

DEPARTMENT OF PHYSICS UMBC

PHYS 100: Ideas in Physics

Dr. Daniel Gonzales

Spring 2026

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Office: Physics 324

Lecture: MWF 3:00 - 3:50 pm
Information Technology 227

Course Description

This 3-credit course is course meant to give the students a basic understanding of physical principles and how they relate to a wide array of phenomena. It will proceed in three units exploring different areas in which physics plays a role. The first unit is on “Everyday Physics” and it will explore concepts and phenomena that many people can experience in their day-to-day lives. The second unit will explore the cutting edge of physics research and explore topics far removed from everyday experiences. The last unit, “Physics for Voters,” will focus on physics concepts the student should be aware of if they want to be an informed citizen of our democracy.

Learning Objectives

This course, in part, will be guided by student curiosity and engagement. The aim of the course will be for students to begin recognizing the beauty of physics in their everyday lives while still learning about some of the more fantastic aspects of physics. This course also aims to increase the students’ media literacy regarding scientific claims.

Required Textbook

There is no single required textbook for the course. However, for the last unit we will draw heavily from Tom Murphy’s *Energy and Human Ambitions on a Finite Planet*. The electronic versions of the book are available for free in the link, and a printed copy is available for about \$30. Additionally, there will be a “book club” component to the course. Each student will have to read and participate in discussions related to a book of their choosing from a provided list.

Prerequisites/Corequisites

There are no prerequisites for this course.

Instructional Team & Contact Information

- **Instructor:** Daniel Gonzales: DPGonzales@UMBC.edu

How to contact me:

- Attend office hours for specific help with the course work. (Office hours schedule in the Weekly Schedule section.)
- Use the discussion board on Blackboard for general help on the course work or questions about the course structure.
- Email the instructor for anything regarding grades or other less public matters.
- **Announcements:** The instructor will utilize Blackboard announcements to communicate with the class. Students are expected to be up-to-date with reading these announcements to be properly prepared for the class.

Course Structure

This course is designed to be taken *in-person* and is *not* a hybrid or remote course. All lectures will be held in person.

Weekly Schedule

- **Lectures:** Instructor-led sessions whereby new material is presented. You are expected to have engaged with the material prescribed by the instructor. The lectures will have a no-electronics policy. Students will refrain from operating their electronics during lectures, unless they have a documented need for such devices. Students *may* have their communication devices nearby if they are expected to respond to possible emergencies.
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 - Most lecture sessions will be a typical lecture session, where the instructor presents some prescribed material related to the unit. Students are encouraged to take notes, ask questions and participate in the discussion.
 - Some lecture sessions will diverge from the standard lecture. Instead, there are times where students will form groups for a book-club style discussion to talk about a popular science book they will be reading. Additionally there will on occasion be an “Ask a Physicist Anything” (APA) sessions. During these APA sessions, students will submit before hand any questions they like regarding physics and science. The instructor will answer those questions. The questions can be about any thing the students are interested in, and the instructor will make a genuine attempt to learn the necessary information enough to provide his perspective and expertise on the subject.
- **Office Hours:** Tu 10:00 - 11:00 pm: Physics 110 & WeTh 1:00 - 2:00 pm: Physics 226A
 - Additional appointments may be made with the instructor or TAs as needed.

Assessments

Most of the assessments can be classified as participation assignments. Students are expected to participate in the discussions of the lectures in a number of ways. Additionally, there will be three exams in this course, one for each unit. The material for the exams will be taken from the regular lectures. Should some material be presented by the class or instructor that is not part of the standard lectures but that the instructor would like to include as a possibility on the quiz, the instructor will make it clear to students as the exam approaches.

The following is a list of the types of assessments that will be expected of the students.

- **In-class half sheets:** These will be handwritten responses to questions posed by the instructor during the lecture. Many of these questions will be determined by the instructor before the lecture. However, the instructor may ask some spontaneous questions that are guided by the discussion in class. There are no right answers to these questions; the student is only expected to make a genuine effort to contribute to the discussion through these half sheets. Some of the prompts for the half sheets may be asked at the beginning of class before the formal lecture has begun. Therefore, it is important that the students arrive on time to participate or risk missing out on these assignments. These are graded by the instructor on a pass/fail standard.
- **Ask a Physicist Anything (APA):** These assignments are to be typed and submitted through Blackboard. The students will simply ask a question about physics, which they are very curious about. The questions *should* be related to the unit currently being covered in class. However, should the question stray to another unit, that won't be a problem. I'd rather the students be curious and ask the questions they want than be hindered by the current topics in class. The instructor will go through these assignments and address some of them in the APA sessions, usually held on Fridays. These assignments are graded on a pass/fail basis.
- **Video Shares:** The students will share links to short format ($\lesssim 5$ min) videos on Blackboard. After students share their videos, they will then be asked to watch some of the videos shared by their fellow students and comment on them. The videos and comments should be based on prompts provided by the instructor. Comments should be meaningful, constructive, and contribute to a discussion on the video. Both the original share and comments will be graded on a pass/fail basis.
- **Book Club:** Students will have to read a book from a selection provided by the instructor. The students will rank the books according to which ones they would prefer to read. From these rankings, the instructor will make small "clubs" of students and tell each club which book they will read. The students will meet during the lecture periods to discuss a portion of the book they agreed to read. These meetings will happen about once every two weeks. During the meetings two roles will be assigned and rotated per meeting. The two roles will be the leader and the scribe. The leader will be responsible for providing questions or prompts to get the discussion going for the meeting, as well as keeping the discussion related to the book. The scribe will do their best to transcribe some notes based on the discussion. When/if possible, they should write down interesting ideas, questions, or discussion points raised by their clubmates and give credit by naming them. Scribes may use electronic devices to accomplish this goal.

All members of the club meetings are expected to participate in the discussion. Club members may bring in handwritten or printed typed notes to their meeting if they wish. These club meetings are graded on a pass/fail basis. Students attending the meetings are assumed to be participating in them. The instructor will provide a means for clubmates to report if one of their peers is not fully participating. The instructor may sit in on any portion of a club meeting. Members are also free to call in the instructor to a meeting should the discussion generate questions they wish to ask of them.

Students *may* use audiobooks if they wish for their reading. However, the instructor asks that students not be distracted with other tasks (chores, driving, other homework, etc.) when they are listening to the audiobook. Recent studies indicate that when audiobooks are used in place of print or electronic media, they provide no extra or diminished benefit to comprehension if the learner has an ability to allocate attention to the audiobook¹.

- **Exams:** There will be three in-class exams, one for each unit. The exams will be based on regular lecture material and by default will not include content from video shares, APAs, or book clubs. However, if the instructor finds content from the APA and video shares to be relevant and acceptable for a possible quiz question, he will make it known to the class well ahead of the quiz. Exams may be made of multiple-choice, true-false, short-answer, and short reflection-based questions. Exams will be worth 24% of a student's final grade.

Grading Policy

For half sheets, APAs, and video share assignments, each assignment will be graded on a pass/fail basis. Each assignment will be equally weighted. Students are allowed a number of drops from these assignments roughly equal to about 10% of the total number of assignments. These assignments, in total, will be worth 60% of a student's grade.

The book club assignments are graded on a pass/fail basis. Participation in the discussion will earn a pass for any session of the book club. Students are allowed one drop from the book club sessions. The book club meetings will be worth 10% of the students' final grade.

The quizzes will be equally weighted toward a student's final grade at 10% each. There will be no dropped grades for the quizzes.

Final letter grades will be given based on standard 10% thresholds of the student's final numerical grade ($\geq 80\%$ is a B, $\geq 90\%$ is an A etc.).

Technology Use:

UMBC requires all students to be technologically self-sufficient, which entails having a **reliable personal computer** (preferably a laptop with webcam) and **Internet access**. Since UMBC requires all students to have a computer and Internet access, financial aid may be used to meet this requirement. To learn more, students should contact their financial aid counselor at financialaid.umbc.edu/contact. In addition, the Division of Information Technology (DoIT) provides a wealth of resources and support, including tips for getting online and minimum specifications to consider when purchasing a computer (doit.umbc.edu/students).

¹Anisha Singh and Patricia A. Alexander: *Audiobooks, Print, and Comprehension: What We Know and What We Need to Know: Educational Psychology Review* (2022) 34:677-715).

- **Blackboard:** Assignments, class slides, lab notes, and announcements will be posted on Blackboard as well as your grades. It is your responsibility to keep up to date with the course materials and announcements posted on Blackboard.
- **Microsoft Word and Excel:** These programs are available for free to download as a UMBC student. The necessary features are available in desktop application version. **At some point, we will learn how to plot data with error bars. This is surprisingly difficult, if not impossible, with other spreadsheet applications, including the browser based version of Excel. You are free to use any spreadsheet application you want, but the instructional team cannot offer support for making plots in other applications. You'll be on your own.** Sorry for the bold font in the previous statements. I'm not trying to shout or be stubborn or inflexible. It really is just *that* difficult to make error bar plots in non-Excel applications. If your data evaluation required the use of a spreadsheet, attach it to your lab report. Incorporate only the main results and plots in the main text of the report.
- **Webex:** Options to meet with the TAs and/or instructor via Webex will be available. If for any reason we need to move to a fully remote course, Webex will be used for lectures and office hours. If this happens, details regarding the move to a fully remote course will be communicated to all students.

Generative AI Use Policy

This class is driven and based on student curiosity. If you need generative AI to be curious, that's a kind of problem I can't help with. Given that, here are some ways in which generative AI tools such as ChatGPT may and may not be used for this course:

- Generative AI **may not** be used for the following tasks:
 - Writing any portion of your 1/2 sheets.
 - Writing your prompts and questions when you are scheduled to be the leader for book-club.
 - Writing responses/comments for the video share assignments.
 - Answering any quiz questions.
 - Summarizing your book club reading assignments.
 - Coming up with your questions for the APA assignments. I will be particularly insulted if generative AI is used for this. These assignments are my opportunity to feed *your* curiosity and to answer *your* questions about physics and astronomy. I have no interest in answering questions for an uncurious soulless entity.
- Generative AI **may** be used for the following tasks:
 - Helping you search and find videos relevant for the video share assignments **if you are struggling**. Give it a genuine effort at first.
 - Help you rank the books for the book club according to your interests.
 - Help you find books to suggest for the book club based on your interests.

Academic Integrity and Honesty

All instances of academic misconduct will be addressed according to the UMBC Policy on [Academic Integrity](#). Examples include attempting to make use of disallowed materials on assignments, soliciting help by posting material on the internet for any assignment, looking at posted material from others online, altering graded work and submitting it for regrading, asking someone else to take an assignment in your place, copying another's work on an assignment, asking someone else to do an assignment and representing it as your own, permitting or assisting another student to carry out any of the above, or any other instance of academic misconduct. Penalties range from a grade of 0 on the assignment to an F in the course (at my discretion), and from denotation of academic misconduct on the transcript to expulsion (as determined by official hearing of the Academic Conduct Committee).

It is my firm belief that no student enrolls in a course with the intention of cheating their way through it. Rather, as a course progresses and a student falls behind their goals, they see cheating as a desperate resort to get back on track. If you find yourself in this situation, please reach out for help from the instructor and TAs. Every one of you can pass this course without resorting to cheating, let the instructional team help you out if you feel overwhelmed.

Accessibility and Disability Accommodations, Guidance and Resources

Accommodations for students with disabilities are provided for all students with a qualified disability under the Americans with Disabilities Act (ADA & ADAAA) and Section 504 of the Rehabilitation Act who request and are eligible for accommodations. The Office of Student Disability Services (SDS) is the UMBC department designated to coordinate accommodations that create equal access for students when barriers to participation exist in University courses, programs, or activities.

If you have a documented disability and need to request academic accommodations in your courses, please refer to the SDS website at sds.umbc.edu for registration information and office procedures.

SDS email: disAbility@umbc.edu

SDS phone: 410-455-2459

If you will be using SDS approved accommodations in this class, please contact the instructor to discuss implementation of the accommodations. During remote instruction requirements due to COVID, communication and flexibility will be essential for success.

Sexual Assault, Sexual Harassment, and Gender Based Violence and Discrimination

[UMBC Policy](#) in addition to federal and state law (to include Title IX) prohibits discrimination and harassment on the basis of sex, sexual orientation, and gender identity in University programs and activities. Any student who is impacted by sexual harassment, sexual assault, domestic violence, dating violence, stalking, sexual exploitation, gender discrimination, pregnancy discrimination, gender-based harassment, or related retaliation should contact the University's

Title IX Coordinator to make a report and/or access support and resources. The Title IX Coordinator can be reached at titleixcoordinator@umbc.edu or 410-455-1717.

You can access support and resources even if you do not want to take any further action. You will not be forced to file a formal complaint or police report. Please be aware that the University may take action on its own if essential to protect the safety of the community.

If you are interested in making a report, please use the [Online Reporting/Referral Form](#). Please note that, if you report anonymously, the University's ability to respond will be limited.

Notice that Faculty and Teaching Assistants are Responsible Employees with Mandatory Reporting Obligations

All faculty members and teaching assistants are considered Responsible Employees, per UMBC's [Policy on Sexual Misconduct, Sexual Harassment, and Gender Discrimination](#). Faculty and teaching assistants therefore required to report all known information regarding alleged conduct that may be a violation of the Policy to the Title IX Coordinator, even if a student discloses an experience that occurred before attending UMBC and/or an incident that only involves people not affiliated with UMBC. Reports are required regardless of the amount of detail provided and even in instances where support has already been offered or received.

While faculty members want to encourage you to share information related to your life experiences through discussion and written work, students should understand that faculty are required to report past and present sexual harassment, sexual assault, domestic and dating violence, stalking, and gender discrimination that is shared with them to the Title IX Coordinator so that the University can inform students of their rights, resources, and support. While you are encouraged to do so, you are not obligated to respond to outreach conducted as a result of a report to the Title IX Coordinator.

If you need to speak with someone in confidence, who does not have an obligation to report to the Title IX Coordinator, UMBC has a number of [Confidential Resources](#) available to support you:

[Retriever Integrated Health](#) (Main Campus): 410-455-2472; Monday – Friday 8:30 a.m. – 5 p.m.; For After-Hours Support, Call 988.

[Center for Counseling and Well-Being](#) (Shady Grove Campus): 301-738-6273; Monday-Thursday 10:00a.m. – 7:00 p.m. and Friday 10:00 a.m. – 2:00 p.m. (virtual) [Online Appointment Request Form](#)

Pastoral Counseling via [The Gathering Space for Spiritual Well-Being](#): 410-455-6795; i3b@umbc.edu; Monday – Friday 8:00 a.m. – 10:00 p.m.

Tentative Course Schedule

Week	Date	Topic
1	8/24	Basics of Physics
2	8/31	Let There Be Light!
3	9/7	What's Cooking
4	9/14	Medical Miracles
5	9/21	Exam 01
6	9/28	Special Theory of Relativity
7	10/5	General Theory of Relativity
8	10/12	Quantum Mechanics
9	10/19	Astronomy and Cosmology
10	10/26	Exam 02
11	11/2	Space Exploration
12	11/9	Energy Consumption
13	11/16	Nuclear Physics
14	11/23	Exponential Growth
15	11/30	What Comes Next?
16	12/7	Exam 03