PHYS-121: GENERAL PHYSICS 2

Effective Term
Fall 2026

CC Approval
03/06/2026

AS Approval
03/12/2026

BOT Approval
03/19/2026

SECTION A - Course Data Elements

Send Workflow to Initiator
No

CB04 Credit Status
Credit - Degree Applicable

Discipline

Minimum Qualifications	And/Or
Physical Sciences (Master's Degree)	

Subject Code
PHYS - Physics

Course Number
121

Department
Physics

Division
Science and Engineering (SE)

Full Course Title
General Physics 2

Short Title
General Physics 2

CB03 TOP Code
1902.00 - Physics, General

CIP Code
40.0801

CB08 Basic Skills Status
NBS - Not Basic Skills

CB09 SAM Code
E - Non-Occupational

Rationale
Fractional units (dangling units) fixed by coding of problem solving discussion as lecture. See appended faculty comments. Updates to textbook, small language improvements throughout.

SECTION B - Course Description

Catalog Course Description

This algebra-based physics course covers electricity, magnetism, optics, and modern physics. Biological and medical applications are emphasized in this course.

SECTION C - Conditions on Enrollment

Open Entry/Open Exit

No

Repeatability

Not Repeatable

Grading Options

Letter Grade or Pass/No Pass

Allow Audit

No

Requisites

Prerequisite(s)

Completion of PHYS-120 with a minimum grade of C.

Requisite Justification

Requisite Description

Course in a Sequence

Subject

PHYS

Course #

120

Level of Scrutiny

Content Review

Upon entering this course, students should be able to:

1. Use the units of metric measurement and be able to convert from one unit to another.
2. Solve problems in kinematics using the concepts of velocity and acceleration.
3. Use the trigonometric functions to solve vector problems.
4. Analyze force and motion using Newton's Laws of Motion.
5. Draw free body diagrams to find unknown forces.
6. Use the concepts of centripetal force and Kepler's Laws of satellite motion to solve problems.
7. Use the conservation of energy and momentum in solving motion and collision problems.
8. Analyze a physical situation using concepts of work and energy.
9. Analyze torque, angular motion, and gyroscopic motion for static and dynamic extended systems.
10. Solve complex statics problems involving multiple forces.
11. Use the concepts of pressure, Archimedes principle and fluid flow in solving problems.
12. Analyze and solve problems in areas of simple harmonic motion and wave motion.
13. Calculate a Doppler shift in frequency.
14. Use the decibel to solve problems concerning the ear and hearing.
15. Solve perfect gas law and calorimetry problems.
16. Use the laws of thermodynamics to solve heat engine problems.
17. Demonstrate understanding of Write a short essay on the processes of heat transfer.
18. Analyze real-world experimental data, including appropriate use of units and significant figures.
19. Relate the results of experimental data to the physical concepts discussed in the lecture portion of the class.

SECTION D - Course Standards

Is this course variable unit?
No

Units
4.00

Lecture Hours
36.00

Lab Hours
54.00

Activity Hours
36.00

Outside of Class Hours
90

Total Contact Hours
126

Total Student Hours
216

Distance Education Approval

Is this course offered through Distance Education?
Yes

Online Delivery Methods

DE Modalities	Permanent or Emergency Only?
Entirely Online	Permanent
Hybrid	Permanent
Online with Proctored Exams	Permanent

SECTION E - Course Content

Student Learning Outcomes

	Upon satisfactory completion of the course, students will be able to:
1.	Communicate the principles of electricity and magnetism, optics, and modern physics, and solve qualitative problems on these topics.
2.	Solve quantitative problems while demonstrating a thorough understanding of the application of electricity, magnetism, optics, and modern physics.
3.	Implement laboratory experiment techniques correctly during the investigation of the lecture topics and express the results clearly in writing.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1.	Use the concepts of electric fields, voltage, capacitance, and batteries to solve problems including calculation of electric fields due to static charge distributions and magnetic fields due to current distributions.
2.	Solve problems using Coulomb's Law and Ohm's Law.
3.	Analyze electrical circuits (both D.C. and) using Kirchoff's current and voltage rules including consideration of current, potential difference, and power dissipation for each element.
4.	Calculate magnetic forces on moving charged particles including the trajectory of a single charged particle in a magnetic field and torques acting on current loops.
5.	Describe a defibrillator, magnetic declination, eddy currents, or a ferrite core antenna.
6.	Draw ray diagrams (the path of a light ray) for mirror and lens devices to find the location and size of an image.

7.	Analyze situations involving interference and diffraction of light waves and apply these to situations including double slits, diffraction gratings and wide slits.
8.	Understand the limitations of classical physics and begin to develop an awareness of the importance of modern physics (i.e., quantum theory and special relativity) in the natural world.
9.	Solve problems regarding a telephoto lens or characteristic x-rays.
10.	Calculate the binding energy and half-life of nucleons.
11.	Write a short essay on the theories governing stimulated emission in a laser, a nuclear reactor, radioactive dating or nuclear fusion.
12.	Estimate the dangers of x-ray or radioactive emissions.
13.	Analyze real-world experimental data, including appropriate use of units and significant figures and relate the results of experimental data to the physical concepts discussed in the lecture portion of the class.

Course Content

1. Electric Charge and Electric Field
   a. Static electricity
   b. Coulomb's Law
   c. The electric field
   d. Field lines
2. Electric Potential and Electric Energy; Capacitance
   a. Electric potential and potential difference
   b. Equipotential lines
   c. Electric dipoles
   d. Capacitance
   e. Dielectrics
3. Electric Currents
   a. The electric battery
   b. Electric current
   c. Ohm's Law
   d. Electric power
   e. Alternating current
4. DC Circuits and Instruments
   a. Resistors in series and in parallel
   b. EMF and terminal voltage
   c. Kirchhoff's Rules
   d. Circuits containing capacitors in series and in parallel
   e. Circuits containing a resistor and a capacitor
   f. DC ammeters and voltmeters
5. Magnetism
   a. Magnets and magnetic fields
   b. Electric currents produce magnetism
   c. Force on an electric current in a magnetic field; definition of B
   d. Force on an electric charge moving in a magnetic field
   e. Magnetic field due to a straight wire
   f. Ampere's Law
   g. Torque on a current loop; magnetic dipole movement
   h. Ferromagnetism; domains
6. Electromagnetic Induction and Faraday's Law; AC Circuits
   a. Induced EMF
   b. Faraday's Law of Induction; Lenz's Law
   c. EMF induced in a moving conductor
   d. Electric generators
   e. Transformers; transmission of power
   f. Inductance
   g. LRC series AC circuit
   h. Resonance in AC circuits; oscillators
7. Electromagnetic Waves

   a. Changing electric fields produce magnetic fields; Maxwell's equations
   b. Production of electromagnetic waves
   c. Light as an electromagnetic wave and the electromagnetic spectrum
   d. Energy in EM waves
8. Light: Geometric Optics
   a. The speed o f light and index of refraction
   b. Formation of images by spherical mirrors
   c. Refraction: Snell's Law
   d. Total internal reflection; fiber optics
   e. Thin lenses
9. The Wave Nature of Light
   a. Huygens' principle and the law of refraction
   b. Interference - Young's double-split experiment
   c. The visible spectrum and dispersion
   d. Diffraction grating
   e. The spectrometer and spectroscopy
   f. Interference by thin films
   g. Polarization
10. Optical Instruments
   a. The camera
   b. The human eye
   c. The magnifying glass
   d. Telescopes
   e. Compound microscope
   f. Lens aberrations
   g. Limits of resolution; the Rayleigh criterion
   h. Resolution of telescopes and microscopes
   i. X-rays and X-ray diffraction
11. Special Theory of Relativity
   a. Galilean-Newtonian relativity
   b. The Michelson-Morley experiment
   c. Postulates of the special theory of relativity
   d. Simultaneity
   e. Time dilation and the twin paradox
   f. Length contraction
   g. Four-dimensional space-time
   h. Mass increase
   i. The ultimate speed
   j. E-mc'2; mass and energy
   k. Relativisitic addition of velocities
   l. The impact of special relativity
12. Early Quantum Theory and Models of the Atom
   a. Planck's quantum hypothesis
   b. The photoelectric effect
   c. Compton effect
   d. Wave nature of matter
   e. Electron microscopes
   f. Early models of the atom
   g. Atomic spectra
   h. The Bohr model
   i. de Broglie's hypothesis
13. Quantum Mechanics of Atoms
   a. Quantum mechanics
   b. The wave function
   c. The Heisenberg uncertainty principle
   d. Quantum mechanics of the hydrogen atom; quantum numbers
   e. Complex atoms; the exclusion principle

f. The period ic table of elements
g. X-ray spectra and atomic number

14. Nuclear Physics and Radioactivity
    a. Binding energy and nuclear forces
    b. Radioactivity
    c. Half-life
    d. Decay series
    e. Radioactive dating
15. Nuclear Energy; Effects and Uses of Radiation
    a. Nuclear reactions
    b. Nuclear fission; nuclear reactors
    c. Fusion
    d. Radiation damage
    e. Dosimetry

Methods of Instruction

Methods of Instruction

Types	Examples of learning activities
Discussion	Classroom discussion of example problems.
Lab	Physical and simulated laboratory experiments.
Lecture	Presentation of course material.

Online Adaptation

Types	Examples of learning activities
Discussion	Synchronous or asynchronous class discussion of example problems.
Lab	Participation in lab simulations and/or analysis and observation of video experiments.
Lecture	Synchronous or asynchronous video lecture.

Instructor-Initiated Online Contact Types

Announcements/Bulletin Boards
Chat Rooms
Discussion Boards
E-mail Communication
Telephone Conversations
Video or Teleconferencing

Student-Initiated Online Contact Types

Chat Rooms
Group Work

Course design is accessible

Yes

Methods of Evaluation

Methods of Evaluation

Types	Examples of classroom assessments
Exams/Tests	Exams include symbolic, numeric, conceptual, and short paragraph questions.
Homework	Numeric, symbolic, and conceptual homework will be assigned from the textbook.
Lab Activities	Lab includes data collection, analysis, and discussion.
Projects	Projects may include submitted example problem solving generated in groups, review of student note taking, and submitted practice exam drafts.

Assignments

Reading Assignments

Example reading assignment:

Read section 2.1-2.4 of the textbook. While reading, you should take notes on the important concepts and equations. You should try to work your way through the example problems, using the solutions as much as needed. Take care to explain the steps to yourself as you go.

Writing Assignments

Example Lab Report Requirements:

1) Cover Page (Typed): Include Your Name, Lab Exp. #, Lab Title, Date, and list of Lab Partners.

2) Procedure (Typed): In your own words describe the general procedure(s) for this experiment. The procedure can be in an outline format, paragraphs, or any other way that can best convey the procedure used to carry out the experiment, make measurements, and obtain the required results. Please: Do Not Just Copy the Procedure from the Lab Manual.

3) Data Sheet(s) Section: Include your recorded lab data sheets. Do Not Forget to include units, correct number of significant figures, and make sure your entries are legible.

4) Graph Section: Any graphs assigned are to be done on the computer with software that includes Regression Analysis by the method of least squares. The regression equation must be printed on the top of the graph. Each graph must be labeled with a Title and Axes description with units.

5) Calculations Section: Hand calculations, which includes providing units for each factor, term and results. Any conversions or geometric calculations are to be included. Intermediate calculations are to be provided. Your goal should be to write up your calculations so someone else can understand them.

6) Question Answer Section (Typed): Answers to assigned lab questions must be typed and spell checked.

7) Analysis and Conclusion (Typed): In this section, you must critically analyze your results, experiment procedure, measurement techniques, and include a conclusion that explains if the experiment objectives were met or not. Explain why or why not. You are expected to show clear logic and understanding of the final results and their physical meaning.

SECTION F - Textbooks and Instructional Materials

Material Type

Open Educational Resource (OER)

Author

P. P. Urone, R. Hinrichs, et. al.

Title

College Physics 2e

Edition/Version

Web version

Publisher

OpenStax

Year

2025

ISBN #

ISBN-13: 978-1-711470-83-2

Material Type

Manual

Author

Wilson, Jerry

Title

Physics Laboratory Experiments 8th Edition

Publisher

Cengage Learning

Year
2015

SECTION G - Diversity, Equity and Inclusivity

How does your course and/or course outline of record reflect strategies for accommodating and engaging diverse student populations, advancing equitable outcomes, and fostering inclusion for all students?
Multiple types of activities and content delivery are included. Courses include policies for flexible deadlines and/or lowest scores dropped. In class, students are referred to student support services.

Course Codes (Admin Only)

CB00 State ID
CCC000299725

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

CB11 Course Classification Status
Y - Credit Course

CB13 Special Class Status
N - The Course is Not an Approved Special Class

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

CB24 Program Course Status
Program Applicable

Allow Pass/No Pass
Yes

Only Pass/No Pass
No