Foundations of Physics – Physics 142
Westminster College

Basic Information

Instructor: Doug Armstead
Office: 124 Hoyt (724) 946-7201
Office Hours: MWF 10:30-11:30am. I am also available by appointment.
Email: armstedn@westminster.edu
Course website: www.westminster.edu/staff/armstedn/S14/Phys142.html.
Lecture meets: MWF 9:20-10:20am in Hoyt 116.
Laboratory meets: Tues. 7:40-10:40am or 2-5pm in Hoyt 104.
Text: *College Physics* by Urone, Hinrichs, Dirks, and Sharma published by OpenStax.
Laboratory Manual: posted at course website.
Prerequisites: Physics 141 or 151.

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 142 we will be covering electricity, magnetisim, light, the physics of the fast (relativity) and the small (quantum mechanics). 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: how the charge on an object effects its motion in electric and magentic fields, how charged objects create electric and magentic fields, the behavior of electric circuits, the behavior of light in the geometric and wave optics approximations, how the speed of light impacts space and time, the idea behind quantum mechanics, and how that effects electrons, nuclii, and smaller constituent parts of matter.

- 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 142 completes a sound foundation in physics.

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. This includes completing the assigned readings before you arrive. A careful reading means keeping track of questions the reading inspires and bringing them to class with you. It also includes working through the Examples and then comparing your result with the one provided in the text.

- When 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 #1-3
6%	Reports
16%	Final Exam

Note: the lab is a required part of this course.

Graded Elements

Problem sets: Problem sets (typically 3-5 problems) will be assigned frequently and due most lecture days at 5pm. You are welcome to work in groups to understand the problem but you must independently write your solution.

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.

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 **two** of the following three types of reports. Address how a journal article you review relates to your major. Address the societal and ethical implications of the science in a journal article you review. Review a talk given in the physics department, e.g., a journal club talk (physics journal club meets Thursdays at 12:30pm), or by a physicist at URAC. Details including suggested journals to draw articles from are available on the course website.

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

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

Academic Integrity[1]

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 2012-2013 Undergraduate Catalog, pages 73-78. Ask the instructor if you have any uncertainty about what is proper and what is not.

[1] 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. 13	18	Electric Charge and Electric Field
2	Jan. 20	19	Electric Potential and Electric Field
			(MLK day on M)
3	Jan. 27	19&20	Electric Current and Resistance
4	Feb. 3	20&21	DC circuits
5	Feb. 10	21&22	Magnetism
			Test:Chapters 18-20 on Fri. Feb. 14.
6	Feb. 17	22& 23	AC circuits and Induction
7	Feb. 24	23 & 24	Electromagnetic Waves (Light)
			Report 1 due on or before Mon. Feb. 24.
8	Mar. 3	25	Geometric Optics
	Mar.10		Spring Break
9	Mar. 17	27	Wave Optics
			Test:Chapters 21-24 on Fri. Mar. 21.
10	Mar. 24	27&28&29	Special Relativity and Intro to Quantum Mechanics
11	Mar. 31	29&30	Atomic Physics
12	Apr. 7	30&31	Nuclear Physics
13	Apr. 14	32	Nuclear Physics-Application
			(Easter Break F)
14	Apr. 22	33	Particle Physics **Test: Chapters 25-31 Tue. Apr. 22.**
			(Easter Break, M Schedule on T)
15	Apr. 28	34	Frontiers of Physics, Review
			(URAC on W)
			Report 2 due on or before Fri. May. 2.

Final Exam from 3pm-5:30pm on Thursday, May 8, 2014