

# Principles of Physics

## Physics 152 Spring 2011

### Westminster College

#### **Pertinent Information**

Instructor: Doug Armstead

Office: 124 Hoyt (724) 946-7201

Office Hours: MWF 2:00-3:00pm. These are just the times I guarantee. I am available other times so feel free to drop by or to contact me for an appointment.

Email: [armstedn@westminster.edu](mailto:armstedn@westminster.edu)

Course website: [www.westminster.edu/staff/armstedn/S11/Phys152.html](http://www.westminster.edu/staff/armstedn/S11/Phys152.html).

Lecture meets: MWF 10:30-11:30am in Hoyt 116.

Laboratory meets: Tues. 2-5pm in Hoyt 104.

Text: *Understanding Physics* by Cummings, Laws, Redish, and Cooney published by Wiley.

Laboratory Manual: posted at course website.

Prerequisites: Phys 151 and Math 152 are required either concurrently or previously.

#### **The Point of this Class**

Physics is an exciting and demanding subject. Physicists make predictive models of reality based on assumptions about the nature of our world. If a model's predictions are born out experimentally then the elements of the model tell us about the physical laws that govern our world. In Physics 151 you developed an understanding of how and why an object with mass moves (through kinematics, Newton's laws, conservation of energy, and conservation of momentum). In Physics 152 we will use this to understanding the behavior of objects that have charge (electricity and magnetism), waves, and light. This entails learning physical laws, the mathematical machinery that allows these laws to be quantitatively predictive, assessing the validity of these laws experimentally, learning various techniques to help organize your thinking about a physical situation and most importantly developing the ability to reason your way through the application of these tools to physical situations.

At the end of this course you must:

- Have a firm understanding of and the ability to calculate: the effect of electric and magnetic fields on charged particles, the electric and magnetic fields that arise from

charged particles and their motion, the behavior of electrical currents in electronic circuits, oscillatory behavior and its use modeling sound and light.

- Demonstrate the ability to apply this understanding to analyze new situations using the problem solving techniques presented in this course.
- Be able to carefully analyze data taken in lab, estimate the uncertainty in the analyzed results, draw valid conclusions from the results, and present the results in an appropriate and coherent manner.
- Reflect on the process and context of the scientific and technological enterprise and its ethical implications.

Physics 152 provides a sound foundation for the sciences and engineering.

## Expectations

What you should expect from me:

- Explanations of physical concepts that include concrete examples and, where reasonable, demonstrations.
- In-class examples that help you to understand the kind of reasoning that is necessary to do the problems you will encounter in the homework and on exams.
- Careful and respectful consideration of your questions.
- An open door policy—if my office door is open you should feel free to come in and talk about physics. This is in addition to my regularly scheduled office hours listed above.

What I expect of you:

- Your presence in class, both physical and mental, for the entire class period.
- For you to be prepared when you arrive at class. I have selected the text because it is readable and I expect you to have completed the assigned readings before you arrive. This includes keeping track of questions the reading inspires and bringing them to class. It also includes working through the reading exercises (solutions of which appear at the back of the text).
- If you have a question, ask it. I strongly encourage you to do this during class since one topic builds on the last. Your fellow classmates will thank you—if you are unclear on something, chances are the person next to you is, too.
- Be considerate of your fellow classmates by turning off your cell phones during class and not eating in class.
- Submit work for grading that is your own. If you copy from another student or source and submit it for a grade, then you risk receiving an F in the course.

## Grades

You start this class out with an A. Over the course of this semester your grade will be adjusted based on the degree of mastery of the material you show through your homework, in your labs, on the midterm exams and on the final exam. The final score for the class has the following weighting:

15%	Problem sets/Quizzes
15%	Labs
48%	Midterm Exams #1-4
6%	Reports
16%	Final Exam

**Important: you must complete the lab portion of this course to pass this course**

## Graded Elements

**Problem sets:** Problem sets (typically 3-5 problems) will be assigned frequently and due most lecture days at 5pm. Solutions are graded both for correctness and clarity of explanation. You are welcome to work in groups to understand the problem but you must compose your solution independently.

**Solution Format:**

- All pages must be stapled together.
- Use a dark pencil or pen.
- The logic of your solution should begin with a clear statement of the basic principle(s) and flow from complete sentences and clear diagrams. Each step should follow clearly from the one before.

Seldom will your first attempt at a solution be of the quality you should hand in. I expect you to proofread, correct, edit, and generally clean up your solutions. **One** late solution will be accepted during the semester.

**Quizzes:** Short quizzes may be given sporadically either on the topics covered in the previous class session or the reading assigned for the current class session.

**Labs:** Your lab grade will be determined by your lab reports both formal and informal as well as your performance in the lab.

**Exams:** The exam format will include problems that probe both your conceptual and qualitative understanding of the material. Exams will be taken in class and you will be allowed one 3x5 index card with your own notes on it for each exam. The final exam will be cumulative. **If there is a conflict with a test because of a college-sponsored function, I must be notified in advance and arrangements made prior to the exam. Failure to do so will result in a zero for that exam. In case of emergency I must be notified immediately.** A make-up exam will only be administered for illness that requires confinement to bed on physician's orders, death/serious illness

in the immediate family, or appearance in court. Supporting documentation will be required.

Reports: You will be required to prepare each of the following three types of reports.

- Review a journal article and address how it relates to your major.
- Review a journal article and address the societal or ethical implications of science in the article.
- Review a talk or poster given at the Undergraduate Research and Arts Celebration on April 27, 2011. Bonus points if you include your own talk/poster.

The articles will come from journals such as: *Nature*, *Science*, *Physics Today*, *American Journal of Physics*, *Discover*, *Scientific American*, *The Physics Teacher*, *Physics World*, *Physics Education*, *New Scientist*, *Astronomy*, or *Sky and Telescope*. Further details are available on the course website.

The raw score above is turned into a grade as below:

Final %	Grade
90-100	A- to A
80-89	B- to B+
70-79	C- to C+ etc.

### Academic Integrity\*

Honesty is an essential part of academic integrity and at the heart of scientific research. Scientists and other scholars take pride in ownership of their own work. They do not take credit for the effort or ideas of others and do not tolerate those who do. This includes cheating, plagiarism and not contributing to group projects. This concept is based on mutual trust. If you cheat you are chipping away at your own moral character and undermining the overall integrity of our college society. Violations of this trust are acts of academic dishonesty; offenses will not be tolerated and may result in a zero on that assignment or in failure for the course.

Obviously, cheating on tests or quizzes involves using information to which you are not entitled such as copying or receiving information from a classmate or using notes other than those permitted by the instructor.

Plagiarism, according to *Webster's New Collegiate Dictionary* is to steal or pass off the ideas and words of another person as new and original an idea or product derived from an existing source. Obviously using work from another student who has previously taken this course is plagiarism.

Group work and group projects are valuable learning experiences, and will be the basis of most lab work. However, it is a form of dishonesty to claim credit for work to which you have not contributed.

I encourage students to work together in discussing methods of solutions to problems in homework assignments. Seek help from the instructor, but only after you have reached an

impasse in your own concentrated effort. Much valuable learning can occur in the *active participation* in such discussions. However, because you are placing your name alone on an assignment, you should then write up your own original solutions. You are not being honest if you just copy another's solution without any thought of your own.

**READ** (and understand) the College's statements and procedures on Academic Integrity in the 2010-2011 Undergraduate Catalog, pages 71-76. Ask the instructor if you have any uncertainty about what is proper and what is not.

\*Adapted from Dr. William L. Johnson's statement of academic integrity.

## Class Schedule

All dates are tentative.

Week	week starting	Chapter(s)	Topic
1	Jan. 18	22	Electric Charges and Forces
2	Jan. 24	23	Electric Fields
3	Jan. 31	24	Gauss' Law
4	Feb. 7	25	Electric Potential
5	Feb. 14	26	Current and Resistance <b>Test: Chapters 22-25 on Tues. Feb. 15.</b>
6	Feb. 21	27 & 28	Circuits and Capacitance
7	Feb. 28	28	Capacitance
8	Mar. 7	29	Magnetic Fields <b>Test: Chapters 26-28 on Wed. Mar. 9.</b> <b>Report 1 due on or before Fri. Mar. 11.</b> <b>(Spring Break Mar. 14-19)</b>
9	Mar. 21	29 & 30	Magnetic Fields Due to Currents
10	Mar. 28	31 & 32	Induction, Maxwell's Equations, and Inductors
11	Apr. 4	16	Oscillations <b>Test: Chapters 29-32 on Tue. Apr. 5.</b>
12	Apr. 11	17	Transverse Mechanical Waves <b>Report 2 due on or before Fri. Apr. 15.</b>
13	Apr. 18	18 & 34	Sound Waves and Electromagnetic Waves <b>Easter Break Apr. 21-25</b>
14	Apr. 25	35	Images (lenses only) <b>URAC Symposium Apr. 27, report due Apr. 28.</b>
15	May 2	36 & 37	Wave optics and Review <b>Test: Chapters 16-18 and 34 on Mon. May 2.</b>

**Final Exam from 3-5:30pm on Monday, May 9, 2011**