

Physics 104 The physics of everyday phenomena II Syllabus, Spring 2023

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By far the best way to contact me is by e-mail. Since I also teach a number of other courses, **please make sure to include the course (PHYS 104) in your email.**

office hours: MW, 2:00-3:00 pm; TR, 12:00-1:00 pm

course lecture website: [202310.22427 PHYS-104-001 \(Spring 2023\)](#)

course lab website: [202310.22428 PHYS-104-201 \(Spring 2023\)](#)

Course meeting: **lecture:** **Tuesday, Thursday 10:30 -11:45 AM, Angel Cabrera Global Center 1320B**

lab:

<i>Monday</i>	1:30 PM – 4:10 PM	PH 324
	4:30 PM – 7:10 PM	Online
<i>Tuesday</i>	4:30 PM – 7:10 PM	PH 324
	7:20 PM – 10:00 PM	PH 324

Note: Lab is a **mandatory laboratory component** to this class that. **Make sure that you are registered for both.**

Prerequisite:

PHYS 103: all material (primarily mechanics) covered in PHYS 103. Thorough knowledge of high school algebra is assumed. If you are a transfer student, if you took physics in high school or if you took PHYS 103 more than a year ago you should contact me to make sure that you do have the necessary background.

Either way you'll likely need a refresher before the beginning of the semester. I can recommend the tutorials on the website: <http://www.physicsclassroom.com/Physics-Tutorial>. I copied the top of their list of the tutorials (on the right) and placed rounded rectangles around those I consider most important for your comprehension of the material covered in this class, but you should be familiar with the content of all the tutorials listed on the right.



If you never took physics before, then, I'm sorry, but this class is not for you. Please consider PHYS 103 in the fall.

Textbook: None required. Lecture notes and all other course materials will be provided via Blackboard.

Additional materials: You'll need something to write with and on, so make sure that you have pencils or pens, notebook or paper. You may want to have a calculator handy.

Technology Requirements:

Blackboard Login Instructions: Access to My Mason 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. Navigate to the Student Support page for help and information about Blackboard. In the menu bar to the left you will find all the tools you need to become familiar with for this course.

Take time to learn each. Make sure you run a system check a few days before class. Become familiar with the attributes of Blackboard and online learning.

Course-specific Hardware/Software:

For the tests, you'll need **Respondus Lockdown Browser** (can be downloaded from Blackboard). If you have privacy, technical, or other concerns related to using this system, please contact me to make alternative arrangements.

Policies:

Work Ethic: You are responsible for keeping up with what is going on in the course, with any announcements and changes. Most importantly, you are responsible for keeping up with assignments. There is no time for makeups and there won't be any. Bottom line: you must do the learning - I can only assist and provide guidance and clarity.

Withdrawal: If you need to withdraw from this course you must do it within the University established time frame.

Students with disabilities: Please contact The Office of Disability Services (SUB I, Room 222, Phone 703-993-2474) if you have a learning or physical disability that will require accommodation in this class. You must obtain the proper paperwork as soon as possible and contact me during the first week of classes so that I can accommodate your needs throughout the course.

Student resources: for more info go to <http://ctfe.gmu.edu/teaching/student-support-resources-on-campus/>

- ✚ A few of the resources available are listed below.
- ✚ **Counseling and Psychological Services** offers psychological services, a variety of learning services, multicultural services, and educational programs that support students' educational goals.
- ✚ **The English Language Institute** holds workshops for students whose first language is not English.
- ✚ **Mathematics Tutoring Center** offers tutoring on a walk-in basis for all George Mason students enrolled in math courses up to MATH 290
- ✚ **Office of Alcohol, Drug, and Health Education Services** provide health-related information, education and training, and resources for the Mason community.
- ✚ **Office of Disability Services** implements and coordinates reasonable accommodations and disability-related services that afford students with special needs equal access to university programs and activities.
- ✚ **Office of Diversity Programs and Services** serves students, cultural organizations, and the Mason community by promoting an environment that fosters and values human understanding and diversity. The office seeks to provide services and programs that will instill university-wide appreciation for diverse perspectives and ensure equal levels of inclusion, participation, and retention of underrepresented student groups in their quest for a quality education.
- ✚ **Sexual Assault Services** provides direct services for survivors of sexual assault and sexual assault education and information to the university community. All services are available to survivors, and to their families, significant others, and friends at no cost.
- ✚ **Student Health Services** provides high quality health care, counseling, education and prevention services in support of student learning and retention.

Academic Advising Center – 703-993-2470

Campus Counseling Center – 703-993-2380

Office of Disability Services – 703-993-2474

Math Tutoring Center – 703-993-1460

Writing Center – 703-993-1200; <http://writingcenter.gmu.edu>

University Library: "Ask a Librarian" <http://library.gmu.edu/mudge/IM/IMRef.html>

Counseling and Psychological Services (CAPS): (703) 993-2380; <http://caps.gmu.edu>

University Policies: The University Catalog, <http://catalog.gmu.edu>, is the central resource for university policies affecting student, faculty and staff conduct in university affairs.

Getting help: In addition to your instructor, you have the following resources available to you for help:

- **Physics tutor:** Planetary Hall room 2A. See <http://mason.gmu.edu/~sfisher2> for hours.

- **Learning Assistant:** Information will be announced in class and posted on Blackboard.

If you have any problems, seek help right away. Do not wait until the last minute before the assignment is due.

Computer support: Computer and/or Web support is not my responsibility. You can find help as well as available workstations at the Johnson Center or contact GMU IT Support at support@gmu.edu.

General course policies: In order to facilitate the optimum learning environment for your fellow students, the following behavior is expected:

- ✚ Class will start on time. Show up on time and be prepared to start learning
- ✚ This class requires active participation by you. You are expected to think, write, share, ask questions, and in general be engaged while you are here.
- ✚ Other than for a valid reason, please refrain from joining and leaving in the middle of the class: it is extremely distracting and discourteous to your fellow students as well as to me.
- ✚ Be respectful of yourself and others in the class.
- ✚ Keep notes and keep them orderly so you can easily find things. Whether or not you choose to keep notes by hand or just listen is up to you, but you should bring some writing implements to practice solving problems in class.

Honor code: You are expected to adhere to the George Mason University student honor code:

"George Mason University shares in the tradition of an honor system that has existed in Virginia since 1842. The Honor Code is an integral part of university life. On the application for admission, students sign a statement agreeing to conform to and uphold the Honor Code. Therefore, students are responsible for understanding the provisions of the code. In the spirit of the code, a student's word is a declaration of good faith acceptable as truth in all academic matters. Therefore, cheating and attempted cheating, plagiarism, lying, and stealing of academic work and related materials constitute Honor Code violations. To maintain an academic community according to these standards, students and faculty must report all alleged violations of the Honor Code to the Honor Committee. Any student who has knowledge of, but does not report, an Honor Code violation may be accused of lying under the Honor Code."

We expect you to hold to this standard by carefully citing sources used in your work and by doing your own work on tests and individual assignments. In an environment where group work is highly valued it can be difficult to sort out what policies apply. At a minimum follow these guidelines:

- During all tests in the COS Testing Center (Planetary Hall basement) you must work.
- Students are expected to actively collaborate on assignments identified as group, e.g. in the lab, homework, while practicing problem solving in lecture. I say collaborate, not mindlessly copy. All students working together are expected to do the work.

If you have questions about the meaning of any of these terms or if you are in doubt about what the above policies mean in regard to specific assignments, ask me for a clarification. If you are caught cheating, you will be brought before the Academic Honor Council which may result in a failing grade in this course, a permanent mark on your transcript, suspension, or expulsion.

Purpose: Physics 104 is part of the general education program at GMU. According to the GMU catalogue the purpose of general education courses is:

"...to educate, liberate, and broaden the mind, and to instill a lifelong love of learning. In conjunction with each student's major program of study and other electives, minors, or certificates, this program seeks to produce graduates with intellectual vision, creative abilities, and moral sensibility as well as skills to ensure a well-rounded and usable education."

General Education courses will ensure that all undergraduates develop skills in information gathering, written and oral communication, and analytical and quantitative reasoning; expose students to the development of knowledge by emphasizing major domains of thought and methods of inquiry; enable students to attain a breadth of knowledge that supports their specializations and contributes to their education in personal and professional ways; and encourage students to make important connections across boundaries—for example, among disciplines, between the university and the external world, and between the United States and other countries.”

Overview: This semester we will discuss simple harmonic motion and resonance, waves, electricity and magnetism, optics, relativity, atomic and nuclear and particle physics. The class will focus on concepts, and the expression of these concepts in colloquial, mathematical, graphical, and schematic descriptions. You will be asked to show your understanding in all these ways on the exams. By the end of this term, you should have a strong conceptual understanding of the above primary topics, and be able to interpret data to support that understanding.

As the instructor in this course, I am the guide through the territory of physics. I will not be pouring facts into your head. You must do the learning: I can only assist and provide guidance and clarity. I will not be talking about everything in these sections only things I think are particularly important or confusing. Part of your task as a participant in this course is to help me identify the most difficult material, and to help interpret that material for your classmates.

Learning outcomes:

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 (e.g., health, conservation, sustainability, energy, natural disasters, etc.).
4. Evaluate scientific information (e.g., distinguish primary and secondary sources, assess credibility and validity of information).
5. Apply knowledge of motion, forces, energy and momentum to explain natural physical processes and technological advances.
6. Use an understanding of mathematics along with physical principles to effectively solve problems encountered in everyday life and in the professional world.
7. Perform experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific results.
8. Assess the contributions of physics to our evolving understanding of our surroundings and the universe at large.

Class components:

Lectures **Face-to-face.**

Homework **Late assignments will not be accepted. There is no make-up homework.**

Homework assignments will be given in Blackboard. It is up to you not to cheat when working on these assignments, for you want to think of them as a training tool for doing well on the exams. Most of the questions on the tests will be similar to the homework questions.

Lab

Make sure to register for the lab portion of this course. You will have different instructors in this part of the course.

Exams There are no make-up exams.

Exams will include problems, questions, interpretations of data and graphs similar to homework assignments and practice examples done in class, lab and solved in lecture notes and handouts. Anything covered in class, lab, homework, the lecture notes, and assigned supplementary sources (including websites, applets, visualizations, and videos), may appear on the tests. In addition tests may contain short essay questions in which you'll need to demonstrate your comprehension of the material. You will be provided with a template for the test similar to that of the homework assignments. Again, wherever appropriate, make sure to show your calculations or you'll receive no credit.

Exam Schedule: There will be three take home midterm exams. No exam grade will be dropped from your final score. There are no make-up exams. You are expected to adhere to the honor code.

Test	Dates
Midterm 1	TBD
Midterm 2	TBD
Midterm 3	TBD
Final	May 16 th , 2023 10:30 am - 1:15 pm

There will be a comprehensive final. If you do well on all midterms, labs and homework, you don't need to take the final. The final tests will be delivered via Blackboard using Respondus Lockdown Browser at the COS Testing Center (<https://science.gmu.edu/ttc>) see Course-specific Hardware/Software section of Technical Requirements.

THERE WILL BE NO SO CALLED "EXTRA CREDIT PROJECT".

Grades:

In this course, you will get exactly the grade you deserve by mathematically weighted average. It is **YOUR** responsibility, not mine, to make sure you study hard enough to get the grade you want. If you have any problems, contact me **EARLY**. I will help you. If needed, get a tutor (free on-line and face-to-face tutoring approved by our Department is available. Bottom line: do not wait until the last minute.

Type of assignment	Percent
Homework	35%
Labs	20%
Tests each	total 45% 15%

Letter grade based on percentage score

Letter grade	Percent
A+	97-100
A	90-96.99
B+	87-89.99
B	80-86.99
C+	77-79.99
C	70-76.99
D	60-69.99
F	below 60

Your grade in this class will be based on homework (35%), labs (20%), 3 midterm exams (15 % each) and a final (redemption time).

I will **NOT** answer any questions about your individual grades at any time during class: you'll need to contact me by e-mail, visit my office hours, or make an appointment.

Final grades will be assigned by me at the end of the semester. Your final grade in this class will not be changed under any circumstances at any time.

NOTE: You must pass the lab to pass the course; if you get a failing grade in the lab, you will be given a failing grade in Physics 104.

How to study – a strategy for success:

As a college student you may think that this part of the syllabus is not needed. After all, you have successfully completed twelve grades of school and, unless you are a freshman, some other college classes.

Yet, the study practices you employed, while possibly adequate for many courses, may not be well tailored to the study of science. This class is cumulative, so in this class, as in any science class, full comprehension, and thus ability to master the new material, relies on your good grasp of the material previously covered, and, therefore, systematic study is vital. If a gap develops, it is hard, and soon impossible, to bridge it – it only grows wider and wider. It's sort of like trying to

follow a plot in a mystery novel after skipping several chapters. So the first message is: don't let it happen, don't let the gaps develop and grow. Regularly scheduled assignments are designed to help you keep up, but, if for whatever reason, you are having hard time understanding the material and/or doing homework, you need to act right away to remedy this situation.

Below please find my suggestions for best study practices in order to succeed in this class:

- + Watch pre-lecture videos. Bring the questions you may have to lecture.
- + Attend the classes and participate. Pay attention and ask questions whenever anything is unclear.
- + After each class read the pertinent lecture notes and review the slides (in slide show mode to get the full benefit of animations). Do not wait till the weekend, do it the day of the class when things are still fresh in your memory. Use supplementary resources referenced in the lecture notes and the slides. Visit recommended websites, watch visualizations and videos, work with simulations.
- + If there are concepts that you feel are muddy and re-reading the relevant lecture notes and/or slides does not make them clear, get help from me, and/or the tutor as soon as possible.
- + Keep an updated equation sheet. This helps to summarize and distil the information and it is handy to have these equations readily available for future use on homework and tests.
- + Complete the sample examples, questions, and problems in lecture notes, slides. Try solving them on your own without looking at the answer first.
- + Do the assigned homework and make sure you understand the solutions. The most important way to learn physics is to practice solving problems. These homework assignments are there to help you. Use them. Before submitting answers, think if they make sense. It is critical that you complete and understand the assignments in order to do well on the tests. Moreover, homework is worth a large fraction of your final grade. If you think that you can do well in this class without doing homework, check your algebra!
- + **MOST IMPORTANTLY: study systematically;** go over presented material after each class, lab, etc. Do not allow yourself to fall behind. In this class, one lecture builds upon another (or lab for that matter), so you will not be able to follow with comprehension if you skip something. This can very quickly result in a hole that grows so big it's impossible to climb out of it.
- + If you have trouble following the material, do a reboot: go back to the last topic you feel comfortable with and start by re-reading it. Chances are the roots of your problem are somewhere there. If such additional review does not help, come see me our Learning Assistants, and/or a tutor.
- + **Except for the work designated to be done individually, such as exams, work in groups.** It is always very productive to discuss things with your classmates and I encourage you to form study groups to work on practice problems, homework, and to quiz each other. I'll leave course room on Collaborate opened for you to use.
- + Write down questions and ask away! It is vital to your learning.

Never hesitate to ask questions. *There are no dumb questions, only ignorance as a result of failure to seek an answer. Your suggestions for improving the course are also requested. You have a valuable perspective on the class, and I want to hear it and learn from it.*

Tentative Course Schedule for Physics 104 Spring 2023

(subject to verification by real life)

Week	Lectures	Dates 2023	Topic
1	1, 2	Tuesday, January 24	Simple harmonic motion
		Thursday, January 26	
2	3, 4	Tuesday, January 31	Waves
		Thursday, February 2	
3	5, 6	Tuesday, February 7	Waves
		Thursday, February 9	
4	7, 8	Tuesday, February 14	Sound
		Thursday, February 16	
5	9, 10	Tuesday, February 21	Electrostatics
		Thursday, February 23	
6	11, 12	Tuesday, February 28	Electric circuits
		Thursday, March 2	
7	13, 14	Tuesday, March 7	Electric circuits continued
		Thursday, March 9	Magnetism
8	15, 16	SPRING BREAK	NO CLASSES
9	17, 18	Tuesday, March 21	Magnetism
		Thursday, March 23	
10	19, 20	Tuesday, March 28	Optics
		Thursday, March 30	
11	21, 22	Tuesday, April 6	Optics
		Thursday, April 8	
12	23, 24	Tuesday, April 13	Modern physics
		Thursday, April 15	
13	25, 26	Tuesday, April 20	Modern physics
		Thursday, April 22	
14	27, 28	Tuesday, April 27	Modern physics
		Thursday, April 29	