

# University of Maryland Department of Physics

Fall 2013

Prof. Steven Anlage

Physics 410

## Title:

Classical Mechanics. Physics 410 is a course on theoretical foundations of classical mechanics with extensive application of the methods. Various tools of theoretical physics will be employed. Intermediate applications of Newton's laws; momentum and energy; damped and driven oscillations; mechanics in noninertial frames; Lagrangian mechanics; central forces; collision theory; Hamiltonian mechanics; rotational motion of rigid bodies; coupled oscillators and normal modes; chaos; relativity. 4 Credits.

## Prerequisite:

PHYS 374 (Intermediate Theoretical Methods). A good preparation in advanced mathematical techniques, including vector calculus, is extremely important. MATH 241, 246, and 240 (Calculus III, Differential Equations, and Linear Algebra) or, alternatively, MATH 340 and 341

## Instructor:

Prof. Steven Anlage, Room 1363 (Physics/CNAM). You can find the CNAM either by 1) going through the blue door labeled "Center for Nanophysics and Advanced Materials" in the basement of the physics building, or 2) entering from the plaza between the Math and Physics buildings. Step-by-step instructions for finding my office (and the room where office hours are held) are posted on the class web site. Phone: 5-7321, e-mail: [anlage@umd.edu](mailto:anlage@umd.edu), research web site: <http://www.cnam.umd.edu/anlage/AnlageHome.htm>

## Schedule:

Two lectures weekly,  
Tu-Th..... 9:00 am - 10:50 am (PHY 1402)

## Required Text:

John R. Taylor, *Classical Mechanics*, (University Science Books, 2005) (ISBN: 9781891389221). We will cover most of the book, but not all sections of every chapter. The homework problems are drawn largely from this book.

## Lectures:

You will be responsible for material presented in lecture that is not in the book. If you miss a lecture you are responsible for finding out from a classmate what we did in class. Lecture summaries will also be posted on the class web site.

## Homework:

The homework assignments will be given on the class website. The assignment will be due at the beginning of class on Thursdays. Please staple papers and show your name, assignment number and date due. Two homework problems will be graded quantitatively (0-10) and the rest will be graded qualitatively (0-2).

Doing the homework is a very important part of this course! Homework will be returned by the following week. Late homework will not be accepted. As compensation, the lowest homework grade from the semester will be dropped.

## Exams:

There will be two "mid-term" exams and a final exam. All exams will be counted towards your final grade. Make-up exams (for any of the exams) must be requested well in advance of the exam; the reason for the absence must be documented and in accord with University policy (see p. 33 of <http://www.umd.edu/catalog/0607/chapter4.pdf>). If an exam is unexpectedly canceled (due to inclement weather, etc.) it is automatically rescheduled for the next class period.

In grading, we are looking more at the reasoning that you use, rather than the final number you arrive at. So remember to carefully set up the problem on paper, even if you cannot see the way through to the solution.

The final exam is Tuesday, December 17 from 8:00 AM – 10:00 AM.

### **Method for Communication with Students Outside the Classroom**

I will use the class web sites (Physics department and Canvas) and possibly e-mail to inform you of changes to the curriculum, homework assignments and due dates, and changes to exam times/dates/locations. Please make sure that your current and active e-mail address is in the ELMS system.

### **Emergency Protocol**

If the university is closed on a homework due date, the homework assignment is due on the next day that the class meets and the university is open. **If the university is closed on an exam day, the exam is rescheduled for the next class meeting.**

### **Numerical Methods**

Developing a working knowledge of numerical methods in the context of physics problem solving is an important skill. You are encouraged to solve problems using programs such as Mathematica or Matlab, and you are also encouraged to visualize the solutions using spreadsheet programs. Note that student versions of Mathematica and Matlab are available for free from OIT. See the class web site for links to download these programs.

### **Dropping the Course:**

Note: the last day to drop with a “W” is November 11.

### **Final Grade:**

Based approximately on homework (~30%), mid-terms (~40%), and final (~30%).

### **Academic Dishonesty (cheating):**

Academic dishonesty is a serious offense that may result in suspension or expulsion from the university. In addition to any other action taken, the normal sanction is a grade of “XF”, denoting “failure due to academic dishonesty,” and will normally be recorded on the transcript of the offending student.

### **Office Hours**

You are strongly encouraged to attend office hours to ask questions, discuss the homework problems, and talk about physics in general. The office hours will be held 3:00-4:00 PM on Mondays, and 3:00-4:00 PM on Wednesdays, just before the homework is due. My office is in the Center for Nanophysics and Advanced Materials.

### **Class Web Site:**

We will use ELMS/Canvas for the class web site for grades and solutions. Make sure that your current e-mail is in the system so that you can receive assignments, updates, etc. The ‘open’ web site will have the homework assignments, lecture summaries, all slides shown in class, and lots of related information. The open web site is located here:

[http://www.physics.umd.edu/courses/Phys410/Anlage\\_Fall13/index.html](http://www.physics.umd.edu/courses/Phys410/Anlage_Fall13/index.html)

### **Tips For Doing Well In This Course:**

- 1) Read the assignment in the book *before* and *after* the material is covered in lecture.
- 2) Freely ask questions in lecture, after lecture, and during office hours. Also discuss problems with your friends and classmates.
- 3) Work all of the homework questions and problems. You are allowed and encouraged to discuss homework with anyone you wish. However, in order to really learn, don’t just copy solutions from somewhere or someone else; rather, work through them in detail yourself. Verbal discussion of how to solve a problem, and sketching together on scratch paper or a blackboard, are fine since they can help you learn while still ensuring that you need to know what you’re doing to write out your own actual solution. Afterwards, make use of the solution sets, your TA’s office hours, and me to make certain you understand all of the solutions. The exams will sometimes involve homework problems.
- 4) Seek help immediately if you do not understand the material or can’t solve the problems. Help is available from your TA, and from me. Don’t wait until just before the exams!
- 5) Remember that you are responsible for material discussed in class, even if it does not appear in the textbook.