PHYS-1210: COLLEGE PHYSICS I

Cuyahoga Community College

Viewing: PHYS-1210 : College Physics I

Board of Trustees:
June 2022

Academic Term:
Fall 2022

Subject Code
PHYS - Physics

Course Number:
1210

Title:
College Physics I

Catalog Description:
Kinematics, vectors, and Newtonian mechanics (forces and motion, gravitation, energy, momentum, rotational motion, simple harmonic motion), fluids, heat, and thermodynamics. Emphasis on problem solving using algebra.

Credit Hour(s):
4

Lecture Hour(s):
3

Lab Hour(s):
3

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
MATH-0965 Intermediate Algebra; or qualified Math placement; or departmental approval.
Note: MATH-1200, 1270 or MATH-1280 taken prior to Fall 2016 will meet prerequisite requirements for this course.

Outcomes

Course Outcome(s):
Apply fundamental principles of physics to applications in engineering technology, health careers, and daily life.

Objective(s):
1. Make correct predictions involving torque and rotational motion.
2. Solve problems in fluid statics and mechanics.
3. Describe how a mechanical or industrial application in the contemporary world depends on a principle of fluid statics.
4. Identify and describe the types of energy conversions involved in different applications.
5. Explain the relevance of efficiency calculations to real world applications.
6. Convert between English and Metric units.
7. Explain a realistic outcome of misstating or not recording units in a modern world application.
8. Demonstrate the proper methods of calculating with significant figures.
9. Apply linear motion equations to solve problems involving everyday objects.

Course Outcome(s):

Apply critical thinking skills to plan and complete solutions to complex problems utilizing fundamental principles of motion, force, energy, and thermodynamics.

Objective(s):

1. Apply a problem-solving strategy to clarify a problem, identify requested information, and ascertain the concepts and equations necessary to find that information.
2. Work with the laws of energy and momentum conservation in motion problems.
3. Do simple harmonic motion problems.
4. Analyze problems involving heat and thermodynamics.
5. Integrate course material from various course topics to solve problems with multiple steps.
6. Incorporate vectors to solve motion problems and statics problems in two and three dimensions.
7. Apply Newton's three laws of motion in problems.
8. Use Newton's law of gravity in problems such as space flight.

Course Outcome(s):

Interpret given data and desired quantity, identify relevant mathematical equations, solve problems, and gauge reasonableness of solutions.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Apply a problem-solving strategy to clarify a problem, identify requested information, and ascertain the concepts and equations necessary to find that information.
2. Work with the laws of energy and momentum conservation in motion problems.
3. Apply equations for kinetic and potential energy in relevant circumstances.
4. Convert between English and Metric units.
5. Demonstrate the proper methods of calculating with significant figures.
6. Apply linear motion equations to solve problems involving everyday objects.
7. Incorporate vectors to solve motion problems and statics problems in two and three dimensions.
8. Apply Newton's three laws of motion in problems.

Course Outcome(s):

Perform, analyze, and express the results of laboratory experiments in written form.

Essential Learning Outcome Mapping:

Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Interact with an appropriate experimental apparatus to safely and properly observe and measure the motion of objects.
2. Measure and record physical data using an appropriate number of significant figures.
3. Calculate percent error and percent difference for recorded laboratory data.
4. Determine and report on likely sources of experimental error.
5. Gather and integrate information on scientific topics from credible sources, and cite sources appropriately.
6. Do laboratory experiments involving course topics, analyze the data, draw evidence-based conclusions, and report results appropriately.
7. Demonstrate an understanding of and respect for safety in the laboratory, including through response to synchronous instructor feedback.
8. Respond to synchronous instructor feedback regarding equipment setup, procedure, modifications, and data analysis.

Course Outcome(s):

Describe and utilize the scientific method.

Essential Learning Outcome Mapping:

Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Explain the steps of the scientific method.
2. Do laboratory experiments involving course topics, analyze the data, draw evidence-based conclusions, and report results appropriately.
3. Distinguish between scientific and non-scientific explanations for observed phenomena.
4. Logically evaluate evidence-based arguments.

Methods of Evaluation:

1. Quizzes
2. Hour examinations
3. Final examination
4. Formal laboratory reports
5. Informal laboratory reports
6. Problem assignments
7. Group work
8. Student presentations
9. Other or some combination of the above

Course Content Outline:

1. Measurement and units
   a. Metric units
   b. Scientific notation
   c. Uncertainty
   d. Significant figures
2. Scientific method
   a. Steps
   b. Reproducibility
3. Linear motion
   a. Distance
   b. Displacement
   c. Speed
   d. Velocity
   e. Acceleration
   f. Kinematic equations
4. Vectors
   a. Vector components
   b. Kinematic equations in 2-D
   c. Projectile motion
5. Forces
   a. Force
   b. Gravity
   c. Weight
   d. Tension
   e. Friction
   f. Centripetal Force
6. Newton's laws of motion and gravitation
   a. Inertia
   b. Newton's 1st law
   c. Net force
   d. Free body diagrams
   e. Newton's 2nd law
   f. Newton's 3rd law
7. Energy

   a. Energy
   b. Work
   c. Kinetic energy
   d. Gravitational potential energy
   e. Elastic potential energy
   f. Conservation of Energy
   g. Power
8. Linear momentum
   a. Center of mass
   b. Linear momentum
   c. Conservation of momentum
   d. Impulse
9. Rotational motion and equilibrium
   a. Rotation
   b. Angular displacement
   c. Angular velocity
   d. Angular acceleration
   e. Torque
   f. Moment of inertia
   g. Angular momentum
   h. Conservation of angular momentum
10. Simple harmonic motion
   a. Period
   b. Frequency
   c. Pendulums
   d. Oscillating masses
11. Fluid statics and mechanics
   a. Density
   b. Pressure
   c. Units of pressure
   d. Absolute pressure
   e. Gauge pressure
   f. Pascal's Principle
12. Heat
   a. Heat
   b. Specific heat capacity
   c. Latent heat
   d. Calorimetry and conservation of heat energy
   e. Heat transfer via conduction, convection, and radiation
13. Thermodynamics
   a. Temperature scales
   b. Ideal Gas Law
   c. 1st Law of Thermodynamics
   d. Pressure-volume diagrams
   e. Entropy
   f. 2nd Law of Thermodynamics
14. Laboratory work
   a. Safety in the laboratory
   b. Physical measurement
   c. Experimental error
   d. Percent error
   e. Percent difference
15. Source evaluation
   a. Currency
   b. Relevance
   c. Authority

d. Purpose
e. Evaluate arguments

Resources

Cutnell, John. *Physics*. 11th ed. Wiley, 2018.

Giancoli, Douglas. *Physics: Principles With Applications*. 7th ed. Pearson, 2014.

Giambattista, Alan. *College Physics.* 4th ed. McGraw-Hill, 2013.

Knight, Randall D; Jones, Brian; and Field, Stuart. *College Physics: A Strategic Approach*. 4th. Pearson, 2019.

Urone, Paul Peter; Hinrichs, Roger; et al. *College Physics*. Houston, Texas: OpenStax, Rice University, 2012. 2020. https://openstax.org/details/books/college-physics

Vacha, Terrance H. *Lab Manual for 1210.* Cuyahoga Community College, 2001.

Walker, James S. *Physics*. 5th. Pearson, 2017.

Wilson, Jerry D. *Physics Laboratory Experiments.* 8th ed. Boston, New York: Houghton Mifflin, 2014.

Zatko, Frank. *Physics Labs with Computers, Vols 1 2.* PASCO Scientific, 1999.

Resources Other

1. Audio-visual materials: videos, dvds, audio recordings, computer programs and simulations
2. Laboratory experiments developed by current and past instructors
3. Online homework and study programs

Instructional Services

OAN Number:

Ohio Transfer 36 TMNS and Transfer Assurance Guide OSC014 and OSC021 (1 of 2 courses for OSC021, both must be taken)

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