

**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:

- In Person: Mondays and Wednesdays 11:30 am - 12:20 pm, in PHYS 226A
- Online: Sundays 6:00-7:00 pm, via Bb Collaborate in Blackboard

Email policy:

- 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.
- 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.
- TurningPoint App and subscription
- 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 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
Reading Quiz	5%
Lecture Participation	5%
Homework	10%
Lab	10%
Quiz	45%
Midterm Exam	10%
Final Exam	15%
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.

- READING QUIZ**
- You are required to read the textbook sections (see schedule) prior to every class; it makes for efficient learning. The class time will be spent on clarifying and applying the materials.
  - To prepare you actively engage in class, weekly reading quizzes will be assigned online through Blackboard. Reading quizzes typically consist of approximately ten questions, and usually due before every Monday's class at 12:30 pm.

- 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.
  - TurningPoint App will be used to track participation and promote active learning by providing instant feedbacks for both the instructor and students. Your submitted answers will be graded on full participation and sometimes accuracy.
  - 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 equally between your full participation and submitted work.
  - 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 view (or perhaps purchase) solutions 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, the less likely you will be able to produce your own solutions on quizzes and exams.

## QUIZ

- You have to do well on all quizzes to be able to get a good grade for the course.
- The reading quizzes, lectures, lab activities, and homework 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 EXAM

- The midterm and final exam will be comprehensive.
- There is no make-up exam for the final and no one will be allowed to take the final at a different time.

## MAKE UP POLICY

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

- Reading Quiz: Start early on reading quizzes, no late quizzes are possible.
- Lecture: You will be given three "free" days for not participating in lecture. These count towards ALL absences and TurningPoint App malfunctions.
- Homework: Lowest two scores will be dropped. These count towards ALL problems with technology.
- Lab: Makeup lab is scheduled at week 15 during your regular lab time, see schedule. If you miss a lab, you must contact your TA and me as soon as possible. Permission is required to attend the makeup lab.
- Quiz: Lowest two quiz scores will be dropped. These count towards ALL absences and problems with technology.

## WHERE TO GET HELP

- SI PASS sessions will be offered for this class, detailed information will be posted in Blackboard site. <https://si.lrc.umbc.edu/>
- 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.
- The Academic Success Center also supplies free tutoring service for this class by appointment. To make an appointment, please visit <https://lrc.umbc.edu/tutor/>

## 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.

## DISABILITIES

If you have any condition such as a physical learning disability, which will make it difficult for you to carry out the work as I have outlined it or which will require academic accommodations, please notify me in the first two weeks of the course.

**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 - SP2022” 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, reading quiz, lectures note, 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.

**TEACHING ASSISTANT INFO**

Sandra Cheng      [scheng5@umbc.edu](mailto:scheng5@umbc.edu)  
 Dongli Deng      [dedong1@umbc.edu](mailto:dedong1@umbc.edu)  
 Sanjay Sharma    [ssharma4@umbc.edu](mailto:ssharma4@umbc.edu)

**TA schedule for the labs**

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00					<b>Lab 09</b> (5071) 8:00-9:50 am <i>Dongli Deng</i>
8:30				<b>Lab 04</b> (5066) 8:30-10:20 am <i>Sanjay Sharma</i>	
9:00					
9:30					
10:00					
10:30					
11:00				<b>Lab 05</b> (5067) 11:00-12:50 <i>Sanjay Sharma</i>	
11:30					
12:00					
12:30					
1:00					
1:30				<b>Lab 06</b> (5068) 1:30-3:20 pm <i>Sandra Cheng</i>	
2:00					
2:30					
3:00					
3:30			<b>Lab 11</b> (6317) 3:30-5:20 pm <i>Dongli Deng</i>	<b>Lab 12</b> (6545) 3:30-5:20 pm <i>Sandra Cheng</i>	
4:00					
4:30					
5:00					
5:30			<b>Lab 02</b> (5064) 5:30-7:20 pm <i>Sanjay Sharma</i>		
6:00					
6:30					
7:00					
7:30			<b>Lab 03</b> (5065) 7:30-9:20 pm <i>Sandra Cheng</i>		
8:00					
8:30					
9:00					

### PHYS 112 – Spring 2022 Schedule\*

	Date	Lecture Topic	Textbook	Lab
Week 1	Jan 31 (M)	Introduction and Electric Charge	20.1-20.2	No Lab
	Feb 2 (W)	Electric Force	20.3	
	Feb 4 (F)	More on Electric Force	20.6	
Week 2	Feb 7 (M)	<b>Quiz 1 (8AM)</b> , Electric Field	20.4	Lab 1 Electric Charge and Forces
	Feb 9 (W)	Electric Field of Point Charges	20.5	
	Feb 11 (F)	More on Electric Field	20.6-20.7	
Week 3	Feb 14 (M)	<b>Quiz 2 (8AM)</b> , Electric Potential Energy	21.1	Lab 2 Electric Field
	Feb 16 (W)	Electric Potential	21.2-21.3	
	Feb 18 (F)	More on Electric Potential	21.4	
Week 4	Feb 21 (M)	<b>Quiz 3 (8AM)</b> , Electric Field and Potential	21.5-21.6	Lab 3 Electric Potential
	Feb 23 (W)	Capacitance	21.7	
	Feb 25 (F)	More on Capacitance	21.8	
Week 5	Feb 28 (M)	<b>Quiz 4 (8AM)</b> , Ohm's Law	22.1-22.5	Lab 4 Introduction to Electric Current
	Mar 2 (W)	Electric Power	22.6	
	Mar 4 (F)	Kirchhoff's Law	23.1-23.2	
Week 6	Mar 7 (M)	<b>Quiz 5 (8AM)</b> , Resistor Circuit	23.3	Lab 5 A Model for Circuits I: Electric Current
	Mar 9 (W)	More on Resistor Circuit	23.4-23.5	
	Mar 11 (F)	Capacitor Circuit	23.6	
Week 7	Mar 14 (M)	<b>Quiz 6 (8AM)</b> , RC Circuit	23.7	Lab 6 A Model for Circuits II: Voltage and Ohm's law
	Mar 16 (W)	More on RC Circuit		
	Mar 18 (F)	<b>Midterm Exam (1:00-1:50 PM), in person, UC 300</b>		
Week 8	Mar 21-25	Spring Break		
Week 9	Mar 28 (M)	Magnets and magnetic field	24.1-24.2	Lab 7 A Model for Circuits III: Capacitors and RC circuits
	Mar 30 (W)	Magnetic field of long straight current	24.3	
	Apr 1 (F)	Magnetic field of current loop	24.4	
Week 10	Apr 4 (M)	<b>Quiz 7 (8AM)</b> , Magnetic Force	24.5	Lab 8 Magnetic Field and Force
	Apr 6 (W)	Motion of charged particles in B field	24.6	
	Apr 8 (F)	Applications	24.7	
Week 11	Apr 11 (M)	<b>Quiz 8 (8AM)</b> , Wave properties	15.1-15.4	Lab 9 Wave Properties
	Apr 13 (W)	Sound Intensity and Intensity Level	15.5-15.6	
	Apr 15 (F)	Loudness of sound		
Week 12	Apr 18 (M)	<b>Quiz 9 (8AM)</b> , Wave Interference	16.1,16.6	Lab 10 Wave Interference
	Apr 20 (W)	Interference of light	17.1-17.2	
	Apr 22 (F)	More on Interference of light		
Week 13	Apr 25 (M)	<b>Quiz 10 (8AM)</b> , Reflection and Refraction	18.1-18.2	Lab 11 Ray Optics
	Apr 27 (W)	Total Internal Reflection	18.3	
	Apr 29 (F)	Plane Mirror	18.3	
Week 14	May 2 (M)	<b>Quiz 11 (8AM)</b> , Thin lens (ray diagram)	18.4-18.5	Lab 12 Thin Lens
	May 4 (W)	Thin lens (lens equation)	18.7	
	May 6 (F)	Modeling the Human Eye	19.1-19.2	
Week 15	May 9 (M)	<b>Quiz 12 (8AM)</b> , Spherical mirror	18.6	Makeup Lab
	May 11 (W)	Spherical mirror (lens equation)	18.7	
	May 13 (F)	More on spherical mirror		
Week 16	May 16 (M)	<b>Quiz 13 (8AM)</b> , Summary		No lab
Final	May 25 (W)	<b>Final Exam (comprehensive); 1:00 – 3:00 PM, in person, UC 300</b>		

\*This schedule is tentative and may be adjusted as needed. Refer to class announcement and Blackboard for the most updated information.