

Fall 2009

DEPARTMENT OF PHYSICS

Sept 25, 2009

**PHYSICS 110A: Classical Mechanics**

**INSTRUCTOR**

Dr. Charles Hicks, [jchicks@cox.net](mailto:jchicks@cox.net)  
Mayer Hall 2651, Office Hr: Mon 11:00-11:50AM,  
or by appointment.

**COURSE COORDINATOR**

Patti Hey, 118 Urey Addition, x2-1468  
[plhey@physics.ucsd.edu](mailto:plhey@physics.ucsd.edu)

**COURSE SCHEDULE**

Lectures:	M,W,F	9:00-9:50 AM	WLH 2111
Discussion Session:	Wed	11:00-11:50 AM	PCYNH 121
Midterm:		TBA	WLH 2111
Final:	Wed	Dec 9 8:00-10:59 AM	TBA

**TEXT**

John R. Taylor, *Classical Mechanics*, University Science Books, ISBN 1-891389-22-X

**COURSE DESCRIPTION**

**Subject Matter and Course Text**

Classical Mechanics is a mature subject which lies at the core of Physics. The course will begin with introductory/review material. We will develop mathematical techniques as required. These will include vector calculus, elementary differential equations, Taylor's series and binomial expansions, calculus of variations, and linear algebra. This will allow us to pursue a rather sophisticated study of Mechanics, and by applying these powerful tools to physical problems, you will sharpen both your physical intuition as well as your mathematical skills.

The course text is John R Taylor's Classical Dynamics. From personal experience I know that Professor Taylor is an excellent teacher and his book is an example of his teaching abilities. This book is very clear and extremely readable as well as being a complete study of mechanics at the undergraduate level. It is also an excellent reference book. In a very short time it has become the standard text for this class at most universities. On occasion I will add some of my personal approaches to issues, but due in part to the

quality of this text book, I will basically follow his text. In the first quarter I intend to cover chapters 1-8 plus chapter 11. The first five chapters contain material that in part is a review of material that the student should already have some familiarity. As such my intent is to cover this material at a rather aggressive pace. The midterm will cover this material. Chapters 6-8 and chapter 11 include an introduction to the calculus of variations, Lagrange's equations, two-body central-force problem, and normal mode oscillations. As this should be new material, I intend to cover these subjects in a bit more detail with more emphasis on examples etc. I hope you find these subjects interesting. For example, one of the problems to be considered in the chapter on central-forces is the effective gravitational interaction that results from general relativity. This interaction is responsible for the precession of the perihelion of Mercury (and to a lesser degree all of the planets orbiting the Sun).

### **Problem Sets**

I will assign one problem set per week at the beginning of class each Friday. They will also be listed on the course website (described below). These will be due the following Friday at the beginning of class. I feel that it is very important for you to work on your own. Studying in groups may be valuable on occasion, but it cannot completely substitute working on your own, since the first step in solving a problem is often the most complicated one. If you are unable to solve a problem on your own, only then should you contact other students, or preferably me for some helpful hints. During the discussion sessions, I will address questions about the assigned problems as well as go over additional problems and examples. I will post my solutions to the assigned problems on the physics website on Friday afternoons (after the assignments have been turned in). Late homework will not be accepted once the solutions have been posted.

I personally feel that solving problems is the only way to really learn the concepts and techniques required in physics. Hence I put a premium on solving the problems. As a result a grader and I will make the effort to grade all of the assigned problems. Your grade on the problem sets will comprise 40% of your grade in the class.

### **Course Web Site**

The lecture notes, problem assignments, problem solutions (after they have been turned in), any relevant announcements, plus midterm solutions will all be posted on the course website, <http://physics.ucsd.edu/students/courses/fall2009/managed/physics110a/>. This web site should provide helpful information for this course and I encourage the students to make use of it.

### **Discussion Sessions and Office Hours**

There will be a weekly discussion section on Wednesdays at 11:00 in Pepper Canyon Hall (just north of the Gilman Parking Garage) room 121. Additionally I will hold office hours in my office, Mayer Hall 2651, on Mondays at 11:00, or by appointment. If you have questions about the concepts that are covered it is best to get them cleared up as

soon as possible. With this in mind, I strongly encourage you to attend (and participate) in these discussion sections as well as see me during office hours.

### Grading

Since I consider solving problems to be an important part of learning physics (probably the **MOST** important part) I will use the following formula to determine grades: 40% problem sets, 20% midterm, 40% comprehensive final. The midterm will take place after we have covered the first 5 chapters of the book. To submit an exam or problem set for re-grading, you must resubmit your original work together with a detailed description of your grievance.

### Prerequisites

The completion of the Physics 2A/B/C or 4A/B/C/D series, Mathematics 20D/E/F (concurrent enrollment in Mathematics 20F permitted).

### Conclusion

I hope that you find this material interesting. Included in this course are new mathematical techniques (calculus of variations), an introduction of normal modes, as well as a much more in depth study of orbital mechanics. Additionally a good understanding of mechanics is necessary for the study of relativity (both special and general) and quantum mechanics.

## **MIDTERM**

I am tentatively planning on having the midterm around October 30. It will be a closed-book exam with one 3x5 cheat-sheet allowed. If necessary, equations will be written on the blackboard or in the exam. The number of formulas that you will be required to know will be minimal and if you have been working on the problem assignments they will be almost automatic as part of your knowledge of mechanics. The midterm will consist of problems each requiring a free form solution.

1. In general a calculator will not be required. Typically the solutions will be algebraic solutions. You should bring a significant amount of blank scratch paper as the problems will require calculations and algebraic manipulations that are beyond what you can perform in your head.
2. Any appeal of an exam grade should be made in writing **to me within one week** of the posting of the solutions to that exam. You must provide an explanation for why you are appealing the grade (be specific).
3. **There will be no make-up midterm (or final) for any reason what-so-ever.**

## FINAL EXAM

As with the midterm, the final will be a closed-book exam with one 3x5 cheat-sheet allowed. It will be comprehensive and cover **the all of the course material**. However it will concentrate to some extent on the material that is discussed during the second half of the course. Also as with the midterm you should bring a significant amount of scratch paper. The final will be given on **Wednesday, December 9th, from 8:00 AM to 11:00 AM**, in a location to be announced. Your student I.D. is required to take it.

**COURSE GRADE:** 40% problem sets, 20% midterm, 40% comprehensive final.

## ACADEMIC DISHONESTY

Please read "UCSD Policy on Integrity of Scholarship" in the UCSD General Catalog. These rules will be rigorously enforced. Any confirmed case of cheating will result in an "F" grade and referral to the appropriate dean for disciplinary action. For the purposes of this class, cheating includes submitting another person's work as your own, copying from another student on the midterm or the Final Exam (or knowingly allowing another student to copy from you), and the use of unauthorized materials during the midterm or Final Exam.

## ADD/DROP PROCEDURE

Use WebReg to add/change/drop, drop from waitlists. **No add/drop cards will be signed by the instructor.**

### Last day to:

Add	Friday, October 9, 2009
Drop without "W" on transcript	Friday, October 23, 2009
Drop without penalty of "F" grade	Monday, November 30, 2009

## WHOM TO SEE

Contact Sharmila Poddar or Richard Hsu E-mail: [Spoddar@physics.ucsd.edu](mailto:Spoddar@physics.ucsd.edu) or [Rhsu@physics.ucsd.edu](mailto:Rhsu@physics.ucsd.edu) ; 115 Urey Hall Addition, Physics Dept. Student Affairs Office, if you have any trouble using WebReg to add/change/drop, drop from waitlists.

The Instructor, if you have basic questions about the subject matter, or if you have administrative problems.