# PHYS 243: College Physics I

# Spring 2022

# Prof. Dreyfus

**Instructors' Contact Info:**

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| *Professor:*<br>Dr. Benjamin Dreyfus<br>bdreyfu2@gmu.edu<br>Office: EXPL 1406<br>In-person office hours: Thu 1-2 pm<br>Online office hours:<br>(or by appointment) | *Learning Assistants:*<br>Gael Abboud gabboud@gmu.edu<br>Office hours:<br>Avaneesh Kilnagar akilnaga@gmu.edu<br>Office hours:<br><br>*Recitation Instructors:*<br>Dr. Jason Lee je@gmu.edu<br>Dr. Predrag Nikolic pnikolic@gmu.edu |

**Intended Audience:** This is the first semester in a two-semester, non-calculus physics course intended primarily for students majoring in biology or other sciences, and/or applying to professional school in the health professions. It will not meet the requirements for physics, math, or engineering majors.

**Overview:** The main topics in this semester will be motion, forces, energy, momentum, fluids, and thermodynamics. But this course is about more than just physics content; it is about scientific thinking, including developing models, mathematical sense-making, coordinating multiple representations, making interdisciplinary connections, and scientific communication. That's what should stick with you even if you forget all the physics.

This course meets the requirements for **Mason Core Natural Science**. As such, the outcomes of the course include that students will:

1) Understand how scientific inquiry is based on investigation of evidence from the natural world, and that scientific knowledge and understanding:
    a. evolves based on new evidence
    b. differs from personal and cultural beliefs
2) Recognize the scope and limits of science.
3) Recognize and articulate the relationship between the natural sciences and society and the application of science to societal challenges
4) Evaluate scientific information

**Prerequisite:** No previous physics experience is required. We will use algebra (and some trig) throughout the course, so you may want to go back and review your math if it has been a while.

**Format and Course Meeting Times:**

The "lecture" portion of this course is online and asynchronous. The lectures are videos that you can watch at any time, and the assignments will also be online. You can expect to spend about 8-10 hours per week total on this course.

We will be meeting "live" once a week for group activities in recitation sections, either online or face-to-face:

- PHYS243-311: Tuesdays 10:30-11:45 am, Horizon 2009, Dr. Lee
- PHYS243-315: Wednesdays 9:00-10:15 am, online, Dr. Nikolic
- PHYS243-308: Wednesdays 10:30-11:45 am, online, Dr. Nikolic
- PHYS243-312: Thursdays 10:30-11:45 am, Horizon 2009, Dr. Dreyfus

Online recitations will take place on Zoom, and Dr. Nikolic will distribute the link to join.

The recitation sections will **not** meet during the weeks of midterm exams (February 22-24 and April 5-7), though there will be review sessions around the exams.

In addition, the lab is a separate course (PHYS244), which you may or may not need to take, depending on your major's requirements. If you are registered for the lab, you will hear separately from your lab instructor about lab meeting times.

Access to MyMason and GMU email are required to participate successfully in this course. Please make sure to update your computer and prepare yourself to begin using the online format BEFORE the first day of class. Check the IT Support Center website for help and information about Blackboard.

**Face-to-Face Recitations**

Face-to-face recitations are subject to all university COVID policies. In particular, all students (who have not obtained an approved exemption) must be fully vaccinated, and must receive a booster (if eligible) and upload documentation by February 15. All students must wear a face covering that securely covers the mouth and nose at all times. All students must complete the Mason COVID Health Check and receive a green status before going to class, and may be asked to show their green status in class. Students who do not comply with these policies may be asked to leave, and may be subject to discipline under the Student Code of Conduct.

The face-to-face recitations will take place in an active learning classroom, equipped with whiteboards and screens all around the room, and you'll get to work with a group and share your work with the rest of the class. If possible, please bring a laptop (and HDMI adapter if necessary), a dry-erase marker (or several if you want to draw in different colors), and something to erase with (this can be as simple as an old sock).

If you are required to quarantine (but still healthy enough to participate in an online class), you are welcome to join one of the online sections for that week if you are available at that time. If you can't join an online section, contact me and we can find a way for you to make up the work on your own.

**Exam Dates:**

Midterm 1: **Wednesday, February 23**

Midterm 2: **Wednesday, April 6**

FINAL EXAM: **TBA**

**Communication:**

If you have a physics question, the best place to turn first is the "Questions and Answers" forum (which you can find in our Blackboard course, in the Discussion Board). You may find that other students have already asked the same question. If not, ask your question, and you may get replies from other students, or from the Learning Assistants, or from me. You may also see unanswered questions from other students that you know the answer to; if you do, please help them out – we're all in this together!

If you email me, I will generally respond within 24 hours. Also, **I am completely away from email every week from Friday evening to Saturday evening**, so if you email during that time, I will not respond until later. I will also be completely away from email on **Fri Apr 22** (starting from the evening before).

If you want to discuss something in real time and can't make it to office hours, just let me know, and we'll set up another time to meet (either online or on campus).

**Required materials:**

- Textbook: Giancoli, *Physics: Principles with Applications*, 7th edition
- MasteringPhysics access code
- Scientific calculator (or software that does the same thing)
- Access to a computer with Internet and speakers (or headphones)
- (For students in online recitations) Access to a computer with microphone and camera

*Textbook:* The textbook is available (new and used) from the university bookstore and other sources. You can get it as a hardcover book containing chapters 1-33 (you'll need the second half if you take PHYS245 next semester), or a softcover book containing just chapters 1-15, or as an e-book. Whichever option you choose, if you buy the book with MasteringPhysics, make sure it comes with a **Modified** MasteringPhysics access code (this will enable using MasteringPhysics through Blackboard). Or you can also buy the book without MasteringPhysics, and purchase MasteringPhysics access through Blackboard.

*MasteringPhysics:* We will be using the MasteringPhysics system for online homework, and accessing it through Blackboard (so you don't need to go to the MasteringPhysics website).

**Components of the course:**

***Reading assignments:*** Your first exposure to each topic will be from reading about it in the textbook. The textbook also includes lots of example problems. You might have questions from your reading; feel free to ask them!

***Interactive lectures:*** Each week includes several "lecture" videos that you can watch on your own time. During each video, there are places where I'll tell you to pause to solve something on your own, and there will also be places where you'll be given multiple-choice questions (similar to clicker questions that you may have done in previous classes). These questions will be graded, but don't stress about this: I'll tell you the correct answer afterwards, and then you can go back and change your answer. So you can think of this as more of a participation grade.

***Assignments:*** Each week there will be several assignments to do. Some of these will be submitted through Blackboard, some will involve discussion board posts, and some will send you to MasteringPhysics. Some will involve running simulations. Students are encouraged to work in groups, but what you submit should represent your own work.

***Group activities:*** Most weeks there will be a live group activity, either in person or over Zoom (see page 2 for the times). You'll get to work with different groups of students, and the instructors will be walking around (or digitally "walking around") to visit all the groups. These activities will help you think through challenging concepts together.

***Exams:*** There will be two midterm exams during the semester, and a comprehensive final exam. The final exam will include relatively more material from the last third of the semester, but it will still cover the entire semester. All three exams will count toward your final grade, but the exam that you do best on will count for more.

The dates of the exams are shown above. You will be given a range of time to complete the exam. If you have an unavoidable conflict with any of the exam dates, please contact me immediately to make alternate arrangements. If there is an unanticipated emergency that causes you to miss an exam, contact me as soon as possible.

The exams will be administered over Blackboard. The exam will be open book and open notes. You may consult any notes that you already have in your possession before the exam begins. However, it is not open-Internet (other than accessing resources within the PHYS243 Blackboard course), and you are expected to abide by the Honor Code and work alone. You may not communicate with anyone else about the exam during the time that the exam is available.

While we will strive to minimize this, there is a possibility that there may be some mistakes in the exam grading, or that the grader misunderstands what you're trying to say. If this happens, you may request a regrade. To do this, send a clear explanation of what needs to be regraded and why. In addition to grading error, if you can make a case that you made an early error, but correctly carried out later parts that depended on that error, you can request consistency points. Again, you will have to explain your argument carefully. **Regrades may only be requested in writing** (over email or on paper). I am also more than happy to meet with you after the exam to discuss any problems that you have questions about, but the purpose of that meeting will be to help you understand the physics, not to change your grade.

**Grading:** The breakdown of your final grade will be as follows:

| **Grade component** | **Points** |
|---|---|
| Exams | 400 |
| Other assignments | 600 |
| TOTAL | 1000 |

The approximate breakdown for the non-exam assignments is 14 weeks × 42-43 points per week = 600 points total. There will be some variation from week to week, but the point breakdown for a typical week might look like:

| **Grade component** | **Points** |
|---|---|
| Interactive lectures | 10 |
| Group activity participation | 5 |
| MasteringPhysics assignments | 15 |
| Simulation and other assignments | 12 |
| **TOTAL** | **42** |

The exams will be weighted differently depending on which exam you get the highest (percentage) grade on, so that your best exam counts for more, as follows:

| **Your best exam** | **Points for Exam 1** | **Points for Exam 2** | **Points for Final Exam** |
|---|---|---|---|
| Exam 1 | *150* | 100 | 150 |
| Exam 2 | 100 | *150* | 150 |
| Final Exam | 100 | 100 | *200* |

(However, if any exam grade is changed to a zero due to an academic integrity violation, then that exam, rather than your best exam, will be given the maximum weight.)

The exams are not "curved" – i.e., the number you get on the exam is the number you get. However, the exact grading scale (i.e. what letter grade corresponds to what number of points) will be determined later in the semester, and is likely **not** to be the traditional 90-80-70-60 scale. (Instead, the minimum cutoff for an A is likely to be somewhere in the 80s.)

**Frequently asked question about grades:**

***FAQ: I submitted my homework on MasteringPhysics and got 10/10, but Blackboard says I only got 3/10! What's wrong?*** The grades are automatically synced from MasteringPhysics to Blackboard. However, this doesn't happen instantaneously. Like looking at distant stars through a telescope (where you see the stars as they were many years ago, because it takes time for the light to reach Earth), the grade you see on Blackboard might be a snapshot of what the real grade was at some point in the past (before you had submitted all your answers). So if this happens to you, don't panic! Just wait a few hours and it should all be fine.

**Academic integrity:** You are expected to observe the GMU Honor Code:

*To promote a stronger sense of mutual responsibility, trust, and fairness among all members of the Mason community, and with the desire for greater academic and personal achievement, we, the student members of the university community, have set forth this honor code:*
***Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.***

Suspected violations of the Honor Code will be referred to the Office of Academic Integrity. For more information, see http://oai.gmu.edu .

Specifically for this class,

- During all tests, you must work alone, without communicating with other students or consulting online resources (outside of the course materials). Out of respect for your personal privacy, we are not using the LockDown Browser or recording you while taking exams, and we are trusting you to be honest (and to prepare to uphold the ethical standards of your future profession). Please do not abuse this trust.
- Students are encouraged to form study groups to work on homework assignments and study the course material together. The group is responsible for ensuring that all members take part, learn the material, and understand how to do the assignments and not merely copy the other members' work.
- The secret word is frog.
- Material that is drawn from written or electronic sources must be appropriately cited. Copying and pasting from web sources without citation is considered plagiarism..

**Disability support:** All students are entitled to reasonable accommodations to enable them to participate in this class. If you have a disability or other condition that requires accommodation, please contact the Office of Disability Services (https://ds.gmu.edu) as soon as possible, and then send me the documentation so that you can receive accommodations.

**Diversity and Inclusion:** As part of the Mason community and the global physics community, we seek to create a learning environment that fosters respect for people across identities. We welcome and value individuals and their differences including race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, national origin, first language, religion, age, and disability.

**COVID-19:** We realize that we are not living in normal times. We understand that this is an unusually stressful time for many of you for a number of reasons, and we can't predict exactly how things will develop over the coming months. We all seek to support one another during this difficult time.

The assignments in this class have due dates, in order to help keep you on track so that you don't leave everything to the very end. However, we recognize that life circumstances may not make it possible to keep to this schedule. If at any point you need to complete assignments on a modified schedule, please contact me and we can make other arrangements.

**Student resources:** For complete information and links to student support resources on campus, visit https://stearnscenter.gmu.edu/knowledge-center/knowing-mason-students/student-support-resources-on-campus/

In particular, please be aware of:

- **Learning Services** (learningservices.gmu.edu)
- **University Libraries** (library.gmu.edu)
- **Writing Center** (writingcenter.gmu.edu)
- **Counseling and Psychological Services** (caps.gmu.edu)
- **Student Support and Advocacy Center** (ssac.gmu.edu)

**CLASS SCHEDULE** (See the course Blackboard site for a more detailed schedule)

| Week # | Week(s) of | Topic(s) | Chapter |
|---|---|---|---|
| 1 | Jan 24 | Introduction to physics | 1 |
| 2 | Jan 31 | Motion in 1 dimension | 2 |
| 3 | Feb 7 | Motion in 2 dimensions | 3 |
| 4-5 | Feb 14, Feb 21 | Forces | 4 |
| 6 | Feb 28 | Energy | 6 |
| 7 | Mar 7 | Momentum | 7 |
| - | Mar 14 | SPRING BREAK | - |
| 8 | Mar 21 | Circular motion and gravitation | 5 |
| 9 | Mar 28 | Rotational motion | 8 |
| 10 | Apr 4 | Oscillations | 11 |
| 11 | Apr 11 | Fluids | 10 |
| 12 | Apr 18 | Temperature and kinetic theory | 13 |
| 13 | Apr 25 | Heat | 14 |
| 14 | May 2 | Entropy | 15 |

**The "ph" in physics stands for:** phun