PHYSICS 343 Dynamics
Fall 2011

Instructor: Prof. Ashley Carter

Contact: 118 Merrill Science Center
              413-542-2593 (office) or 303-818-8536 (cell/text)
              acarter@amherst.edu

Office Hrs: Prof. Carter - TTh 11:30 – 12:00 pm, MWF 11:00 – 12:00 pm
These are official office hours, but you should feel free to stop by at any time. You can also make an appointment for a more convenient time. I teach from 10-11:30 in Seeley Mudd 207. If I am not in my office on TTh during office hours, I may be there.

Class Hours:
Lecture is MWF 10:00 - 11:00 am, Merrill 211 (Merry-go-round room)
Tentative problem session on Tuesday 7-8 pm.

Catalog Description:
This course begins with the **foundation of classical mechanics as formulated in Newton's Laws** of Motion. We then use Hamilton's **Principle of Least Action** to arrive at an alternative formulation of mechanics in which the equations of motion are derived from energies rather than forces. This **Lagrangian formulation** has many virtues, among them a deeper insight into the connection between symmetries and conservation laws. From the Lagrangian formulation we will move to the **Hamiltonian formulation** and the discussion of dynamics in phase space, exploring various avenues for the transition from the classical to the quantum theory. We will study motion in a central force field, the derivation of Kepler's laws of planetary motion from Newton's law of gravity, two-body collisions, and physics in non-inertial reference frames. **Other topics** may include the dynamics of driven, damped oscillators, and non-linear dynamics of chaotic systems. Three class hours per week.
Requisite: PHYS 227 or consent of the instructor. Fall semester. Professor Carter.
I have highlighted above the major topics in this course. There will also be a one hour problem session.

Text and Materials:
1) **Text**: *Classical Mechanics* by John Taylor. Recommended text is *Classical Mechanics* by Goldstein. Both texts are available at Amherst Books.
2) **Lecture Materials:** For lectures you will need to bring a scientific calculator, a pen, and a notebook/binder for notes or to hold handouts.

Grading:

Your grade for the course will be based on your homework and exam grades. You will also be expected to participate during lecture and problem sessions.

Homework:

In addition to reading roughly a chapter per week, you will be expected to complete one homework assignment per week for a total of 10 assignments. Homework assignments are primarily a teaching exercise to prepare you for the exams, but **you must pass each homework assignment**. To pass a homework assignment you must attempt all of the problems and show all of your work. You cannot leave any problems blank. Homework will be due on Wednesday night at midnight to the green box outside of my office (Merrill 118). I encourage you to do the straightforward (one star) problems by yourself and to collaborate with your classmates on the harder problems (two star and three star). Remember that copying is a violation of the code of intellectual responsibility, and each student needs to turn in their own work in their own words. If you have any doubts please ask the instructor. Late policy: You are allowed one late assignment for up to 3 days late for any reason. If you turn in more than one assignment late you will need permission of your Class Dean in order to not fail that assignment. Extensions will be granted on a case by case basis, and must be requested before the assignment is due. I am going to be a real stickler about turning the homework in on time, be warned.

Homework assignments are as follows: (Other problems may be added in lieu of the problems shown here at my discretion.)

Assignment 1: (Due Sept. 21) Ch.1 – 10, 25, 27, 37, 46, 48 & Ch. 2 – 2, 3, 19, 21, 26, 50
Assignment 2: (Due Sept. 28) Ch.3 – 4, 9, 11, 13, 18, 23, 27, 35 & Ch. 4 – 4, 7, 13, 28, 41, 44, 48, 52
Assignment 3: (Due Oct. 5) Ch. 5 – 3, 7, 18, 19, 25, 36, 45, 46
Assignment 4: (Due Oct. 12) Ch. 6 – 1, 6, 9, 10, 16, 17, 27
Assignment 5: (Due Oct. 26) Ch. 7 – 1, 3, 4, 10, 14, 17, 31, 36, 47, 51
Assignment 6: (Due Nov. 9) Ch. 13 – 1, 3, 5, 11, 17, 20, 23, 24, 28
Assignment 7: (Due Nov. 16) Ch. 8 – 2, 6, 8, 13, 19, 27, 29, 35
Assignment 8: (Due Nov. 30) Ch. 9 – 1, 3, 8, 9, 14, 18, 19, 27, 33
Assignment 9: (Due Dec. 7) Ch. 10 – 1, 3, 4, 8, 11, 24, 33, 40
Assignment 10: (Due Dec. 14) Ch. 11 – 1, 5, 9, 14, 16, 23, 25, 35

Exams:

There will be three exams during the course and a final. Times are tentative. The exams will not be curved, but they will be written such that the mean of the exam should be around 75%.

First Exam: Take home exam, Review of Introductory Mechanics, September 9-12
Second Exam: Ch. 1-5, Wednesday, October 12, 7-9 pm.
Third Exam: Ch. 6-7 and 13, Wednesday, November 16, 7-9 pm.
Final Exam: Ch. 1-11 and 13, Registrar scheduled.

Rubric:

Your grade in the course will be out of 1000 points. If you pass each homework assignment you will receive 300 points. If you fail one of the homework assignments then you will receive 0 points. Thus,

homework is all or nothing. If you pass the first exam, then you will earn 100 points. To pass you must score 80% or above on the first exam or take the make-up exam. The second and third exam will be worth 150 points. The final exam is worth 300 points. The total number of points you receive divided by 1000 will be your base grade. You will not receive a grade lower than your base grade. The class will not be curved. Below is a spreadsheet with this information, as well as sample grades from three imaginary students.

	Points Possible	Student 1 (85%)	Student 2 (75%)	Student 3 (50%)
Homework	300	300	300	300
First Exam	100	100	100	100
Second Exam	150	128	113	75
Third Exam	150	128	113	75
Final	300	255	225	150
Total	1000	911	851	700
Grade		0.911	0.851	0.7
		A-	B	C-

INTELLECTUAL RESPONSIBILITY:

Homework – You are encouraged to work with other students on your homework, but what you turn in must represent your own understanding of the problems. Copying a solution from another student or from a published source will be considered a violation of the intellectual responsibility code. This rule applies to solutions posted on the internet or other sources as well.

Exams – You will not be allowed to collaborate with anyone during an exam. What you submit must be entirely your own work.