Syllabus for PHYS 2212

Principles of Physics II, 4 Credits

Instructor: Sven Behrens, sbehrens3@gatech.edu

Prerequisites
PHYS 2211 or PHYS 2231 (Physics I)

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 students 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 classical theory of electricity and magnetism. The course will also cover computational models to visualize electric and magnetic fields and the interaction of charged particles. These models will be developed 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:

Students who successfully complete this course will know how to quantitatively describe and analyze the interaction of charged particles with electric and magnetic fields, analyze simple electric circuits, and they will be able to describe the origin of such fields, the generation of electromagnetic radiation by accelerated charges, and re-radiation, a fundamental interaction of light and matter.

Required course materials:

None. 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. Our curriculum will, however, roughly follow the book Matter & Interactions, Vol. II: Electric and Magnetic Interactions, 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).

Course modality:

All the **lectures** in this course are **remote asynchronous.** Students should watch the pre-lecture videos AND the recorded live lectures listed in each weekly Module.

Lab Meetings have options for in-person or remote synchronous modalities. During the lab meetings, students will work in small group problem solving (**GPS**) for about two hours, followed by about an hour of working on **lab experiments**.

The **in-person** lab meetings happen in the physics lab rooms in the third floor of the CULC building.

The **remote synchronous** lab meetings happen on MS Teams. To actively participate, students will need a computer with internet access, a camera, and a microphone. They should have the camera and microphone turned on during the lab meetings.

All **exams** are taken on paper, proctored **in-person**, in one or more lecture halls on campus (locations TBD).

Grading policy:

The total course score will be calculated from scores on individual course deliverables using the following weights:

Final Exam - 25%

Weighted average of 2 tests - 30% (stronger test result: 20%, weaker test result: 10 %)

Labs – 45%

- Laboratory experiments/reports - 20%
- Contributions to Group Problem Solving sessions - 15%

Homework - 10%

(Sum: total weight of 100%)

The percentage score achieved will translate to the following letter grades

Letter grade: Percent

A: 90 or more

B: 80-89

C: 70-79

D: 60-69

F: 59 or less

Attendance policy:

Attendance of the **lab meetings** (where students work on GPS and Lab Experiments) is **mandatory**. The lowest GPS score is dropped, however, so every student gets ONE free no-questions-asked absence from the lab meetings. Beyond that, students who need to miss an additional lab meeting may only be excused if they have a documented emergency, religious obligation, or attend an Institute-approved event. They must complete a GPS Excused Absence form distributed on Canvas 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 corresponding lab experiment.

Test absences

If you have to miss a test (e.g., because of illness, or emergency, or religious obligations, etc), you need to follow the instructions in this page to request an excused absence: https://studentlife.gatech.edu/resources/class-attendance

Please contact the instructor as soon as you submit your request to the Dean of Students to let them know that you have requested documentation for an excused absence. You do NOT need to wait for the Dean of Student's office to get back to you with their decision before contacting the instructor.

The final exam score is used in place of a missing test score (we call this **"final exam replacement"**). This means that your missing test is marked as 'excused' until you take the final exam and it gets graded, then whatever grade you got in the final exam is also used in place of the missing test grade.

Excuses or Extensions for Lab Experiments

Note that a GPS excused absence DOES NOT excuse you from any of the lab experiment assignments! If you need to submit a lab report late, or are unable to submit a lab report or its associated peer grades (e.g., because of illness, academic travel, etc), then you must email the instructor as soon as possible. In general, you will get an extension on the due date to submit the lab report and/or be excused from submitting peer grades. Include the phrase "PHYS 2211 - lab report extension" in the subject line of your email to expedite the process.

Academic honesty/integrity statement:

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on an exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Permitted Collaboration

Collaboration with other students in this course on homework assignments and lab activities is permitted and encouraged. For the 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.

Prohibited Collaboration

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 smartphone calculator apps are not allowed).

Every student must work on the tests and final exam individually and receive **no assistance** from any other person or resource. This includes, but is not limited to: other students, non-students, cheat-sheets, online resources external to Georgia Tech (e.g., Chegg), or any kind of generative AI (e.g., ChatGPT). Additionally, any exam work submitted outside of the testing period will not be graded.

Students who violate the academic misconduct policies will be reported to the Office of Student Integrity (OSI).

Use of Generative AI

We encourage you to use AI tools to deepen your understanding, **provided you do the work yourself**. Here is how we recommend to use AI effectively in this course:

- **Lecture Synthesis.** Example: "I didn't quite understand the integral we solved to calculate the electric potential. Can you summarize the key steps and explain why this is needed?"
- **Self-Quizzing.** Example: "I have a test on the xxx coming up. Please generate 5 conceptual multiple-choice questions to test my understanding."
- **Code Debugging.** Example: "My GlowScript code has a syntax error on line 12. Can you help me find the typo?" However, you MUST NOT ask it to write the physics logic for you.

The "trust but verify" rule

AI models are often confident but wrong when working through math or physics problems. If an AI gives you an explanation that conflicts with your notes, or if you feel like you "sort of" get it but not fully, please come to Office Hours to discuss with an instructor -- and **bring the receipt!** Show your instructor what the AI told you. We can help you identify if the AI made a subtle physics error (which is common), or if it used advanced techniques beyond the scope of the class (it happens sometimes), or if there is a gap in your own understanding. Using AI should increase, not decrease, your engagement with faculty!

Prohibited Uses of AI

- **The Solver.** DO NOT input homework or exam review problems prompts to copy and paste an answer. This creates an illusion of competence that will evaporate during the exam. You may think you're just doing it to save time, but in the end it will come back to bite you, so don't do it.
- **Lab Reports.** You may not use AI to generate the script, voiceover, or slides for your video lab reports. The presentation must feature your voice and your logic.

Exams. The use of any AI tools during exams is strictly prohibited

Core IMPACTS statement(s):

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

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.