Mechanics – Physics 351
Spring 2010
Westminster College

1 Pertinent Information

Instructor: Douglas Armstead
Office: 124 Hoyt (724) 946-7201
Office Hours: MF 3-4pm and W 10:20-11:20. These are just the times I guarantee. I am available other times so feel free to drop by or to email me for an appointment.
Email: armstedn@westminster.edu
Course website: www.westminster.edu/staff/armstedn/phys351.html
Lecture meets: MWF 2pm in Hoyt Planetarium.
Texts:
Classical Mechanics 1^{st} *Ed.* by John Taylor published by University Science Books.
Mathematical Methods in the Physical Sciences by Boas published by Wiley.
Prerequisites: Physics 152 is a prerequisite and Math 251 is needed at least concurrently.

2 The Point of this Class [1]

In Physics 151 you became familiar with mechanics using the formalism of either Newton's laws or one of the conservation laws (momentum and energy). In this course you will deepen the sophistication with which you approach mechanics. Some of this will come from being able to apply mathematical tools such as series expansion, vector calculus, differential equations, symbolic solvers, and numerical integration in your problem solving. This sophistication will also come from analyzing motion when your frame of reference is accelerating (non-inertial reference frames) and the motion of rotating objects. Last but not least you will master an entirely different formulation of mechanics, one that will generalize into the framework for understanding quantum mechanics (Lagrangian and Hamiltonian mechanics).

3 Expectations

What you should expect from me:

[1] If you are looking for the outcomes of this course, they are here. This course's effectiveness will be assessed by monitoring the quality of the student's work on the graded elements of this course. See Graded Elements section for their descriptions.

- Explanations of physical concepts that include concrete examples and, where reasonable, demonstrations.
- In-class examples that help you to develop the level 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.
- To prepare for class. This includes doing the reading at a level that you arrive with questions in hand about the material.
- When you have a question, ask it. Your fellow classmates will thank you–if you are unclear on something, chances are the person next to you is, too.
- 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

The final score for the class is found in the following way:

$$score = \frac{H + E_1 + E_2 + F}{4} \tag{1}$$

where H =homework average, $E_i = i$th midterm exam, and F =final exam.

4.1 Graded Elements

The point of the homework in this course is for developing the ability to apply the modes of thinking that are the core of this course. This entails mastering the concept, technique, and thought process that leads from beginning to end using a clear, methodical plan. There are many aids at your disposal: the instructor, in and out of class; your classmates; and the library. But in the end nothing beats quiet concentration and gradually sorting things out for yourself.

Your goal in solving the homework is to both demonstrate and express the logic that leads to the answer, not simply finding the answer itself. This is the standard I will apply when evaluating the homework and the exams. Some exams will have an in-class format and others a take-home. Make-up exams will only be administered for "Excused Absences" (see pages 70-71 of Undergraduate Catalog for details). Supporting documentation to excuse your absence will be required.

The score is mapped into a grade roughly as:

Final %	Grade
90-91,92-100	A- to A
80-81,82-86,87-89	B- to B+
70-71,72-76,77-79	C- to C+ etc.

Improvement and class participation may be used raise a border line grade.

4.2 Academic Integrity

You are expected to observe the College's statements and procedures on Academic Integrity in the 2009-2010 Undergraduate Catalog, pages 72-76. Ask the instructor if you have any uncertainty about what is proper collaboration and what is not.

5 Class Schedule

All dates are tentative.

Week	week starting	Chapter(s)	Topic
1	Jan. 18	Taylor 1	Newton's Laws of Motion
2	Jan. 25	Taylor 2	Projectiles and Charged Particles
3	Feb. 1	Taylor 3	Momentum and Angular Momentum
4	Feb. 8	Taylor 4	Energy
5	Feb. 15	Taylor 4 & 5	Energy Oscillations
			Test:Chapters 1-4
6	Feb. 22	Taylor 5	Oscillations
7	Mar. 1	Taylor 6 or Boas 9	Calculus of Variations
			Spring Break
8	Mar. 15	Taylor 7	Lagrangian Mechanics
9	Mar. 22	Taylor 7 & 13	Lagrangian Mechanics and Hamiltonian Mechanics
10	Mar. 29	Taylor 13	Hamiltonian Mechanics
			Easter Break
11	Apr. 5	Taylor 8	Central Forces
			Test: Chapters 5-7, 13
12	Apr. 12	Taylor 8 & 9	Central Forces and Non-Inertial Reference Frames
13	Apr. 19	Taylor 9	Non-Inertial Reference Frames
14	Apr. 26	Taylor 10	Rotational Motion of Ridgid Bodies
15	May 3	Taylor 11	Coupled Oscillators and Normal Modes
16	May 10	Taylor 11	Coupled Oscillators and Normal Modes

Final Exam from 8-10:30am on Saturday May 15, 2010