Principles of Physics II

Last Updated: Mon, 01/05/2026

Course prefix: PHYS

Course number: 2212

Section: HP

CRN (you may add up to five):
31671

Instructor First Name: Edwin

Instructor Last Name: Greco

Semester: Spring

Academic year: 2026

Course description:

This course deals with electric and magnetic interactions, which are central to the structure of matter, to chemical and biological phenomena, and to the design and operation of most modern technology. The main goal of this course is to have you engage in a process central to science: the attempt to model a broad range of physical phenomena using a small set of powerful fundamental principles.

The specific focus is an introduction to field theory, in terms of the classical theory of electricity and magnetism. To aid in this goal you will develop computational models to visualize these fields and the interaction of charged particles. These models will be made using the Visual Python programming language. The course also emphasizes the atomic structure of matter, especially the role of electrons and protons in matter. This is a calculus-based course.

Course learning outcomes:

By the end of this course, you will be able to:

- Analyze physical systems by applying the fundamental principles of electricity and magnetism (e.g., Coulomb's Law, Gauss's Law, Ampere's Law, Faraday's Law).
- Calculate electric and magnetic fields, forces, potentials, and energies for various charge and current distributions.

- Develop and interpret 3D computational models of electromagnetic phenomena using VPython.
- Explain the behavior of electric circuits containing resistors, capacitors, and inductors from both a microscopic and macroscopic perspective.
- Describe the production and properties of electromagnetic radiation.
- Model complex physical systems by making appropriate idealizations and approximations.
- Communicate scientific reasoning and results effectively through laboratory activities.

Topics Covered

- The Electric Field: Coulomb's Law, fields of point and distributed charges, polarization, and physical integrals.
- Electric Potential: Potential difference, potential energy, and the relationship to the electric field.
- Electric Circuits: Microscopic models of current, resistance, capacitance, inductance, batteries, and DC circuits.
- The Magnetic Field: Magnetic forces, sources of magnetic fields (Ampere's Law), and atomic models of magnetism.
- Electromagnetism: Patterns of fields (Gauss's Law), motional EMF, and Faraday's Law of Induction.
- Electromagnetic Radiation: The properties of electromagnetic waves and their production by accelerating charges.

Required course materials:

In an effort to reduce cost to students, we are offering this course using a combination of instructor created content and open-access resources. This means students are not required to purchase a textbook or pay a lab fee. Our curriculum will, however, roughly follow the Matter & Interactions, Vol. 2: Electricity and Magnetism, 4th Edition by R. Chabay & B. Sherwood (John Wiley & Sons 2015). If students prefer a traditional textbook as a study aid, we recommend purchasing a used copy (even the 3rd edition should work).

The Georgia Tech Library has a few physical copies of the textbook available for students to borrow or to make photocopies. Ask at the INFODesk: Grove Level, Price Gilbert;

The lab experiments require students to have a smartphone (for video recording) and a laptop/computer (for coding and video analysis).

Grading policy:

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Grading policy

Numerical ranges for final grades are as follows:

- A = 90-100 points
- B = 80-89 points
- C = 70-79 points
- D = 60-69 points
- F = 0-59 points

Final grades will not be curved.

You can use the Canvas gradebook to keep track of your progress in this course. However, please note that the Canvas gradebook cannot accommodate our test weighing scheme or the bucket points. This causes a small but sometimes significant error in the overall grade that Canvas reports to students.

To accurately compute your final course grade, you cannot rely on the Canvas gradebook; instead you MUST use the spreadsheet found in Files > Documents >

The Core Points

All students must participate in these activities or receive a zero for the assignment. Please contact the Course Coordinator to be excused from these activities.

- 40 pts – Tests
    - Weighted: lowest scoring test is 5pts, middle score is 15pts, highest score is 20pts
- 25 pts - Final Exam
- 25 pts – Laboratory
    - 15pts for the Lab Experiments (video lab reports + peer grading)
    - 10pts for Group Problem Solving (GPS)

The Bucket Points

There are various categories of bucket point assignments totaling 20 points. Students can earn up to 10 points max toward their final grade through any combination of the bucket point activities. These assignments cannot be excused or made up; missing points are earned by completing additional bucket activities. Partial credit can be earned in all categories. No extra credit is earned from completing more than 10 bucket points.

- 6 pts - Class participation (clickers)
- 4 pts – Homework
- 2 pts - aiPlato Review Assignments
- 1 pts - Weekly previews
- 1 pt - Test wrappers
- 1 pt - Wiki resource
- 1 pt - Public lecture reviews
- 1 pt - Midterm survey

The Extra Credit

You have the opportunity to earn up to 1 point of extra credit to be added to your final course grade. This can be earned by completing the Physics Pre/Post Tests and the Problem Solving Surveys.

Attendance policy:

Lectures. Attendance to lectures is required. Class participation will be monitored through a series of in-class polling-type questions (clickers). Students must complete at least 50% of the questions in each lecture to earn the participation point for that lecture. Class participation is in the "Bucket" category of assignments, so any missed points can be made up by completing other Bucket assignments.

Lab Meetings. Attendance to the lab meetings (where students work on GPS and Lab Experiments) is mandatory. Students who need to miss a lab meeting must complete the GPS Excused Absence form to be excused from the GPS. Since Lab Experiments follow two-week cycles, missing one lab meeting does not excuse a student from completing the lab experiment.

Academic honesty/integrity statement:

Students are expected to maintain the highest standards of academic integrity. All work submitted must be original and properly cited. Plagiarism, cheating, or any form of academic dishonesty will result in immediate consequences as outlined in the university's academic integrity policy.

The policy on academic honesty as stated in the Honor Code will be fully enforced during this course for both the instructors and student. All Honor code violations will be referred to the Dean of Students office.

- Collaboration with other students in this course on homework assignments, lab assignments, and in-class activities is permitted and encouraged.
    - For lab experiments, students are allowed to collaborate in performing the experiment and collecting data, but all data analysis, coding, and video lab reports must be individual.
- Collaboration is NOT PERMITTED during tests or the final exam.
    - These activities are closed internet, closed books, closed notes, with the following exceptions:
        - Students are allowed a copy of the formula sheet found on Canvas (which will be included in the exam papers).
        - Students are allowed blank sheets of paper (which will be included in the exam papers).
        - Students are allowed a calculator (as long as it cannot communicate with other calculators, which means no smartphone calculator apps are allowed).
    - Students must work on the tests individually and receive no assistance from any other person or resource.
    - Work submitted outside of the testing period will not be graded.
- Students who post course content to online resources external to Georgia Tech (e.g, Chegg) will be referred to the Dean of Students office for Academic Misconduct.

Core IMPACTS statement(s) (if applicable):

This is a Core IMPACTS course that is part of the Technology, Mathematics & Sciences area.

Core IMPACTS refers to the core curriculum, which provides students with essential knowledge in foundational academic areas. This course will help master course content, and support students' broad academic and career goals.

This course should direct students toward a broad Orienting Question:

- How do I ask scientific questions or use data, mathematics or technology to understand the universe?

Completion of this course should enable students to meet the following Learning Outcome:

- Students will use the scientific method and laboratory procedures or mathematical and computational methods to analyze data, solve problems and explain natural phenomena.

Course content, activities and exercises in this course should help students develop the following Career-Ready Competencies:

- Inquiry and Analysis
- Problem-Solving
- Teamwork