

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 Kirchoff'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: Mon 9:30-10:20 am, Wed 2:30-3:20 pm, Fri 9:30-10:20 am,
or by appointment, in Physics 321

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 *Blackboard Discussion Board* 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

- College Physics: A Strategic Approach by Knight, Jones, and Field, 3rd ed.
- MasteringPhysics (electronic homework assignments)
- Clicker (Turning Technologies RFC-03, can be purchased from UMBC bookstore)
- Calculator
- A clear and focused mind, positive attitude, and patience

GRADING POLICY

Type of Assignment	Percentage
Reading Quiz	5%
Lecture participation	5%
Weekly Quiz	5%
Homework	10%
Lab	10%
Exam (3 @ 15% each)	45%
Final Exam	20%
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 day 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 5-10 questions, and usually due before each 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.
- Clickers will be used to track attendance and promote active learning by providing instant feedbacks for both the instructor and students. You need to bring your clicker (with good battery) to every class. If your clicker does not work or if you forget your clicker, you will not receive attendance credit.
- There will be a short quiz at the beginning/end of Monday's lecture.
- 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.*
- Your grade for each lab is based on completing an individual online prelab (20%), full participation in and completion of team lab activity (40%), and individual lab

homework due at the beginning of the next session (40%). The prelab needs to be submitted before the beginning of your lab. Lab homework will only be accepted if you complete the related lab.

- There will be one in-lab exam, see the schedule for the exact date. The lab activities and homework will help you acquire the skills you'll need for the lab exam.

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 exams and to succeed in the course.
- Individual homework will be submitted via the MasteringPhysics online system.
- 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 night 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 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.

EXAM

- You have to do well on all exams to be able to get a good grade for the course. The lecture, lab, and homework will help you acquire the understanding and problem solving skills you'll need.
- Three 50-minute exams will be given on Mondays at 8 AM. See the schedule for the exact dates, location will be announced later.
- Each exam will consist of a mix of multiple-choice questions and show-your-work problems.
- You are allowed to bring a 3 inch *5 inch index card and use a calculator during exams. 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 with 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 3 "free" days for not clicking in lecture. These count towards ALL absences and clicker malfunctions.
- Lab: If you must miss a lab, contact your TA and my as soon as possible. You must submit the homework from the previous lab to me directly or through the Physics Department before 5 pm Friday of the week of your missed lab. With your TA's permission, you may attend your missed lab section during the makeup week and submit the related homework to your TA within 3 days.
- Online homework: it's better late than never: Possible credit for each item drops steadily to 50% after 48 hours and stays there until the last day of class.

- Exam: If you must miss an exam due to officially-sanctioned UMBC activities, illness, family emergency, detention by authorities, or another insurmountable difficulty, contact me as soon as possible. At my discretion, I'll request written verification of the cause of your absence.

TUTORIAL CENTER

The Learning Resource Center supplies free tutors for this and many other 100- and 200-level courses. Please contact at (410) 455-2444 or visit <http://www.umbc.edu/lrc/> for more information.

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.

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.
- If you are taking the exam with the Student Support Services, inform me by email with the detailed information at least 48 hours before every exam.

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-FA17" 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 Documents*: syllabus, reading quiz, lectures note, lab, and etc.
- Checking the *Grades* that you have earned.
- Interacting with the instructor and others online using *Discussion Board*.

SUCCESS STRATEGY

- Be sure you have the time required for the course. You are expected to attend all classes – lectures and discussions. 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.

**TA
CONTACT
INFO**

Janak Joshi
jjoshi1@umbc.edu
 Office hour: Wed 10:30-12:30, in PHYS 109

Neranga Kaluappuwa
neranga1@umbc.edu
 Office hour: Wed 4:30-5:30 & Th 4:30-5:30, in PHYS 109

Nathan Myers
myersn1@umbc.edu
 Office hour: Wed 2:30-3:30 & Th 4:30-5:30, in PHYS 109

TA schedule for the labs

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00					Lab 04 (1054) 8:00-9:50 am Neranga Kaluappuwa
8:30					
9:00					
9:30				Lab 07 (6052) 9:30-11:20 am Janak Joshi	Lab 08 (6775) 10:30-12:20 Janak Joshi
10:00					
10:30					
11:00				Lab 06 (1056) 11:30-1:20 pm Janak Joshi	
11:30					
12:00					
12:30					
1:00					
1:30					
2:00					
2:30				Lab 02 (1052) 2:30-4:20 pm Nathan Myers	Lab 09 (6908) 2:30-4:20 pm Nathan Myers
3:00					
3:30					
4:00					
4:30					Lab 10 (8175) 4:30-6:20 pm Nathan Myers
5:00					
5:30			Lab 05 (1055) 5:30-7:20 pm Neranga Kaluappuwa	Lab 03 (1053) 5:30-7:20 pm Neranga Kaluappuwa	
6:00					
6:30					
7:00					

PHYS 112 – Fall 2017 Schedule

	Date	Lecture Topic	Textbook	Lab
Week 1	Aug 30 (W)	Electric charges and forces	20.1-20.2	No Lab
	Sept 1 (F)	Coulomb's Law	20.3	
Week 2	Sept 4 (M)	NO CLASS – Labor Day		Lab 1: Electric Charge
	Sept 6 (W)	Electric field of point charges	20.4-20.5	
	Sept 8 (F)	Uniform electric field and applications	20.6-20.7	
Week 3	Sept 11 (M)	Quiz 1 , Electric potential energy	21.1	Lab 2: Electric field
	Sept 13 (W)	Electric potential	21.2-21.4	
	Sept 15 (F)	Connecting potential and field	21.5-21.6	
Week 4	Sept 18 (M)	Quiz 2 , Capacitors	21.7	Lab 3: Introduction to electric current
	Sept 20 (W)	Dielectrics	21.8	
	Sept 22 (F)	Applications		
Week 5	Sept 25 (M)	Exam 1 (Chapters 20-21), 8:00 - 8:50 AM, location TBA		Lab 4: A model for circuits I: Electric current
	Sept 27 (W)	Current and Resistance	22.1-22.5	
	Sept 29 (F)	Ohm's law	22.6	
Week 6	Oct 2 (M)	Quiz 3 , Resistors in parallel and series	23.1, 23.3	Lab 5: A model for circuits II: Voltage and Ohm's law
	Oct 4 (W)	Kirchhoff's law	23.2	
	Oct 6 (F)	Household circuit	23.4-23.5	
Week 7	Oct 9 (M)	Quiz 4 , RC Circuit	23.6-23.7	Lab 6: A model for circuits III: Capacitors and RC circuits
	Oct 11 (W)	RC Circuit applications	23.8	
	Oct 13 (F)	Magnets and magnetic field	24.1-24.2	
Week 8	Oct 16 (M)	Quiz 5 , Magnetic field of current	24.3-24.4	Lab 7: Modeling the action potential I
	Oct 18 (W)	Momentum and Impulse	Ch8: 1	
	Oct 20 (F)	Magnetic force on moving charges	24.5	
Week 9	Oct 23 (M)	Quiz 6 , Motion of charged particles in B field		Lab 8: Modeling the action potential II
	Oct 25 (W)	Magnetic force on moving charges	24.5	
	Oct 27 (F)	Applications		
Week 10	Oct 30 (M)	Exam 2 (Chapters 22-24), 8:00 - 8:50 AM, location TBA		Lab Exam on DC circuit
	Nov 1 (W)	Wave properties	15.1-15.4	
	Nov 3 (F)	Intensity of sound	15.5-15.6	
Week 11	Nov 6 (M)	Quiz 7 , Doppler Effect	15.7	Lab 9: Wave model of light: Interference and diffraction
	Nov 8 (W)	Wave superposition and interference	16.1, 16.6	
	Nov 10 (F)	Interference of light	17.1-17.2	
Week 12	Nov 13 (M)	Quiz 8 , Reflection and plane mirror	18.1-18.2	Lab 10: Reflection and refraction
	Nov 15 (W)	Spherical mirrors (ray diagram)	18.6	
	Nov 17 (F)	Spherical mirrors (equation)	18.7	
Week 13	Nov 20 (M)	Quiz 9 , Refraction and total internal reflection	18.3	Lab 11: Lenses
	Nov 22 (W)	Thin-lens (ray diagram)	18.5	
	Nov 24 (F)	NO CLASS – Thanksgiving		
Week 14	Nov 27 (M)	Quiz 10 , Thin-lens equation	18.7	Lab 12: Modeling the human eye
	Nov 29 (W)	Human eye and microscope	19.1-19.4	
	Dec 1 (F)	Applications		
Week 15	Dec 4 (M)	Exam 3 (Chapters 15-19), 8:00 - 8:50 AM, location TBA		Make-up lab
	Dec 6 (W)	Nuclear structure	30.1	
	Dec 8 (F)	Nuclear decay and exponential decay	30.4	
Week 16	Dec 11 (M)	Quiz 11 , Radiation and radioactivity	30.5-30.6	
Final	Dec 20 (W)	Final Exam (comprehensive), 1:00 – 3:00 PM		