

Class Meeting: **M, W & F** 10:10-11:30am

Class Location: Heg 106

Office Hours: **TBD**

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Office: Rose 112

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Course Description — This is amongst the most important classes you will take in your undergraduate career. The material covered in this course makes up the majority of the foundation on which the rest of physics is constructed. You will also pick up invaluable skills for calculation in all areas of physics. The material has numerous interesting applications: particle physics and field theory; chaos and nonlinear mechanics; quantum mechanics and its myriad applications; and the theory of fluids and turbulence. The formulation of mechanics in terms of Lagrange's or Hamilton's equations brings a plethora of systems that were previously extremely difficult or completely intractable in to the reach of the interested and curious physicist. These formulations provide the most succinct and direct formulations of mechanics ever discovered. Welcome to a new world!

Text: *Classical Mechanics*, by J. R. Taylor (University Science Books, 2005)

Course website: <http://faculty.bard.edu/hhaggard/teaching/phys303Fa18/>

Homework — There will be homework due every *week* at 5pm. Complete solutions will be posted. I will grade a portion of the problems on a 0-5 scale. These scores mean roughly the following: 5=clear and complete solution, 4=good solution missing one conceptual point or calculation, 3=clear attempt but with substantive flaw, 2=effort made but

Grading Structure

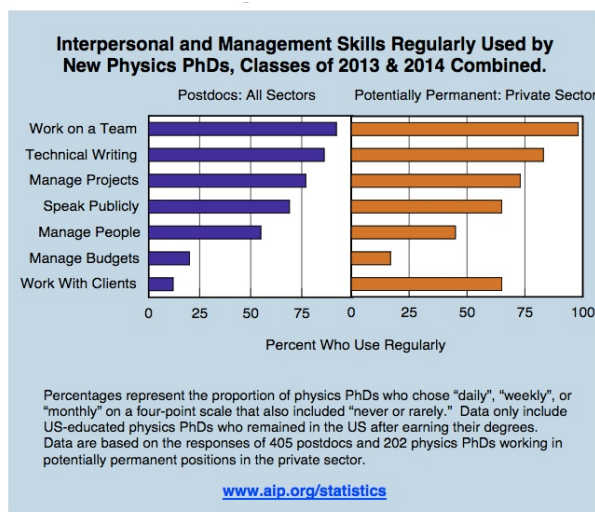
Weekly Homework (due on Thursdays)	35%
Attendance	5%
Guest Lecture	5%
Take home 1	20%
Oral	15%
Take home 2	20%

incomplete plan, 1=little effort, 0=nothing appearing. I care most about the effort you invest and you can receive credit on this basis. The goal of the homework is for us to engage each other in a discussion of physics regularly, please come and visit as often as you like to discuss. Along these lines, I recommend that you work together; this is invaluable in learning physics. Please write things up yourself to show me and you that you understand it (this helps battle the illusion of explanatory depth, which is worth looking up). I will always answer any questions in class, as well. Please do not use the internet as a resource for anything but physics books.

Regrades — I will get graded work back to you as quickly as possible. I will post solutions to the homework promptly when the homework is due. This will allow you to correct the problems yourself using the homework corrections guide. Then resubmit your corrected homework. I will correct 2 problems from the initial submission and 2 from the resubmitted version. Initially graded problems can also be regraded problems. Because of this regrade policy I cannot accept late work.

Take homes — Twice during the semester I will give you take home exams. These will be 4 hour, open book, self-timed exams. You can study as much as you like using any resource up to opening the exam. However, once you have opened the exam I ask that you only refer to your class notes and our primary text. You should honor your peers and the effort that we all put into the class by not going over time or referencing any outside materials.

Oral — To many people’s surprise two of the most important skills of a physicist are writing and talking about physics, see the Figure below. For the oral you will be asked to explain concepts from the course and to do problems at the board. More details about this when the time approaches.



Week	Topics	Chap.
9/3	Oscillations: Damped & Driven	5
9/10	Calculus of Variations (<i>9/12 Drop/Add Ends</i>)	6
9/17	Lagrangian Mechanics	7.1-7
9/24	Noether’s Theorem & Constraints	7.8 & 7.10
10/1	Central Forces & Kepler Prob. (Take home 1 due 10/5, 5pm)	8.1-7
10/8	(<i>10/8 & 10/9 Fall Break</i>) Orbital Transfer	8.8
10/15	Tides & Rotational Motion	9.1-2 & 9.3-5
10/22	Centrifugal and Coriolis Forces	9.6-10
10/29	Rigid Bodies and Principal Axes	10.1-5
11/5	Examples and Euler’s Equations (Oral this week)	10.6-10
11/12	Coupled Oscillations and Normal Modes	11
11/19	Nonlinear Mechanics & Chaos (<i>Thanksgiving 11/22-23</i>)	12.1-6
11/26	Phase Space	Depart from Taylor
12/3	Hamiltonian Mechanics (Wed. 12/9 Adv. day)	(but see Ch. 13)
12/10	Symmetry in Phase Space	
12/17	<i>Completion days begin</i> (Take home 2 due 12/22, 1pm)	
	Catastrophes or Continuum Mechanics or More Chaos?	Depends

Note: I reserve the right to adjust this syllabus during the semester

I have read over this syllabus. I agree not to look at solutions manuals or use the internet for anything other than looking up reference information. I agree not to use my peers or other people to gain unfair advantage in the course. Finally, I commit to stick to the parameters of the take home exams and stay within the allotted time.

Signed:

Date: