

### SYLLABUS

#### **COURSE DESCRIPTION**

This algebra-based physics course is intended for those majoring in the life sciences and others for whom basic knowledge of physics is helpful or desired.

#### **LEARNING GOALS**

This course addresses the General education program (GEP)'s functional competency Scientific and Quantitative Reasoning. It has been approved to meet the GEP Sciences distribution requirement. In particular, it addresses the following two competencies:

- Understand and use mathematical and scientific methods of inquiry, reasoning, processes, and strategies to investigate and solve problems.
- Organize, interpret, draw inferences, and make predictions about natural or behavioral phenomena using mathematical and scientific models and theories.

By the end of this semester, students should be able to demonstrate the following abilities:

1. Apply the charge model to explain basic electric phenomena.
2. Use Coulomb's law to calculate vector properties (magnitude and direction) of electrical forces between charged particles, and electric fields of charged particles.
3. Calculate electric potential and electric potential energy of discrete charge configurations, and apply conservation of energy to solve problems.
4. Apply Ohm's law to calculate resistance, current, voltage and power in circuits.
5. Apply Kirchhoff's laws to analyze series and parallel configurations of circuits containing batteries, resistors and capacitors.
6. Calculate the magnetic fields due to moving charges, and currents in wires of different geometries, namely, straight wire and loops.
7. Calculate the magnetic forces on moving charges and on current-carrying wires in magnetic fields.
8. Understand general characteristics of waves on strings, sound waves and light waves.
9. Apply the principle of wave superposition to the phenomena of interference.
10. Understand and apply the laws of reflection and refraction.
11. Use the thin-lens equation to analyze image formation by lenses and mirrors.

**PREREQUISITE** Completed PHYS 111 with a C or better

**INSTRUCTOR** Dr. Lili Cui [lili@umbc.edu](mailto:lili@umbc.edu)

Office hour:

- MonWed 2:10-3:00 PM and Fri 9:30-10:20 AM, in PHYS 226A
- Visiting my office hour is the best way of contact. The time is set aside for you, and you will get individual attention. I'd love to use the time to know you in person.

Email policy:

- Physics related questions should be posted on the *Discord* instead of personal email so everyone in class can benefit from the discussion.
- Email is a great method for non-physics questions. Please include your full name, course number, and use your UMBC email address to ensure prompt response.

#### **REQUIRED TEXTBOOK & OTHER MATERIAL**

- A reliable computer, reliable Internet access, and a microphone
- College Physics: A Strategic Approach by Knight, Jones, and Field, 4<sup>th</sup> ed.
- PollEverywhere App
- A clear and focused mind, positive attitude, and patience

## SUCCESS STRATEGY

- Be sure you have the time required for the course. You are expected to attend all classes – lectures and labs. In addition, experience shows that success requires at least 8 hours of intensive effort outside of class each week. If you typically spend much less than 8 hours of outside study, you are unlikely to be able to learn the material. If you typically spend much more than 12 hours of outside study, you should consult with the instructor about ways to study more efficiently.
- Physics is about understanding, not memorization. Instead of only paying attention to results, it is more important to understand how you get results.
- You have many resources including the textbook, study group, your friends, Teaching Assistants, me, YouTube, AI, and more. Use them wisely.
- It is essential to develop an ability to think and learn for yourself. You must be actively engaged to learn the material, you cannot passively watch me or your classmates and expect to understand the concepts and develop problem solving skills. Cognitive science has proven that the mind must interact to learn.

Success in the course is not “a piece of cake” but can be achieved with effort and the right study strategies.

## GRADING POLICY

Type of Assignment	Percentage
Homework	15%
Quiz	5%
Lab	10%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final Exam	25%
Total	100%

I do not grade on a curve. Why should I assume that x% of you will be failing this course? If you all do an excellent job, you all deserve an A. How well your neighbor is doing should not affect your grade. Help each other and learn from each other.

90.0% or Above	A
80.0% - 89.9%	B
70.0% - 79.9%	C
60.0% - 69.9%	D
59.9% or Below	F

- There is NO extra credit at the end of the term. It is far easier to fix problems early in the semester than after the tests have been taken.
- Check your grades on Blackboard routinely. Please contact me or your TA for any grading questions within TWO days after grade is available.

## LECTURE

- Lectures focus on deepening your understanding of the more difficult concepts and developing scientific reasoning and systematic problem-solving skills, not on delivering the basic content.
- The lecture PowerPoint slides will be posted on Blackboard the night before every lecture. You are expected to print them out to take lecture notes on; it gives you the structure of every lecture and facilitates the note-taking process. But remember these slides are not the complete content of the class but only an outline, studying them out is not a substitute for attending lectures.
- Poll Everywhere App will be used to promote active learning by providing instant feedback for both the instructor and students. It is not required but highly recommended.
- If you miss one lecture, you are responsible for making up the material.

## LAB

- You must attend the lab section that you are officially registered for.
- Many of the main concepts of the course will be introduced or reinforced in weekly laboratory sessions, through direct experience with the physical world. *In some cases, later lectures will build on the understanding you achieve in lab.*
- Lab grade will be divided between your full participation and submitted work.
- Personal computers and smartphones are not allowed during the lab.
- Your lab TA will give specific guidelines.

## HOMEWORK

- A major part of what I expect you to learn in this class will come as a result of doing homework. The homework assignments are designed primarily to build conceptual understanding, develop scientific reasoning skills, and provide practice and feedback with systematic problem solving. You need to fully *understand* how to solve the assigned homework problems to do well on the quizzes and to succeed in the course.
- Individual online homework will be submitted via Blackboard, typically due at 11:59:00 pm on Tuesdays, Thursdays, and Sundays, however the due dates may be adjusted on occasions.
- Homework questions are not easy, and you will find yourself spend a lot of time on them. This is expected. Don't put off assignments until the hour before they are due. Instead start your homework early enough so you have time to get help.
- You are encouraged to work together, however, you must fully understand how to solve problems on your own.
- Since the main purpose of homework is to prepare you for the quizzes and exams, keep a careful written record of your work for future studying.
- There are websites where you can find answers to homework problems. I cannot stop you from cheating, but I strongly recommend you don't. *Consider your goals...are you trying to just get the homework done or do you actually want to learn something?* I guarantee that the more you use solutions written by someone else (or by AI), the less likely you will be able to produce your own solutions on exams.

## QUIZ

- The lectures, homework, and lab activities will help you acquire the understanding and problem-solving skills you'll need.
- Weekly quizzes will be given on Mondays at 8:00-8:50 am, online in Blackboard. You must access the quiz between 8:00-8:20 am. Each quiz is 30 minutes long.
- Quizzes are cumulative.
- Quizzes are individual work, and academic integrity will be enforced. They are open book and open note, but you cannot talk to anyone nor access Internet to search for answers. No cell phones or other communication devices.

## MIDTERM & FINAL EXAMS

- The midterm and final exams are cumulative and in person.
- You have to do well on all exams to be able to get a good grade for the course.
- A 3×5 inch index card with anything written on both sides is allowed.
- Calculator is allowed.
- See schedule for the exam dates.

## MAKE UP POLICY

Life is full of surprises so it's understandable that you might miss an assignment or two. The course policy has been set up to accommodate a few unexpected situations.

- Homework: Lowest two scores will be dropped. These count towards ALL absences (excused or unexcused) and problems with technology.
- Quiz: Lowest two quiz scores will be dropped. These count towards ALL absences (excused or unexcused) and problems with technology.
- Lab: If you must miss a lab for legitimate reasons\*, contact your TA and me as soon as possible. With written verification of your absence, you might be allowed to attend the makeup lab scheduled on Week 15. Only one make up lab is allowed for the entire semester.
- Midterm and Final Exams: If you must miss an exam for legitimate reasons\*, contact me before the scheduled exam. Failure to do so could result in a zero for that exam. With written verification of your absence, a makeup exam can be arranged.

*\*Legitimate reasons are defined as officially sanctioned UMBC activities, illness, family emergency, detention by authorities, or another insurmountable difficulty. I'll request written verification for the cause of your absence.*

## FREE TUTORING

- Physics Tutoring Center is located in PHYS 226A and it offers free walk-in tutoring. Operation hours and staffing information will be posted in our Blackboard site.
- Academic Success Center also supplies free tutoring service by appointment. To make an appointment, please visit <https://academicsuccess.umbc.edu/tutoring/>

## AI USAGE

Students are encouraged to use Artificial Intelligence (AI), such as ChatGPT, as a learning companion *rather than simply a shortcut to find answers*. When used responsibly, AI can greatly enhance learning by providing personalized explanations and guiding through problem-solving processes. However, relying on AI solely to complete assignments, without actively engaging in the material, leads to little or no understanding, which will inevitably be reflected in poor performance on individual, in-person exams. To gain the most value, students should use AI to ask questions, explore concepts, and develop the understanding necessary to solve physics problems independently.

## ACADEMIC INTEGRITY

- *"By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal."* To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook.
- All incidents of alleged Academic Misconduct will be reported.

## COURSE WEBSITE

I will put most of my teaching materials in our course site through Blackboard. After log in myUMBC, click on the “Blackboard” tab and then click on “PHYS112 - FA2025” in the “My Courses” area. You are responsible for all content delivered via Blackboard. You are *required* to logon to the course website *at least once between lectures*.

You will use the website for:

- Checking the *Announcements*.
- Accessing *Course Materials*: syllabus, lectures note, homework, lab, and etc.
- Checking the *Grades* that you have earned.

Discord server will be set up and used for 24/7 online interaction outside of the classroom.

## DISABILITIES

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 creates 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](https://sds.umbc.edu) for registration information and office procedures.

SDS email: [disAbility@umbc.edu](mailto: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.

## SEXUAL ASSAULT, SEXUAL HARASSMENT, AND GENDER BIASED 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](mailto: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

### Lab Schedule with TA Information

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00					<b>Lab 4</b> (5180) 8:00-9:50 am <i>Nicolas Neves De Oliveira</i>
8:30					
9:00					
9:30				<b>Lab 7</b> (5423) 9:30-11:20 am <i>Cailin Howe</i>	<b>Lab 8</b> (5451) 10:00-11:50 am <i>Nicolas Neves De Oliveira</i>
10:00					
10:30					
11:00				<b>Lab 6</b> (5182) 11:30-1:20 <i>Nicolas Neves De Oliveira</i>	
11:30					
12:00					
12:30					
1:00					
1:30					
2:00					
2:30				<b>Lab 2</b> (5178) 2:30-4:20 pm <i>Cailin Howe</i>	
3:00					
3:30					
4:00					
4:30					
5:00					
5:30			<b>Lab 5</b> (5181) 5:30-7:20 pm <i>Cailin Howe</i>		
6:00					
6:30					
7:00					

#### TA CONTACT INFO

Cailin Howe  
Nicolas Neves De Oliveira

[chowe3@umbc.edu](mailto:chowe3@umbc.edu)  
[nnevesd1@umbc.edu](mailto:nnevesd1@umbc.edu)

## PHYS 112 – Fall 2025 Schedule

	Date	Lecture Topic	Textbook	Lab
Week 1	Aug 27 (W)	Introduction and Electric Charge	20.1-20.2	No Lab
	Aug 29 (F)	More on Electric Charge		
Week 2	Sep 1 (M)	NO CLASS – Labor Day		No Lab
	Sep 3 (W)	Electric Force	20.3	
	Sep 5 (F)	More on Electric Force	20.6	
Week 3	Sep 8 (M)	Quiz 1 (8AM), Electric Field	20.4	Lab 1 Electric Charge and Forces
	Sep 10 (W)	Electric Field of Point Charges	20.5	
	Sep 12 (F)	More on Electric Field	20.6-20.7	
Week 4	Sept 15 (M)	Quiz 2 (8AM), Electric Potential Energy	21.1	Lab 2 Electric Field
	Sept 17 (W)	Electric Potential	21.2-21.3	
	Sept 19 (F)	More on Electric Potential	21.4	
Week 5	Sep 22 (M)	Quiz 3 (8AM), Electric Field and Potential	21.5-21.6	Lab 3 Electric Potential
	Sep 24 (W)	Capacitance	21.7	
	Sep 26 (F)	More on Capacitance	21.8	
Week 6	Sep 19 (M)	Quiz 4 (8AM), Ohm’s Law	22.1-22.5	Lab 4 Introduction to Circuit
	Oct 1 (W)	Electric Power	22.6	
	Oct 3 (F)	Exam 1 (1:00-1:50 PM, in person, location TBA)		
Week 7	Oct 6 (M)	Kirchhoff’s Law	23.1-23.2	Lab 5 Electric Current
	Oct 8 (W)	Resistor Circuit	23.3	
	Oct 10 (F)	More on Resistor Circuit	23.4-23.5	
Week 8	Oct 13 (M)	Quiz 5 (8AM), Capacitor Circuit	23.6	Lab 6 Voltage and Ohm’s law
	Oct 15 (W)	RC Circuit	23.7	
	Oct 17 (F)	RC Circuit applications	23.8	
Week 9	Oct 20 (M)	Quiz 6 (8AM), Magnets and magnetic field	24.1-24.2	Lab 7 Capacitors and RC circuits
	Oct 22 (W)	Magnetic field of long straight current	24.3	
	Oct 24 (F)	Magnetic field of current loop	24.4	
Week 10	Oct 27 (M)	Quiz 7 (8AM), Magnetic Force	24.5	Lab 8 Magnetic Field and Force
	Oct 29 (W)	Motion of charged particles in B field	24.6-24.7	
	Oct 31 (F)	Exam 2 (1:00-1:50 PM, in person, location TBA)		
Week 11	Nov 3 (M)	Wave properties	15.1-15.4	Lab 9 Wave Properties
	Nov 5 (W)	Sound Intensity and Intensity Level	15.5-15.6	
	Nov 7 (F)	Wave Interference	16.1,16.6	
Week 12	Nov 10 (M)	Quiz 8 (8AM), Interference of light	17.1-17.2	Lab 10 Wave Interference
	Nov 12 (W)	More on Interference of light		
	Nov 14 (F)	Reflection and Refraction	18.1-18.2	
Week 13	Nov 17 (M)	Quiz 9 (8AM), Total Internal Reflection	18.3	Lab 11 Ray Optics
	Nov 19 (W)	Plane Mirror and Thin lens (ray diagram)	18.4-18.5	
	Nov 21 (F)	Thin lens (lens equation)	18.7	
Week 14	Nov 24 (M)	Quiz 10 (8AM), More on thin lens		No Lab
	Nov 26 (W)	NO CLASS – Thanksgiving		
	Nov 28 (F)	NO CLASS – Thanksgiving		
Week 15	Dec 1 (M)	Modeling the Human Eye	19.1-19.2	Makeup Lab
	Dec 3 (W)	Spherical Mirror	18.6-18.7	
	Dec 5 (F)	Exam 3 (1:00-1:50 PM, in person, location TBA)		
Week 16	Dec 8 (M)	Summary		No lab
Final	Dec 17 (W)	Final Exam (1:00 – 3:00 PM, in person, location TBA)		