Physics 303, Fall 2015	Classical Mechanics	Hal M. Haggard
Class Meeting: $\mathbf{M}, \mathbf{W} \& \mathbf{F}$ 10):10-11:30am	Email: haggard@bard.edu
Class Location: Heg 106		Office: Rose 112
Office Hours: TBD		Office Phone: (845) 758-7302

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)

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. I ask that you honor your peers and the effort

Grading Structure	
Weekly Homework (due on Thursdays)	40%
Quizzes	5%
Take home 1	20%
Oral	15%
Take home 2	20%

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. For the oral you will be asked to give a brief presentation on a physics problem. More details about this when the time approaches.

Homework — There will be homework due every Thursday 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 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.

Course website: http://bohr.physics.berkeley.edu/hal/teaching/phys303Fa15/

Week	Topics	Chap.
8/31	Oscillations: Damped & Driven	5
9/7	Calculus of Variations	6
9/14	Lagrangian Mechanics	7.1-7
9/21	Noether's Theorem & Constraints	7.8 & 7.10
9/28	Central Forces & Kepler Problem	8.1-7
10/5	Orbital Transfer & Tides (Take home 1 due 10/9, 5pm)	8.8 & 9.1-2
10/12	$(10/12 \ \ensuremath{\mathfrak{C}}\ 10/13 \ \ensuremath{\mathit{Fall Break}}\ \ensuremath{Rotational Motion}\ \ensuremath{Motion}\ \ensuremath{Comparison}\ \ensuremath{Comparison}\ \ensuremath{Rotational Motion}\ \ensuremath{Comparison}\ \ensuremath{Rotational Motion}\ \ensuremath{Rotational Motional Motion}\ \ensuremath{Rotational Motion}\ \ensurem$	9.3-5
10/19	Centrifugal and Coriolis Forces	9.6-10
10/26	Rigid Bodies and Principal Axes	10.1-5
11/2	Examples and Euler's Equations	10.6-10
11/9	Coupled Oscillations and Normal Modes (Oral this week)	11
11/16	Nonlinear Mechanics & Chaos	12.1-6
11/23	Phase Space (Thanksgiving 11/26-27)	Depart from Taylor
11/30	Hamiltonian Mechanics	(but see Ch. 13)
12/7	(Wed. 12/9 Adv. day) Symmetry in Phase Space	
12/14	Completion days begin (Take home 2 due 12/18, 11am)	
	Catastrophes or Continuum Mechanics or More Chaos?	Depends

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

Quizzes — Sporadic brief (10-15min) quizzes will help you keep track of what you should know and the few equations you should memorize.

Lateness and Other Anomalies — I will usually grade your homework on Thursdays and return it to you in class on Fridays. Late work will be accepted before I have graded that week's assignment with a 20% deduction on the graded score. After a set has been graded I will no longer accept late work. If you tell me about something ahead of time, almost any situation can be accommodated.

Further recommended books:

Classical Dynamics: A Contemporary Approach, by J. V. José & E. J. Saletan A wonderful book, which is at a slightly more advanced level than our text.

Analytic Mechanics, by L. N. Hand and J. D. Finch A bit sparse at points, but also provides nice discussion of some fine points.

Classical Dynamics of Particles and Systems, by J. B. Marion & S. T. Thornton A bit drier than our course text, but it is at the same level and provides an alternative perspective.

Classical Mechanics, by H. Goldstein, C. P. Poole & J. Safko The standard graduate level text. Old fashioned, but excellent in many respects.

Mathematical Methods of Classical Mechancis, by V. I. Arnol'd A rigorous and exquisite treatise by one of the greats of the field. 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. Finally, I commit to stick to the parameters of the take home exams and stay within the allotted time.

Signed:

Date: