PHYS A185H: CALCULUS-BASED PHYSICS: MECHANICS WITH LAB HONORS

Item	Value
Curriculum Committee Approval Date	09/21/2022
Top Code	190200 - Physics, General
Units	5 Total Units
Hours	126 Total Hours (Lecture Hours 72; 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
Grading Policy	Standard Letter (S)
Associate Arts Local General Education (GE)	• OC Physical/Biological Sci - AA (OB)
Associate Science Local General Education (GE)	• OCC Physical/Biological Sci-AS (OSB)
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

Formerly: Calculus-Based Physics: Mechanics Honors. The first semester of a three-semester sequence with lab (PHYS A185/PHYS A280/PHYS A285) covering a calculus-based study of all topics in fundamental physics. Topics for this first semester include kinematics, dynamics, work and energy, momentum, gravitation, simple harmonic motion, mechanical waves, and fluids. Intended for astronomy, chemistry, engineering, and physics majors, as well as students needing an extended sequence in calculus-based physics as a requirement for their major program. Enrollment Limitation: PHYS A185; students who complete PHYS A185H may not enroll in or receive credit for PHYS A185. PREREQUISITE: MATH A180, MATH A180H, or appropriate placement; and Completion of or concurrent enrollment in MATH A185, MATH A185H, or MATH A182H. ADVISORY: One year of high school physics or a semester of college physics. Transfer Credit: CSU; UC: Credit Limitation: PHYS A120, PHYS A125, PHYS A130, PHYS A135 and PHYS A185, PHYS A280, PHYS A285 combined: maximum credit, 1 series. C-ID: PHYS 205.**C-ID:** PHYS 205.

Course Level Student Learning Outcome(s)

1. State the basic principles of mechanics, define important scientific terms in these areas, and provide explanations of how they apply to real-life situations.
2. Use calculus, algebra, trigonometry, and conceptual reasoning to solve problems involving mechanics.
3. Conduct experiments using standard scientific methods, evaluate the resulting data, and construct evidence-based conclusions in a written report.

Course Objectives

- 1. Use the laws of mechanics to gain a conceptual understanding of the behavior of nature.
- 2. Use the laws and relationships of mechanics to solve problems conceptually and with mathematical rigor.
- 3. Define scientific terms and concepts precisely.
- 4. Communicate the principles of science and of physics to his or her peers.
- 5. critically evaluate scientific data and arguments encountered in daily life.
- 6. Discuss the importance of scientific methods and the concepts of physics in Western thought.
- 7. Conduct basic science experiments, analyze and reduce experimental data , produce a scientific conclusion from experimental data, and define its limits of validity.

Lecture Content

Measurement Units of measure Dimensional analysis Vectors addition, subtraction, and multiplication Motion in One Dimension Kinematics Free fall Motion in Two and Three Dimensions Projectile motion Circular motion Relative motion/velocity Particle dynamics andNewtons Laws Friction Uniform and non-uniform circular motion Momentum Impulse Conservation of momentum Collisions Center of mass Rotation Kinematics Dynamics (rotational inertia and torque) Static equilibrium Angular momentum Work and Energy Work-Energy Theorem Kinetic energy, potential energy Internal energy Conservation of Energy Power Gravitation Planetary motion Fluids Statics and dynamics, Archimedes Principle, Bernoullis Principle Oscillations and Waves Oscillators Standing waves Types of waves Interference and beats Doppler effect Sound Nature of sound Intensity and sound level

Lab Content

Motion graphs Vector analysis Free fall Newtons 2nd Law Newtons 3rd Law Forces and collisions Energy conservation Momentum conservation Buoyancy Oscillators Standing waves Speed of sound

Method(s) of Instruction

- Lecture (02)
- Lab (04)

Instructional Techniques

Lectures, reading from standard textbooks, assigned reading, laboratory exercises, computer simulations, peer learning.

Reading Assignments

2 hrs/week as assigned by instructor from texts, on-line or library research, and/or instructor handouts.

Writing Assignments

Problem solving Lab report writing Essays on special topics

Out-of-class Assignments

4 hrs/week of assignments and test preparation emphasizing problem solving and concept application.

Demonstration of Critical Thinking

Conceptual and numerical problem-solving, analysis of laboratory data, classroom responses.

Required Writing, Problem Solving, Skills Demonstration

Written lab reports in standardized format, conceptual and numerical problem-solving, analysis of laboratory data, classroom responses.

Eligible Disciplines

Physics/Astronomy: Masters degree in physics, astronomy, or astrophysics OR bachelors degree in physics or astronomy AND masters degree in engineering, mathematics, meteorology, or geophysics OR the equivalent. Masters degree required.

Textbooks Resources

1. Required Resnick, R, Halliday, D. and Krane, K.. Physics, 5th ed. New York: John Wiley Sons, 2002 Rationale: Standard textbook in common use 2. Required Young, H. , Freedman, R.. University Physics, 14th ed. San Francisco: Addison Wesley, 2016 Rationale: . 3. Required Moebs, William, et. al.. . University Physics, ed. , ed. OpenStax College, 2017 Rationale: .

Manuals Resources

1. Wilson, Jerry, and Hernandez-Hall, Cecilia. Physics Laboratory Experiments, 8th ed., Cengage Learning , 01-01-2015

Other Resources

1. Lab manual handout by the OCC physics faculty