Physics II with Laboratory

PHYS 105/115 • Fall 2024

Centenary College of Louisiana

Instructor	Dr. David Kordahl	**Email**	dkordahl@centenary.edu
Office	Centenary Square 203B	**Lecture**	MWF 11:00–11:50 am, Mickle Hall 110
Office Hours	T 8:00–11:00 am F 12:00–3:00 pm	**Lab**	T or W 1:00–4:00 pm, Centenary Square 204

Course at a Glance

Lecture Course	PHYS 105: Physics II
Laboratory Course	PHYS 115: Physics II Laboratory
Lecture Text	Halliday, Resnick, Walker, *Fundamentals of Physics*, 12th ed.
Homework Platform	WileyPLUS
Prerequisites	MATH 115, Calculus I; PHYS 104/114, Physics I and Physics I Lab

Course Description

Physics II continues the introductory physics sequence by developing the basic elements of fluids, fields, circuits, electromagnetic waves, and optics. The course uses mathematical models to solve classic problems involving pressure and buoyancy, electric and magnetic fields, electrical potential, capacitors, current and resistance, circuits, induction, alternating current, light, and image formation. Being able to use these models to solve problems and interpret physical situations is the central measure of success in the course.

The accompanying laboratory is closely aligned with the lecture course. Each lab gives students an opportunity to explore ideas from lecture in an applied setting through measurement, circuit construction, data analysis, and physical interpretation. Some laboratory activities conclude with formal lab reports or writeups, while others conclude with lab packets involving questions and quantitative analysis.

Together, the lecture and lab emphasize physics as a practice of modeling: identifying relevant quantities, representing fields and circuits mathematically, testing relationships against data, and interpreting results physically.

Learning Goals

By the end of PHYS 105/115, students should be able to:

- describe pressure and apply Archimedes's, Pascal's, and Bernoulli's principles;
- describe electric charge and explain charging by conduction and induction;
- apply Coulomb's law to calculate electrical forces;
- use electric fields and electric potential to describe electrical interactions;

- apply Gauss's law to calculate electric fields in symmetric situations;
- analyze capacitors, dielectrics, electric current, resistance, and basic circuits;
- describe magnetic fields and magnetic forces associated with moving charges and currents;
- analyze induction, inductance, alternating current, and resonance in circuits;
- describe light as an electromagnetic wave and apply basic models of refraction, diffraction, and image formation;
- collect, graph, and interpret experimental data from fluids, electrostatics, circuits, magnetism, and optics experiments;
- compare experimental measurements with mathematical models and communicate results clearly.

Relationship Between Lecture and Lab

The lecture course develops the mathematical models used in the second semester of introductory physics. The laboratory course asks students to investigate those models experimentally, using measurements and data analysis to connect physical concepts with observed behavior.

The lab sequence mirrors the lecture sequence as closely as possible. Early labs emphasize electric charge, electrostatic force, Gauss's law, and electric potential; later labs address capacitors, Ohm's law, magnetic fields, time-dependent circuits, resonance, and light.

Assessment

PHYS 105: Physics II

The lecture grade balances participation and practice with demonstrated mastery on exams. Homework, quizzes, reflection questions, and attendance are intended to support steady engagement with the material, while exams ask students to apply the knowledge developed through that work.

Component	Weight
Tests and Final Exam	60%
Homework	20%
Quizzes	10%
Reflection Questions	5%
Attendance	5%

Problem sets, if completed in good faith, should result in substantial progress in learning the material, which should in turn be reflected in exam performance. The homework average may therefore be adjusted downward if the disparity between homework performance and demonstrated learning on exams is too large. In particular, the homework grade can be no more than 20 percentage points higher than the hour-exam average, excluding the final exam.

PHYS 115: Physics II Laboratory

The laboratory grade is points-based. Each week is worth 25 points and has one graded assignment. During preparation week, students take an open-note laboratory exam, weighted the same as a

regular week of class.

Letter Grades

Grade	Percentage Range
A	90–100%
B	80–89%
C	70–79%
D	60–69%
F	below 60%

Detailed Lecture Schedule

This schedule records the specific lecture topics and approximate textbook coverage. The pacing may be adjusted as needed, but the table reflects the intended structure of the course.

Dates	Reading	Lecture Topics
Aug. 26, 28, 30	Ch. 14	Fluids
Sept. 4, 6	Ch. 21	Coulomb's law
Sept. 9, 11	Ch. 22	Electric fields
Sept. 13, 16	Ch. 23	Gauss's law
Sept. 18	Review 1	Unit 1: forces from fluids and fields
Sept. 20		Exam 1
Sept. 23, 25	Ch. 24	Electrical potential
Sept. 27, 30; Oct. 2	Ch. 25	Capacitance and dielectrics
Oct. 4, 9, 11	Ch. 26	Current and resistance
Oct. 14, 16, 18	Ch. 27	Circuits
Oct. 21	Review 2	Unit 2: potential, capacitance, resistance, and circuits
Oct. 23		Exam 2
Oct. 25, 28, 30	Ch. 28	Magnetic forces
Nov. 1, 4, 6	Ch. 29	Magnetic fields due to currents
Nov. 8, 11	Ch. 30	Induction and inductance
Nov. 13, 15	Ch. 31	Alternating current
Nov. 18	Review 3	Unit 3: magnetic fields, induction, and alternating current
Nov. 20		Exam 3
Nov. 22, 25	Ch. 33	Electromagnetic waves
Dec. 2	Ch. 34	Images
Dec. 4	Final Review	Course review
Dec. 6		Course post-test
Dec. 12		Final Exam, 12:00–3:00 pm

Detailed Laboratory Schedule

The laboratory sequence closely mirrors the sequence of topics in PHYS 105. Each activity reinforces concepts introduced in lecture while developing experimental and data-analysis skills. The last week of lab will be a cumulative lab final, testing analytical skills developed throughout the semester.

Lab	Date(s)	Learning Outcome
Archimedes's and Bernoulli's principles	Aug. 27–28	Understanding fluid pressure and how it can be translated into buoyancy and lift
Electrical and gravitational forces	Sept. 3–4	Understanding Newton's law of universal gravitation and Coulomb's law of electrostatics
Electrostatic charge	Sept. 10–11	Understanding electric charge and charging by induction and conduction
Gauss's law	Sept. 17–18	Understanding how to calculate electric fields using Gauss's law
Electrical potential	Sept. 24–25	Understanding the relationship between electrical potential and electric field
Capacitors	Oct. 1–2	Understanding capacitors in parallel and series electrical circuits
Resistivity + Ohm's law	Oct. 15–16	Understanding the connection between resistivity and electrical resistance
Magnetic forces + fields	Oct. 22–23	Understanding the relationship between electric current and magnetic forces and fields
RC circuits	Oct. 29–30	Understanding the time-dependent behavior of charge in an RC circuit
RL circuits	Nov. 5–6	Understanding the time-dependent behavior of current in an RL circuit
RLC circuits	Nov. 12–13	Understanding resonance phenomena in circuits involving alternating current
Light	Nov. 19–20	Understanding basics of diffraction, refraction, and imaging

Laboratory Writing

Some laboratory activities are assessed through formal lab reports or writeups, while others are assessed through completed lab packets involving questions and data analysis. Formal reports follow a standard scientific structure: title, objective, introduction, materials, procedure, data, discussion, and conclusion. The purpose of this format is to help students connect experimental procedure, quantitative evidence, uncertainty, and physical interpretation.

Course Policies

Academic Honesty and the Honor Code

Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. All students at Centenary are bound by the Honor Code. It is not considered cheating in this course to share suggestions on assignments or lab submissions with peers, although the final work must ultimately be one's own unless specified otherwise. Weekly quizzes are open-book, but are expected to be completed by students on their own.

Students are required to write the following pledge at the end of any examination or assignment:

> *I have neither given nor received unauthorized aid on this examination (paper), nor have I seen anyone else do so.*

If any student has received aid or suspects others of violating the Honor Code, the following clause is to be added to the pledge: "...except as I shall report immediately to the Honor Court." The complete pledge must be written and signed by the student, shall not be abbreviated, and should never be written until the test or paper has been completed for submission. Students are bound by the Honor Code even if they fail to write the pledge on their assignment or examination.

Attendance

Attendance is required. However, students are expected not to jeopardize their own health or anyone else's health to attend class. Illness-related absences will be excused. There is no penalty for missing class if students proactively communicate with the professor and complete all required work. If a qualified professional deems remaining in classes and fulfilling the necessary requirements impossible, alternatives will be sought in coordination with Student Support Services.

For PHYS 105, more than nine unexcused absences will lead to a failing grade in the course. For PHYS 115, more than three unexcused absences will lead to a failing grade in the course.

Disability Accommodations

It is the policy of Centenary College to accommodate students with disabilities, pursuant to federal law, state law, and the College's commitment to equal educational opportunities. Any student with a disability who needs accommodations should inform the instructor at the beginning of the course. Students with disabilities need to contact Disability Services, a division of the Center for Teaching and Learning, located in the Learning Commons on the second floor of Magale Library. Disability Services can be reached by telephone at 318-869-5738.

Diversity Statement

Centenary College of Louisiana values human diversity in all its richly complex and multi-faceted forms, whether expressed through race and ethnicity, culture, political and social views, religious and spiritual beliefs, language and geographic characteristics, gender, gender identities and sexual orientations, learning and physical abilities, age, and social or economic classes.