PHYS R101: COLLEGE PHYSICS 1

Originator
jwmiller

College
Oxnard College

Discipline (CB01A)
PHYS - Physics

Course Number (CB01B)
R101

Course Title (CB02)
College Physics 1

Banner/Short Title
College Physics 1

Credit Type
Credit

Start Term
Fall 2023

Catalog Course Description
This course is an introduction to classical mechanics and thermal physics that is appropriate for non-majors. It assumes a prior knowledge of mathematics through algebra/trigonometry. Central topics include kinematics, vectors, forces, energy, rotational motion, heat, fluids, waves, and sound. The course is designed to meet the needs of students majoring in the biological sciences and science-allied fields such as architecture.

Taxonomy of Programs (TOP) Code (CB03)
1902.00 - Physics, General

Course Credit Status (CB04)
D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)
A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
E - Non-Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
Y - Not Applicable

Support Course Status (CB26)
N - Course is not a support course

Field trips
Will not be required

Grading method
(L) Letter Graded

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture
Minimum Contact/In-Class Lecture Hours
70
Maximum Contact/In-Class Lecture Hours
70

Activity

Laboratory

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
70
Total Maximum Contact/In-Class Hours
70

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class
Minimum Outside-of-Class Hours
140
Maximum Outside-of-Class Hours
140

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
210
Total Maximum Student Learning Hours
210

Minimum Units (CB07)
4
Maximum Units (CB06)
4

Prerequisites
MATH R116 or placement as determined by the college's multiple measures assessment process

Entrance Skills

Entrance Skills
Students are required an understanding of triangular relations, trigonometric functions, and vector representation so that problems involving them can be solved.

Prerequisite Course Objectives
MATH R116-Identify special triangles and their related angle and side measures;
MATH R116-Evaluate the trigonometric function of an angle in degree and radian measure;
MATH R116-Manipulate and simplify a trigonometric expression;
MATH R116-Solve trigonometric equations, triangles, and applications;
MATH R116-Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs;
MATH R116-Evaluate and graph inverse trigonometric functions;
MATH R116-Convert between polar and rectangular coordinates and equations;
MATH R116-Represent a vector (a quantity with magnitude and direction) in the form and ai+bj.

Entrance Skills
Algebraic fluency with expressions and equations. Understanding functions and graphs

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Requisite Justification

Requisite Type
Prerequisite

Requisite
MATH R116 or placement as determined by the college's multiple measures assessment process

Requisite Description
Course not in a sequence

Level of Scrutiny/Justification
Required by 4 year institution

Requisite Type
Prerequisite

Requisite
Placement as determined by the college's multiple measures assessment process

Requisite Description
Course not in a sequence

Level of Scrutiny/Justification
Content review

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	Calculate the acceleration produced on a given mass by consulting a force diagram.
2	Calculate the final linear speed of a solid sphere released from rest upon an incline.
3	Determine the average velocity of an object given a plot of its motion through time.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	Draw a diagram or cartoon that clearly and usefully depicts the salient features and characteristics of a mechanical or thermodynamic system, and is labeled or annotated so that known and unknown quantities can readily be determined by examination of the diagram and other written information that accompanies it.
2	Analyze a simple mechanical or thermodynamic system to identify applicable principles (e.g., conservation laws) that may be used to predict the future behavior or evolution of the system.
3	Solve conceptual and numerical problems related to the behavior or evolution of a mechanical or thermodynamic system by applying those principles identified above.
4	Employ appropriate mathematical tools to solve a variety of equations encountered in the study of physics, including geometric/graphical approaches, approximation techniques, and/or numerical methods.
5	Argue for or against a scientific hypothesis, supporting their conclusions by describing how various physical principles might apply to a novel situation.
6	Identify the names and major contributions of notable historical and present-day physicists whose work has expanded humankind's understanding of mechanical and thermodynamic systems.

Course Content

Lecture/Course Content

1. Measurement, review of mathematics, and philosophy
   a. Standards of length, mass, time
   b. Dimensional analysis and conversion of units
   c. Significant figures
   d. Order-of-magnitude calculations
   e. Coordinate systems and frames of reference
   f. Trigonometry review
   g. Physics as a model of our universe: advantages and limitations
2. Kinematics in one and two dimensions
   a. Displacement
   b. Average and instantaneous velocity
   c. Acceleration
      i. Motion under constant acceleration
      ii. Objects in free fall
      iii. Projectiles and parabolic trajectories

   d. Vectors and scalars
      i. Properties of vectors
      ii. Components of a vector
3. Laws of motion
   a. Concept of force
   b. Newton's laws
   c. Friction
4. Work and energy
   a. Work
   b. Kinetic energy
   c. Potential energy
   d. Work-kinetic energy theorem
   e. Conservation of energy
      i. Conservative and non-conservative forces
      ii. Conservation of mechanical energy
      iii. General conservation of energy
   f. Power
5. Momentum and collisions
   a. Momentum
   b. Impulse
   c. Elastic and inelastic collisions
   d. Elastic collisions in two dimensions (glancing collisions)
6. Circular Motion
   a. Angular speed and acceleration
   b. Rotational motion under constant angular acceleration
   c. Relations between angular and linear quantities
   d. Centripetal acceleration and centripetal force
7. Gravitation
   a. Newton's universal law of gravitation
   b. Gravitational potential energy
   c. Kepler's laws
8. Rotational statics and dynamics
   a. Torque
   b. Rotational equilibrium
   c. Center of gravity
   d. Torque and angular acceleration
   e. Rotational kinetic energy
   f. Angular momentum
      i. Conservation law
      ii. Relation to net torque
9. Solids and fluids
   a. States of matter
   b. Deformation of solids (elastic moduli)
   c. Hydrostatics
      i. Density and pressure
      ii. Buoyant forces and Archimedes' principle
   d. Hydrodynamics of ideal fluids
      i. Continuity
      ii. Bernoulli's equation
10. Vibrations and waves
   a. Hooke's law
   b. Elastic potential energy
   c. Simple harmonic motion and comparison to uniform circular motion
      i. Kinematics
      ii. Motion of pendulum
      iii. Damped oscillations
   d. Waves
      i. Motion
      ii. Types

iii. Parameters: frequency, amplitude, wavelength
iv. Waves on strings
v. Superposition, interference, and standing waves
vi. Reflection

e. Sound
i. Production
ii. Characteristics
iii. Speed
iv. Energy and intensity of sound waves
v. Doppler effect
vi. Forced vibrations and resonance
vii. Standing waves in air columns
viii. Beats

11. Thermal physics
a. Temperature
i. Zeroth law of thermodynamics
ii. Thermometers and temperature scales
iii. Thermal expansion
iv. Ideal gases
1. Ideal gas law
2. Avogadro's number
3. Kinetic theory of gases

b. Heat
i. Mechanical equivalent of heat
ii. Specific heat
iii. Conservation of energy and calorimetry
iv. Latent heat and phase changes
v. Heat transfer by conduction, convection, and radiation

c. Laws of thermodynamics
i. Heat and internal energy
ii. Work and heat
iii. First law of thermodynamics
iv. Second law of thermodynamics and heat engines
1. Reversible and irreversible processes
2. Carnot engine

Laboratory or Activity Content

None

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Written expression
Problem solving exercises

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Computational homework
Objective exams
Problem-solving exams
Quizzes
Problem-Solving Assignments

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Computer-aided presentations
Demonstrations
Distance Education
Instructor-guided interpretation and analysis
Lecture

Small group activities

Describe specific examples of the methods the instructor will use:

1. Computer aided presentation: The instructor may employ the computer to aid in the presentation of course materials which would include simulations of specific phenomena such as traveling waves and computerized graphical representations of aspects of a system such as changes in velocity.
2. Demonstrations: The instructor will demonstrate physical principals by employing equipment and other items such as catapults, oscillators, balls, and force tables. For instance, when studying projectile motion, launching a ball out of a catapult would be used so that students see the parabolic trajectory of the ball as well as other notions regarding projectile motion.
3. Distance Education: When applicable, recordings of lectures will be used to convey subject matter. Also, the use of discussion boards and virtual meeting will be used to allow students to ask questions regarding the course and its material.
4. Instructor guided analysis: The instructor will work through physics problems during lecture that investigate a given system in which the students will follow along, answering questions posed by the instructor. This will also serve as a forum for students to ask particular questions regarding the logic and methods employed to come to certain conclusions regarding said problem/system.
5. Lecture: The instructor will deliver the course subject matter via in person lectures to the students. For example, a lecture on Newton's Laws of Motion.
6. Small group activities: These may be employed in the form of group quizzes where students work together in small groups to solve some physics problems regarding current material.

Representative Course Assignments

Writing Assignments

1. The homework includes conceptual questions, typically related to the physical principles discussed in the course, that require short-essay style responses to explain an issue or to justify or refute phenomena; for example, a question may ask a student how he/she would rule if he/she were a judge in a case involving a traffic accident, based on the claims of witnesses to the accident combined with known physical principles that would support or contradict the testimony.
2. Students may complete written reports of their participation in campus or community activities related to physics.

Critical Thinking Assignments

1. Answering a wide array of homework, quiz, and exam questions requiring the analysis of a given physical system or circumstance in order to come to the correct conclusion and/or answer regarding the question and/or desired outcome. For instance; Driving down the road at a constant rate of 20 m/s, you see that a large tree branch is breaking off of a tree. The tree is 50 m away from the front of your car and the branch is 15 m high relative to your car as it begins to fall. Your car has a length of 3.0 m can accelerate at a rate of 2.5 m/s^2 or slow down at a rate of 5.0 m/s^2. To avoid being hit by the branch should you speed up, slow down, or continue at a constant rate? Justify your answer.

Reading Assignments

1. Regular textbook readings that reinforce the concepts discussed or demonstrated during the class meetings; these readings typically include theory and principles, descriptions of the results of important experiments, data tables, definitions, problem-solving examples, and practical applications of physics in everyday life and in specialized environments.
2. Library and other research needed to complete homework problems and/or prepare talks or reports.

Skills Demonstrations

None

Problem-Solving and Other Assignments (if applicable)

None

Outside Assignments

Representative Outside Assignments

1. Assigned reading from the textbook accounting for 2 hours per week.
2. Assigned conceptual and problem solving based homework that further investigates and explores the notions and theories discussed throughout the course. This will generally require 6 hours per week.
3. Studying and preparing for quizzes and exams.

Articulation

Comparable Courses within the VCCCD

PHYS M10A - General Physics I

PHYS V02A - General Physics I: Algebra/Trigonometry-Based

District General Education

A. Natural Sciences

A2. Physical Science
Approved

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable
Yes

CSU Baccalaureate List effective term:
Fall 1999

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

B1 Physical Science
Approved

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

Area F: Ethnic Studies

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

UC TCA

UC TCA
Approved

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 5A: Physical Science
Approved

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Textbook

Classic Textbook
No

Description
Serway, R.A. & Vuille, C. (2018). *College Physics* (11th). Boston, Cengage Learning.

Resource Type
Other Resource Type

Description
Supplemental handouts on selected topics prepared by the instructor..

Distance Education Addendum

Definitions

Distance Education Modalities
Hybrid (1%–50% online)
Hybrid (51%–99% online)
100% online

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.
Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.
Yes

Regular Effective/Substantive Contact

Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Other DE (e.g., recorded lectures)	The students will watch recorded lecture videos that go over the pertinent subject matter of the course.
Synchronous Dialog (e.g., online chat)	The students will join live, online meetings in which they will receive instruction, be reminded of all upcoming assignments/events, and be allowed to ask questions pertaining to the lecture and lab material. Recordings will be made available of all live meetings. Students may also be put into small groups to discuss a given class problem.
Asynchronous Dialog (e.g., discussion board)	Students will have access to a discussion board in which they can ask questions regarding the course material.
Face to Face (by student request; cannot be required)	Face to face meetings can be arranged when needed.

Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Other DE (e.g., recorded lectures)	The students will watch recorded lecture videos that go over the pertinent subject matter of the course.
Synchronous Dialog (e.g., online chat)	The students will join live, online meetings in which they will receive instruction, be reminded of all upcoming assignments/events, and be allowed to ask questions pertaining to the lecture and lab material. Recordings will be made available of all live meetings. Students may also be put into small groups to discuss a given class problem.
Asynchronous Dialog (e.g., discussion board)	Students will have access to a discussion board in which they can ask questions regarding the course material.
Face to Face (by student request; cannot be required)	Face to face meetings can be arranged when needed.

100% online Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Other DE (e.g., recorded lectures)	The students will watch recorded lecture videos that go over the pertinent subject matter of the course.
Synchronous Dialog (e.g., online chat)	The students will join live, online meetings in which they will receive instruction, be reminded of all upcoming assignments/events, and be allowed to ask questions pertaining to the lecture and lab material. Recordings will be made available of all live meetings. Students may also be put into small groups to discuss a given class problem.
Asynchronous Dialog (e.g., discussion board)	Students will have access to a discussion board in which they can ask questions regarding the course material.

Examinations

Hybrid (1%–50% online) Modality

On campus
Online

Hybrid (51%–99% online) Modality

On campus
Online

Primary Minimum Qualification

PHYSICS/ASTRONOMY

Review and Approval Dates

Department Chair
04/29/2023

Dean
05/08/2023

Technical Review
05/10/2023

Curriculum Committee
05/10/2023

DTRW-I
MM/DD/YYYY

Curriculum Committee
MM/DD/YYYY

Board
MM/DD/YYYY

CCCCO
MM/DD/YYYY

Control Number
CCC000556731

DOE/accreditation approval date
MM/DD/YYYY