Principles of Physics – Physics 151
Westminster College

1 Pertinent Information

Instructor: Doug Armstead
Office: 124 Hoyt (724) 946-7201
Office Hours: MWF 1:30-2:30pm. 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
Course website: www.westminster.edu/staff/armstedn/phys151.html.
Lecture meets: MWF 8:10-9:10am 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: Math 141 is required either concurrently or previously. If you have not taken high school calculus you must also take Math 125.

2 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 we will be covering mechanics and thermodynamics. 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 motion of an accelerating object, the motion of an object subject to external forces, the implications of the conservation of energy and momentum for the motion of a set of objects, how an object rotates, the behavior of fluids and gases, and the properties of heat engines.
- 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 151 provides a sound foundation for the sciences and engineering. It is also the first course on the road to becoming a physics major.

3 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.

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

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

4.1 Graded Elements

Problem sets: Problem sets (typically 4-6 problems) will be assigned frequently and due two class periods later. 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** reports. One report should review a journal article and address how it relates to your major. The second report should review a journal article and address the societal or ethical implications of the science in the article.

The articles must each be at least two pages long and taken from a recent (within the past year) journal such as *Scientific American, Nature, Physics Today, American Journal of Physics, Discover, The Physics Teacher, Physics World, Physics Education, New Scientist, Astronomy*, or *Sky and Telescope*.

Note: if you find an interesting article that pertains to physics from another source (e.g. a newspaper or an online source) you may use that article but you must also find second source for you information and consider the reliability of the sources.

You will submit, in electronic format on the *R* drive a **single page** report. You will also submit a hard copy of your report with along with a copy of your source article(s). The report will have your name, date, either "Major" or "Societal/Ethical" and bibliographic citation for your source(s) all at the top right corner. The report will consist of a concise summary of and brief reaction to the source article(s). If your report cites two sources the summary should integrate the information from the two articles instead of including two separate summaries.

One of these reports is due at the latest by **October 8th**. The other is due at the latest by **November 12th**. **Reports will be accepted and welcome before those dates.**

Reports will be graded on a 0-5 scale considering the following:

- Format followed, citations complete.
- Summary accurately reflects the original source.
- Reaction well reasoned.
- Correct grammar and spelling used.
- Written with clarity.

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.

4.2 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 2007-2008 Undergraduate Catalog, pages 71-75. 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.

5 Class Schedule

All dates are tentative.

Week	week starting	Chapter(s)	Topic
1	Aug. 27	1 & 2	Intro, Measurement, Motion in 1-D
2	Sept. 3	2 & 3	Motion & Forces in 1-D
3	Sept. 10	3 & 4	Forces and Motion in 1-D, Vectors
4	Sept. 17	4 & 5	Vectors, Net Force and 2-D Motion
			Test:Chapters 1-3 on Mon. Sept. 17.
5	Sept. 24	5	Net Force and Motion 2-D
6	Oct. 1	6	Identifying and Using Forces
7	Oct. 8	7	Translational Momentum
			Test:Chapters 4-6 on Fri. Oct. 12.
8	Oct. 15	8	Extended Systems
			(Fall Break on M&T)
9	Oct. 22	9	Kinetic Energy and Work
10	Oct. 29	10	Potential Energy and Conservation of Energy
11	Nov. 5	11	Rotation
			Test: Chapters 7-10 on Wed. Nov. 7.
12	Nov. 12	12 & 13	Complex Rotations and Static Equilibrium
13	Nov. 19	15	Fluids
			(Thanksgiving W-F)
14	Nov. 26	19	Temperature, Heat, Thermodynamics 1^{st} Law.
			Test: Chapters 11-13, and 15 Fri. Nov. 30.
15	Dec. 3	21	Entropy, Thermodynamics 2^{nd} Law
16	Dec. 10	-	Review

Final Exam from 8-10:30am on Saturday, December 15, 2007