluid Mechanics Archimedes' Principle Bernoulli's Equation Pressure and Pascal's Principle Heat and Thermodynamics Measurement of Temperature Temperature Scales Heat Transfer Calorimeters Heat as another form of energy First Law of Thermodynamics Second Law of Thermodynamics Ideal Gases Thermodynamic properties Wave Motion and Sound Types of waves Transverse Compressional Properties of waves Velocity Frequency Wavelength Interference Diffraction Sound waves Resonance and musical instruments Doppler effect

Lab Content

Collect data with appropriate sensors and to the correct number of significant figures. Analyze data in graphical form. Perform statistical error analysis. Perform experiments involving positions, velocities, accelerations, and forces. Perform experiments involving temperature, specific heat, and thermal expansion. Perform experiments involving oscillators, standing waves, and velocity of sound.

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Reading Assignments

Textbook and instructor prepared materials. Students are encouraged to read current popular scientific articles found in newspapers and magazines and to watch scientific programs on television.

Writing Assignments

Students are expected to maintain lab notebooks that contain an analysis of each experiment and to write lab reports.

Out-of-class Assignments

Homework questions that emphasize problem solving.

Demonstration of Critical Thinking

Students will demonstrate the ability to think critically by analyzing given physical situations (reading word problems and interpreting them), applying the basic laws of physics toward the solution of such problems, deducing valid conclusions from their results, and then explaining these results in terms of non-mathematical ideas. From data collected in the lab students will be able to verify and "discover" the basic laws of physics and use graphs to predict the results of other experiments. Students will then take these ideas and write a lab report that describes the results of thier work, as well as answering questions related to the performance of the experiment.

Required Writing, Problem Solving, Skills Demonstration

Students are given regular homework assignments and examinations that stress problem solving skills. The laboratory portion of the course gives students practice in making measurements and using equipment, and proficiency is determined by lab exams in which each student is expected to demonstrate the ability to use a piece of equipment to the instructor. Additionly, students are expected to maintain lab notebooks that contain calculations and an analysis of each experiment.

Eligible Disciplines

Physics/Astronomy: Master's degree in physics, astronomy, or astrophysics OR bachelor's degree in physics or astronomy AND master's degree in engineering, mathematics, meteorology, or geophysics OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Giancoli, D.C.. Physics: Principles with Applications, 7th ed. Boston: Pearson, 2014 Rationale: (Legacy text) Legacy Textbook Transfer Data: (Legacy text)

Manuals Resources

1. Stein, K.M.. Instructor Prepared Materials, Golden West College , 03-07-2020