Principles of Physics II

Last Updated: Mon, 01/05/2026

Course prefix: PHYS

Course number: 2212

Section: AUN

CRN (you may add up to five):
35613

Instructor First Name: Michael

Instructor Last Name: Schatz

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.

Topics include:

- Matter and electric field, polarization of atomic matter
- Electric fields of distributed charges, setting up physical integrals, numerical integration
- Electric potential and energy for fields
- Magnetic field, atomic model of ferromagnetism
- A microscopic view of electric circuits, surface charge model
- Capacitors, Inductors, Resistors, and Batteries
- Magnetic force, including motional emf
- Patterns of field in space (Gauss's and Ampere's laws)
- Faraday's law and non-coulomb electric field

- Electromagnetic radiation, including its production by accelerated charges and re-radiation (classical interaction of light and matter)

Course learning outcomes:

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

- Apply a small set of fundamental physical principles to a wide variety of situations.
- Use these principles to explain a wide variety of physical phenomena.
    - Communicating scientific ideas is a big part of the laboratory.
- Use these principles to predict the behavior of a variety of physical systems.
- Model complicated physical systems by making idealizations and approximations.
- Create a 3D, animated computer model of a physical situation involving particles and fields.**:**
- Apply a small set of fundamental physical principles to a wide variety of situations.
- Use these principles to explain a wide variety of physical phenomena.
    - Communicating scientific ideas is a big part of the laboratory.
- Use these principles to predict the behavior of a variety of physical systems.
- Model complicated physical systems by making idealizations and approximations.
- Create a 3D, animated computer model of a physical situation involving particles and fields.

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. The Wiki link on the left menu bar contains readings that approximately follow the course. If students prefer a traditional textbook as a study aid, we recommend purchasing a used copy of Matter and Interactions Vol. 2: Modern Mechanics, 4th Edition by R. Chabay & B. Sherwood (John Wiley & Sons 2015). Note the 3rd edition of this text is fine, too.

Grading policy:

Numerical ranges for final grades are as follows: 90-100 points = A, 80-89 points = B, 70-79 points = C, 60-69 points = D, 0-59 points = F.

We will be using the Canvas Grades to keep track of your progress in this course.

50pts - Tests (Mandatory Attendance)

- Three equally weighted tests as listed on the Course Summary given at the end of this Syllabus.

- Regrades must be submitted through Gradescope before the start of the next test
- Students with ODS exam accommodations should notify Dr Schatz

30pts - Laboratory (Mandatory Attendance)

- **15pts** will be earned for actively participating in group problem solving activities (GPS) and in laboratory experimentation.
- **15pts** will be earned for report on five individual lab experiments.

10pts - Weekly Homework

- Online, completed through WebWork
- Due twice weekly on Tuesdays and Thursdays at 11:59pm, Atlanta time.

10pts - Class Participation (Mandatory Attendance)

Class participation includes

- Responding in-class polling-type questions (clickers)
    - Each student will need to download and use the PointSolutions App (free)
    - There is no penalty for the submission of wrong answers but you must complete **at least 75%** of the polling questions in a given lecture to be eligible for full participation credit for that lecture.
- Asking questions during lecture or responding to (non-polling) questions posed by Dr. Schatz during lecture.
    - A good faith effort to ask or to respond to questions is required to be eligible for full participation credit for that lecture.

Extra Credit

You have the opportunity to earn **up to 1pt of extra credit** to be added to your final course grade. This can be earned by completing the Physics Pre-Test and the Physics Post-Test.

- If you do the **pre-test** (only available for the first week of the semester) you earn 0.5pt of extra credit.
- If you do the **post-test** (only available for the last two weeks of the semester), you can earn up to 0.5pt of extra credit, depending on your score in the post-test. Example: if you scored 80% in the post-test, then you earned 80% of 0.5pt, which is 0.4pt.
- You can do the pre-test only, or the post-test only, or both, or neither, up to you.

Attendance policy:

Attendance Policy

Attendance in lecture and lab meetings is mandatory; failure to attend will directly result in loss of points associated with each missed meeting. Each missed meeting must be explained to Dr. Schatz in person. If the absence is determined to be unexcused, the student must also discuss in person with the Pacific Program Director, Dr. Goodisman. For each unexcused absence beyond one, students will also receive a 10% final grade deduction per absence.

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 instructor 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, GPS, lab assignments, and in-class activities is permitted and encouraged. However, the following exceptions should be noted:
  - Video lab reports must only be the work of the student submitting the report.
  - Resources for solving GPS problems must be limited to those provided as part of the current course (e.g., lecture notes for this term, resources posted on this Canvas website).
- **Collaboration is not permitted during tests**
  - Students must work on the test individually and receive no assistance from any other person or outside resource.
    - Students will be provided with a formula sheet (see the Course Resources folder for a copy).
    - Students are allowed blank paper
    - Students are allowed a calculator if required (that cannot communicate with other calculators)
- **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**

Policy on Use of Generative AI

Generative AI such as ChatGPT can be a powerful tool for mastering new material, but it should be used cautiously, since AI is often wrong and can sometimes trick someone into thinking that they understand material when they don't. In this course, the use of AI on

exams is forbidden. The use of AI for GPS problem solving is not allowed, unless Dr. Schatz gives explicit permission to do so. Use on submitted homework and lab reports is permissible; however, for each submission where AI is used: 1) students must understand and be able to explain (without consulting the AI) all material they submit and 2) must, for each submission, disclose with detail and specificity how they used AI to complete the given assignment (for example, each submitted video lab report must include a explicit verbal description of any AI used.) Failure to follow these requirements will be considered Honor Code violations and handled as described above

Core IMPACTS statement(s) (if applicable):

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, and Teamwork