

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

Office hour:

- In Person: Mondays 9:30-10:20 am and Wednesdays 2:10-3:00 pm, in PHYS 226A
- Virtual: Sundays 6:00-7:00 pm, link in Blackboard, Bb Collaborate tab

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, 4th 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	55%
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.

FINAL EXAM

- The 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 two "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 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 - FA2021” 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.

TA CONTACT INFO

Sandra Cheng	scheng5@umbc.edu
Dongli Deng	dedong1@umbc.edu
Sanjay Sharma	ssharma4@umbc.edu

TA schedule for the labs

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00					Lab 4 (1914) 8:00-9:50 am <i>Dongli Deng</i>
8:30					
9:00					
9:30				Lab 7 (5963) 9:30-11:20 am <i>Sandra Cheng</i>	
10:00					
10:30					
11:00				Lab 6 (1920) 11:30-1:20 <i>Dongli Deng</i>	Lab 8 (5889) 10:30-12:20 <i>Dongli Deng</i>
11:30					
12:00					
12:30					
1:00					
1:30					
2:00					
2:30				Lab 2 (1908) 2:30-4:20 pm <i>Sandra Cheng</i>	
3:00					
3:30					
4:00					
4:30					
5:00					
5:30			Lab 5 (1917) 5:30-7:20 pm <i>Sandra Cheng</i>	Lab 3 (1911) 5:30-7:20 pm <i>Sanjay Sharma</i>	
6:00					
6:30					
7:00					
7:30			Lab 9 (5921) 7:30-9:20 pm <i>Sanjay Sharma</i>	Lab 10 (6057) 7:30-9:20 pm <i>Sanjay Sharma</i>	
8:00					
8:30					
9:00					

PHYS 112 – Fall 2021 Schedule

	Date	Lecture Topic	Textbook	Lab
Week 1	Sep 1 (W)	Introduction and Electric Charge	20.1-20.2	No Lab
	Sep 3 (F)	More on Electric Charge		
Week 2	Sep 6 (M)	NO CLASS – Labor Day		No Lab
	Sep 8 (W)	Electric Force	20.3	
	Sep 10 (F)	More on Electric Force	20.6	
Week 3	Sep 13 (M)	Quiz 1 (8AM), Electric Field	20.4	Lab 1 Electric Charge and Forces
	Sep 15 (W)	Electric Field of Point Charges	20.5	
	Sep 17 (F)	More on Electric Field	20.6-20.7	
Week 4	Sept 20 (M)	Quiz 2 (8AM), Electric Potential Energy	21.1	Lab 2 Electric Field
	Sept 22 (W)	Electric Potential	21.2-21.3	
	Sept 24 (F)	More on Electric Potential	21.4	
Week 5	Sep 27 (M)	Quiz 3 (8AM), Electric Field and Potential	21.5-21.6	Lab 3 Electric Potential
	Sep 29 (W)	Capacitance	21.7	
	Oct 1 (F)	More on Capacitance	21.8	
Week 6	Oct 4 (M)	Quiz 4 (8AM), Ohm’s Law	22.1-22.5	Lab 4 Introduction to Electric Current
	Oct 6 (W)	Electric Power	22.6	
	Oct 8 (F)	Kirchhoff’s Law	23.1-23.2	
Week 7	Oct 11 (M)	Quiz 5 (8AM), Resistor Circuit	23.3	Lab 5 A Model for Circuits I: Electric Current
	Oct 13 (W)	More on Resistor Circuit	23.4-23.5	
	Oct 15 (F)	Capacitor Circuit	23.6	
Week 8	Oct 18 (M)	Quiz 6 (8AM), RC Circuit	23.7	Lab 6 A Model for Circuits II: Voltage and Ohm’s law
	Oct 20 (W)	RC Circuit applications		
	Oct 22 (F)	Electricity in the Nervous System	23.8	
Week 9	Oct 25 (M)	Quiz 7 (8AM), Magnets and magnetic field	24.1-24.2	Lab 7 A Model for Circuits III: Capacitors and RC circuits
	Oct 27 (W)	Magnetic field of long straight current	24.3	
	Oct 29 (F)	Magnetic field of current loop	24.4	
Week 10	Nov 1 (M)	Quiz 8 (8AM), Magnetic Force	24.5	Lab 8 Magnetic Field and Force
	Nov 3 (W)	Motion of charged particles in B field	24.6	
	Nov 5 (F)	Applications	24.7	
Week 11	Nov 8 (M)	Quiz 9 (8AM), Wave properties	15.1-15.4	Lab 9 Wave Properties
	Nov 10 (W)	Sound Intensity and Intensity Level	15.5-15.6	
	Nov 12 (F)	Loudness of sound		
Week 12	Nov 15 (M)	Quiz 10 (8AM), Wave Interference	16.1,16.6	Lab 10 Wave Interference
	Nov 17 (W)	Interference of light	17.1-17.2	
	Nov 19 (F)	More on Interference of light		
Week 13	Nov 22 (M)	Quiz 11 (8AM), Reflection and Plane Mirror	18.1-18.2	No Lab
	Nov 24 (W)	Refraction	18.3	
	Nov 26 (F)	NO CLASS – Thanksgiving		
Week 14	Nov 29 (M)	Total Internal Reflection	18.3	Lab 11 Ray Optics
	Dec 1 (W)	Thin lens (ray diagram)	18.4-18.5	
	Dec 3 (F)	Thin lens (lens equation)	18.7	
Week 15	Dec 6 (M)	Quiz 12 (8AM), Modeling the Human Eye	19.1-19.2	Makeup Lab
	Dec 8 (W)	Spherical Mirror (ray diagram)	18.6	
	Dec 10 (F)	Spherical Mirror (lens equation)	18.7	
Week 16	Dec 13 (M)	Quiz 13 (8AM), Summary		No lab
Final	Dec 15 (W)	Final Exam (comprehensive); 1:00 – 3:00 PM, location TBA		