PHYS 106: INTRODUCTION TO MODERN PHYSICS

In Workflow

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Approval Path

1. 2026-09-15T21:38:05Z
   Mikkel Jensen (mikkel.jensen): Approved for PHYS Committee Chair
2. 2026-09-15T22:22:03Z
   Michael Ray (ray): Approved for PHYS Chair
3. 2026-10-08T01:13:42Z
   Mikkel Jensen (mikkel.jensen): Approved for NSM College Committee Chair
4. 2026-10-08T15:32:08Z
   Chris Taylor (ctaylor): Approved for NSM Dean

History

1. Aug 24, 2026 by Mikkel Jensen (mikkel.jensen)

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Changes proposed by: Mikkel Jensen (218650862)

Contact(s):

Name (First Last)	Email	Phone 999-999-9999
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Catalog Title:
Introduction to Modern Physics

Class Schedule Title:
Intro To Modern Physics

Academic Group: (College)
NSM - Natural Sciences & Mathematics

Academic Organization: (Department)
Physics and Astronomy

Will this course be offered through the College of Continuing Education (CCE)?
No

Catalog Year Effective:
Fall 2027 (2027/2028 Catalog)

Subject Area: (prefix)
PHYS - Physics

Catalog Number: (course number)
106

Course ID: (For administrative use only.)
158361

Units:
3

Is the ONLY purpose of this change to update the term typically offered or the enforcement of existing requisites at registration?
No

In what term(s) will this course typically be offered?
Fall, Spring

Does this course require a room for its final exam?
Yes, final exam requires a room

This course complies with the credit hour policy:
Yes

Justification for course proposal:
The course is a GE area 5A course, and so is being updated and submitted for review per the recently approved GE Program policy. The course LOs and assessment strategies have been updated to match the new policy, and an updated syllabus is provided.

Course Description: (Not to exceed 90 words and language should conform to catalog copy.)
Basic concepts of special relativity and quantum theory of matter. Phenomenological study of atomic and molecular energy states and spectra. Elements of solid-state and nuclear physics.

Are one or more field trips required with this course?
No

Fee Course?
No

Is this course designated as Service Learning?
No

Is this course designated as Curricular Community Engaged Learning?
No

Does this course require safety training?
No

Does this course require personal protective equipment (PPE)?
No

Does this course have prerequisites?
Yes

Prerequisite:
MATH 31. PHYS 11A, PHYS 11B, and PHYS 11C or PHYS 5A and PHYS 5B.

Prerequisites Enforced at Registration?
Yes

Does this course have corequisites?
No

Graded:
Letter

Approval required for enrollment?
No Approval Required

Course Component(s) and Classification(s):
Discussion

Discussion Classification
CS#04 - Lecture /Recitation (K-factor=1 WTU per unit)
Discussion Units
3

Is this a paired course?
No

Is this course crosslisted?
No

Can this course be repeated for credit?
No

Can the course be taken for credit more than once during the same term?
No

Description of the Expected Learning Outcomes and Assessment Strategies:

List the Expected Learning Outcomes and their accompanying Assessment Strategies (e.g., portfolios, examinations, performances, pre-and post-tests, conferences with students, student papers). Click the plus sign to add a new row.

	Expected Learning Outcome	Assessment Strategies
1	Analyze relativistic effects such as time dilation, length contraction, and relativity of simultaneity.	Quizzes, homework, midterms, final exam.
2	Apply concepts of special relativity, such as Lorentz transformations (including velocity addition), relativistic momentum, and energy through problem solving.	Quizzes, homework, midterms, final exam.
3	Describe the various pre-quantum-mechanics models of the atom and their limitations.	Quizzes, homework, midterms, final exam.
4	Apply concepts of quantum mechanics such as particle-wave duality, the Heisenberg uncertainty principle, wave functions, probability density, the Pauli exclusion principle, and spin.	Quizzes, homework, midterms, final exam.
5	Identify solutions to the Schrodinger equation for example 1-dimensional potentials, such as the infinite square well potential.	Quizzes, homework, midterms, final exam.
6	Apply the Schrodinger equation to qualitatively sketch the wavefunction for various potential energies, such as the infinite square well, finite square well, and 1-dimensional harmonic oscillator.	Quizzes, homework, midterms, final exam.
7	Apply the principles of wave mechanics to explain quantum mechanical phenomena, such as quantum tunneling.	Quizzes, homework, midterms, final exam.
8	Explain some of the various applications of quantum mechanics, including the model of the Hydrogen atom, as well as other examples, such as larger atoms and nuclear physics.	Quizzes, homework, midterms, final exam.
9	Explain and apply core ideas and models concerning physical systems and mechanisms, citing critical observations, underlying assumptions and limitations.	Written out-of-class assignments, short essays.
10	Describe how scientists create explanations of natural phenomena based on the systematic collection of empirical evidence subjected to rigorous testing and/or experimentation.	Written out-of-class assignments, short essays.
11	Access and evaluate scientific information, including interpreting tables, graphs and equations.	Written out-of-class assignments, short essays.
12	Recognize evidence-based conclusions and form reasoned opinions about science-related matters of personal, public and ethical concern.	Written out-of-class assignments, short essays.

Attach a list of the required/recommended course readings and activities:

2026-F Syllabus PHYS 106.docx

Is this course required in a degree program (major, minor, graduate degree, certificate?)

Yes

Has a corresponding Program Change been submitted to Workflow?

No

Identify the program(s) in which this course is required:

Programs:
BS in Physics (General Physics)
BS in Physics (Applied Physics)
BA in Physics
BA in Physics (Teacher Preparation)
Minor in Physics
BS in Physics (Biophysics)

Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer)?

No

Will there be any departments affected by this proposed course?

No

I/we as the author(s) of this course proposal agree to provide a new or updated accessibility checklist to the Dean's office prior to the semester when this course is taught utilizing the changes proposed here.

I/we agree

University Learning Goals

Undergraduate Learning Goals:

Competence in the disciplines
Knowledge of human cultures and the physical and natural world
Intellectual and practical skills

Is this course required as part of a teaching credential program, a single subject, or multiple subject waiver program (e.g., Liberal Studies, Biology) or other school personnel preparation program (e.g., School of Nursing)?

No

Is this a General Education (GE) or Graduation Requirement (GR) course or is it being considered for GE/GR?

Is this a General Education (GE) course or is it being considered for GE?

Yes

In which GE area(s) does this apply?

5A. Physical Science

Which GE objective(s) does this course satisfy?

Use mathematical ideas to accomplish a variety of tasks.
Gain a general understanding of current theory, concepts, knowledge, and scientific methods pertaining to the nature of the physical universe, ecosystems, and life on this planet.

Attach Course Syllabus with Detailed Outline of Weekly Topics:

2026-F Syllabus PHYS 106.docx

Syllabi must include: GE area outcomes listed verbatim; catalog description of the course; prerequisites, if any; student learning objectives; assignments; texts; reading lists; materials; grading system; exams and other methods of evaluation.

Will more than one section of this course be offered?

No

General Education - Area 5A: Physical Science

Section 1.

"Indicate in written statements how the course meets the following criteria for Area 5A. Relate the statements to the course syllabus and outline. Be as succinct as possible.

General Criteria:

Is an introductory course with no college level prerequisites.

The GE policy states that GE courses “usually have no prerequisites” because they are intended for students without specialized disciplinary preparation, but also states that "Upper division courses may be somewhat narrower in scope than lower division courses and they may require more specialized preparation" (p.19).
As such, the policy does not prohibit UD GE courses having college prerequisites. Since PHYS 106 is somewhat narrower in scope and requires more specialized preparation, as described by the GE policy, the course has subject-specific prerequisites, in addition to the Area A completion and sophomore status required by all UD GE courses.

Emphasizes general principles and concepts having a broad range of application and is not restricted to specialized topics.

Throughout the course, students study general principles of the scientific method, as well as key historical scientific discoveries of the early 1900s. As part of this process, they learn how to apply scientific methods which, while taught on topics of modern physics, extend to science in general.

Introduces students to one or more of the disciplines whose purpose is to acquire knowledge of the physical universe.

The course introduces students to both the history and applications of modern physics, and emphasizes the experimental and theoretical reasoning by which physicists acquire knowledge of the physical world.

Specific Criteria:

A student will be able to explain and apply core ideas and models concerning physical systems and mechanisms, citing critical observations, underlying assumptions and limitations.

Students develop models of special relativity and early quantum mechanics in the course. As part of the curriculum, students study the experiments and theoretical advances that lead to the new theories and revealed limitations of classical (19th century) physics. Students also explore in what ways these new models are limited, e.g., how special relativity only describes inertial reference frames with 0 acceleration.

A student will be able to describe how scientists create explanations of natural phenomena based on the systematic collection of empirical evidence subjected to rigorous testing and/or experimentation.

Students describe in their writing assignments key experiments or ideas that led to the developments of new scientific theories in the early 20th century. These include, among other things, Einstein's thought experiments on the speed of light, the Michelson-Morley experiment proving the invariance of the speed of light, the empirical photoelectric effect experiments leading to the photon model, and the experiments of the subatomic particles (e.g., the Rutherford and Thomson experiments).

A student will be able to access and evaluate scientific information, including interpreting tables, graphs and equations.

The course is a quantitative and mathematically rigorous introduction to modern physics, and students routinely interact with data, graphs, and equations.

A student will be able to recognize evidence-based conclusions and form reasoned opinions about science-related matters of personal, public, and ethical concern.

Students periodically submit writing assignments as part of which they are asked to relate the topics of the course to their personal concerns (e.g., goals, interests, etc.), as well as the public sphere.

Includes a writing component described on course syllabus

l) If course is lower division, formal and/or informal writing assignments encouraging students to think through course concepts using at least one of the following: periodic lab reports, exams which include essay questions, periodic formal writing assignments, periodic journals, reading logs, other. Writing in lower division courses need not be graded, but must, at a minimum, be evaluated for clarity and proper handling of terms, phrases, and concepts related to the course.

2) If course is upper division, a minimum of 1500 words of formal, graded writing. [Preferably there should be more than one formal writing assignment and each writing assignment (e.g. periodic lab reports, exams which include essay questions, a research/term paper etc.) should be due in stages throughout the semester to allow the writer to revise after receiving feedback from the instructor. Include an indication of how writing is to be evaluated and entered into course grade determination.]

The course assesses the GE LOs through a series of writing assignments. These are interspersed throughout the course (rather than having a single writing assignment), and students are given opportunities to rework their submissions to meet the LOs. The

assignments are required for all students to pass the course, since these assess the GE component of the LOs. The total writing meets the minimum of 1,500 words formal, graded writing.

Section 2.

If you would like, you may provide further information that might help the G.E. Course Review Committee understand how this course meets these criteria and/or the G.E. Program Objectives found in the CSUS Policy Manual, General Education Program, Section I.B.

n/a

Key: 3901