# 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: Mon 9:30-10:20 am, Tue 11-11:50 am, and Wed 2-3 pm
in Physics 226A (Physics Tutoring Center), or by appointment

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, 4th 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

## 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% |
| 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 Friday'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 exam is 20% of the lab grade. 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.
- 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.
- Lab: If you must miss a lab due to legitimate reasons*, contact me and your TA as soon as possible. Documentation will be needed to verify the cause of your absence. You must submit the homework from the previous lab to me directly or through the Physics Department PHYS 220 before 4 pm Friday of the week of your missed lab.
- Exam: If you must miss an exam due to legitimate reasons*, contact me as soon as possible. Documentation will be needed to verify the cause of your absence.

**Legitimate reasons: officially-sanctioned UMBC activities, illness, family emergency, detention by authorities, or another insurmountable difficulty.*

**TUTORIAL CENTER**

- 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 Learning Resource Center supplies free tutors for this and many other 100- and 200-level courses. Please visit https://lrc.umbc.edu/ 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.
- 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.
- If you are taking the exam with the Office of Student Disability 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 - FA2019" 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.
- Interacting with the instructor and others online using *Discussion Board*.

TA CONTACT INFO

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|---|---|
| Dongli Deng | dedong1@umbc.edu |
| Patrick Mangan | pmangan1@umbc.edu |
| Brendan Richards | brichar2@umbc.edu |

TAs will host office hours in the Physics Tutoring Center (PHYS 226A). Schedule will be available in Blackboard.

**TA schedule for the labs**

| | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|
| 8:00 | | | | | **Lab 4** (1501) 8:00-9:50 am *Dongli Deng* |
| 8:30 | | | | | |
| 9:00 | | | | | |
| 9:30 | | | | **Lab 7** (5963) 9:30-11:20 am *Patrick Mangan* | |
| 10:00 | | | | | |
| 10:30 | | | | | **Lab 8** (6417) 10:30-12:20 *Brendan Richards* |
| 11:00 | | | | | |
| 11:30 | | | | **Lab 6** (1503) 11:30-1:20 *Brendan Richards* | |
| 12:00 | | | | | |
| 12:30 | | | | | |
| 1:00 | | | | | |
| 1:30 | | | | | |
| 2:00 | | | | | |
| 2:30 | | | | **Lab 2** (1499) 2:30-4:20 pm *Brendan Richards* | **Lab 9** (6480) 2:30-4:20 pm *Dongli Deng* |
| 3:00 | | | | | |
| 3:30 | | | | | |
| 4:00 | | | | | |
| 4:30 | | | | | **Lab 10 (**7069) 4:30-6:20 pm *Patrick Mangan* |
| 5:00 | | | | | |
| 5:30 | | | **Lab 5** (1502) 5:30-7:20 pm *Patrick Mangan* | **Lab 3** (1500) 5:30-7:20 pm *Dongli Deng* | |
| 6:00 | | | | | |
| 6:30 | | | | | |
| 7:00 | | | | | |

## PHYS 112 – Fall 2019 Schedule

| | Date | Lecture Topic | Textbook | Lab |
|---|---|---|---|---|
| Week 1 | Aug 28 (W) | Electric charge | 20.1-20.2 | No Lab |
| | Aug 30 (F) | Coulomb's Law | 20.3 | |
| Week 2 | Sep 02 (M) | NO CLASS – Labor Day | | Lab 1<br>Electric Charge and Forces |
| | Sep 04 (W) | Electric field | 20.4-20.5 | |
| | Sep 06 (F) | **Quiz 1,** Uniform electric field | 20.6 | |
| Week 3 | Sep 09 (M) | Electric potential energy | 21.1 | Lab 2<br>Electric Field |
| | Sep 11 (W) | Electric potential | 21.2 | |
| | Sep 13 (F) | **Quiz 2,** Electric potential applications | 21.3-21.6 | |
| Week 4 | Sep 16 (M) | Capacitors | 21.7 | Lab 3<br>Electric Potential |
| | Sep 18 (W) | Dielectrics | 21.8 | |
| | Sep 20 (F) | **Quiz 3,** Applications | | |
| Week 5 | Sep 23 (M) | **Exam 1 (Ch. 20-21), 8:00 - 8:50 AM, location TBA** | | Lab 4<br>Introduction to electric current |
| | Sep 25(W) | Ohm's law | 22.1-22.6 | |
| | Sep 27 (F) | **Quiz 4,** Kirchhoff's law | 23.1-23.2 | |
| Week 6 | Sep 30 (M) | Resistors in parallel and series | 23.3-23.4 | Lab 5<br>A model for circuits I:<br>Electric current |
| | Oct 02 (W) | Household circuit | 23.5 | |
| | Oct 04 (F) | **Quiz 5,** Capacitors in parallel and series | 23.6 | |
| Week 7 | Oct 07 (M) | RC Circuit | 23.7 | Lab 6<br>A model for circuits II:<br>Voltage and Ohm's law |
| | Oct 09 (W) | RC Circuit applications | 23.8 | |
| | Oct 11 (F) | **Quiz 6,** Electricity in the Nervious System | | |
| Week 8 | Oct 14 (M) | Magnets and magnetic field | 24.1-24.2 | Lab 7<br>A model for circuits III:<br>Capacitors and RC circuits |
| | Oct 16 (W) | Magnetic field of long straight current | 24.3 | |
| | Oct 18 (F) | **Quiz 7,** Magnetic field of current loop | 24.4 | |
| Week 9 | Oct 21 (M) | Magnetic force on moving charges | 24.5 | Lab 8<br>Modeling the action potential I |
| | Oct 23 (W) | Motion of charged particles in B field | 24.6 | |
| | Oct 25 (F) | **Quiz 8,** Applications | | |
| Week 10 | Oct 28 (M) | **Exam 2 (Ch. 22-24), 8:00 - 8:50 AM** | | Lab 9<br>Modeling the action potential II |
| | Oct 30 (W) | Wave properties | 15.1-15.4 | |
| | Nov 01 (F) | **Quiz 9,** Loudness of sound | 15.5-15.6 | |
| Week 11 | Nov 04 (M) | Wave superposition and interference | 16.1,16.6 | **Lab Exam**<br>**Resistor circuit** |
| | Nov 06 (W) | Interference of light | 17.1-17.2 | |
| | Nov 08 (F) | **Quiz 10,** Thin film interference | 17.4 | |
| Week 12 | Nov 11 (M) | Soap bubbles | | Lab 10<br>Wave model of light:<br>Interference and diffraction |
| | Nov 13 (W) | Reflection and refraction | 18.1,18.2 | |
| | Nov 15 (F) | **Quiz 11,** Total Internal Reflection | 18.3 | |
| Week 13 | Nov 18 (M) | Thin lens (ray diagram) | 18.4-18.5 | Lab 11<br>Thin Lens |
| | Nov 20 (W) | Thin lens (lens equation) | 18.7 | |
| | Nov 22 (F) | **Quiz 12,** Applications | | |
| Week 14 | Nov 25 (M) | **Exam 3 (Ch. 15-18), 8:00 - 8:50 AM** | | No Lab |
| | Nov 27 (W) | Spherical Mirror | 18.6 | |
| | Nov 29 (F) | NO CLASS – Thanksgiving | | |
| Week 15 | Dec 02 (M) | Human eye and microscope | 19.1-19.4 | Lab 12<br>Modeling the human eye |
| | Dec 04 (W) | Nuclear structure | 30.1 | |
| | Dec 06 (F) | **Quiz 13,** Nuclear decay | 30.4 | |
| Week 16 | Dec 09 (M) | Radiation and radioactivity | 30.5-30.6 | No lab |
| Final | Dec 18 (W) | **Final Exam (comprehensive); 1:00 – 3:00 PM, location TBA** | | |