

Physics 318 — Analytical Mechanics
Spring 2008

Instructor: Prof. Éanna Flanagan, 606 Space Sciences.
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Lectures: 10:10 - 11:00am Mondays, Wednesdays and Fridays in 105 Rockefeller.

Section: Section meetings are 2:30-3:20pm Fridays in Rockefeller 104.

TA and grader: Duane Loh is the TA for this course. His email is duaneloh@gmail.com, and his office is 616 Clark Hall. Joe Chen is the grader. His email is joe.p.chen@gmail.com and his office is B81 Rockefeller, phone x56036.

Office Hours: Professor Flanagan's office hours will be 2pm-4pm Mondays in 606 Space Sciences or by appointment. The TA will also hold office hours at a time and place to be announced later.

Web Page: Information relevant to the course (handouts, problem sets, etc.) can be found on the web page
<http://www.astro.cornell.edu/~flanagan/ph318/>

Prerequisites: This course assumes that you have prior exposure to Fourier analysis, linear differential equations, linear algebra, and vector analysis. You should have taken Physics 116 and A&EP 321 or equivalent. Note that Physics 314 covers similar material to Physics 318 at a less demanding level; if you find the going difficult you have the option of dropping back to Physics 314.

Topics: The following topics will be covered during the course:

1. Review of Newton's mechanics and its limitations
2. Lagrangian formulation of mechanics
3. Variational principles
4. Motion in a central force
5. Rigid bodies
6. Small oscillations
7. Chaos
8. Hamiltonian formulation of mechanics
9. Continuous systems and field theories

Homework: Homework sets will be handed out once a week on Wednesdays, and will be due the following Wednesday at the end of class. Except in special circumstances, late homeworks will be docked 10 percent for each day of lateness, and no credit will be given after the solutions have been handed out.

Homework assignments are an essential part of the course and should be taken very seriously. Solving problems is the most effective way of learning physics. Any effort put into it is an investment that will pay off later. It is legitimate, even desirable, for you to discuss the problems with other students, consult textbooks, or get advice from your TA or the instructor. However, the final work should be yours! You are expected to abide by the Cornell University Code of Academic Integrity.

Exams: There will be two prelim exams and a final exam for this course. The course grade will be based 50% on homeworks, 15% each on the two prelims, and 20% on the final. The first prelim will be at 7:30pm on Thursday Feb 21, and the second prelim will be at 7:30pm on Thursday March 27. The final will be on Wednesday, May 7 from 7-9:30pm.

Textbook: The required textbook is *Classical Mechanics* by H. Goldstein, C. Poole and J. Safko, third edition, available in the bookstore. Other recommended texts are *Analytical Mechanics* by L. N. Hand and J. D. Finch, and *Classical Dynamics of Particles and Systems* by S.T. Thornton and J.B. Marion. All of these have been placed on reserve in the physical sciences library. Marion and Thornton contains many examples and useful exercises; the other two books are at a more formal level.

I also recommend that you consult the first volume of *The Feynman lectures on physics*. This is a classic book that every aspiring physicist should read. *Mechanics*, third edition by L.D. Landau and E.M. Lifshitz is a classic text and also a good reference to consult; it covers a lot of material but is too terse to use as a textbook.