Lecturer: Prof. Fiona Harrison 211 Downs x6601 fiona@srl.caltech.edu

Location: Tuesday/Thursday 10:30 – 12:00, 155 Arms

Office Hours: I will be available for questions Mondays, 10:00 – 11:00 and by appointment (e-mail to arrange a time). The TAs will hold office hours to provide support for questions on homework.

Teaching Assistants:
- Donal O’Connell (donal@caltech.edu)
  Office Hours: 3:00 – 4:30 p.m. Wednesday, location TBD
- Oleg Evnin (eoe@caltech.edu)
  Office Hours: Tuesday evening, 422 Downs

Course Description/Text:
Physics 106a and the first half of 106b will cover intermediate level classical mechanics, with an introduction to non-linear systems and chaos. The required textbook will be Hand and Finch, Analytical Mechanics.

Assignments/Grades: Your grade will be based on homework (30%), midterm (30%), and final (40%).

Homework will be assigned each Thursday, due the following Thursday in class. Late homework will be accepted for 50% credit for up to 1 week (no credit for assignments more than 1 week late). No extensions on homework will be granted without a note from the Dean or health official. Graded papers will be returned within one week. Copies of assignments will also be available at http://www.srl.caltech.edu/phys106. You may collaborate (and are encouraged to do so) on solving homework problems, and you may get help from me or the from TAs. The writeup of the problems must be your own (no “handwritten Xeroxs” of someone else’s work!).

Midterm: There will be a take-home midterm, handed out October 31, Due November 4 by 5 p.m. in 203 Downs.

Final Exam: There will be a final exam handed out at the last lecture, due December 12 by 5:00 p.m. in 203 Downs.
Synopsis of Topics

The following summarizes the approximate schedule we will follow Fall term. Note that dates may be modified slightly depending on how things evolve.

1. 10/1  Review – Newtonian Mechanics
   Inertial frames, conservation laws, elastic collisions.

2.  10/4 – 10/11  The Lagrangian Formulation of Mechanics  Reading: H&F Chap. 1,2
   Calculus of variations, Euler equations, Lagrangian formulation of mechanics, Hamilton’s Principle, holonomic constraints, D’Alembert’s Principle, generalized forces.

3.  10/14 – 10/18  Applications of Lagrangian Dynamics  Reading: H&F Chap. 1,2
   Conservation laws, simple and double pendula, elliptic functions, parametric oscillator, non-holonomic constraints.

4.  10/21 – 10/25  Linear Oscillations  Reading: H&F Chap. 3
   Stable/unstable equilibrium, simple harmonic motion, damping

5.  10/28 – 11/1  Central Force Motion  Reading: H&F Chap. 4

6.  11/4 – 11/8  Theory of Small Oscillations  Reading: H&F Chap. 9
   Normal modes, diatomic and triatomic molecules

7.  11/11 – 11/15  Rotating Coordinate Systems  Reading: H&F Chap 7
   Infinitesimal rotations, rotating reference frames, angular velocity, fictitious forces

8.  11/18 – 11/29  Rigid Body Dynamics and Precession  Reading: H&F Chap 8
   Inertia tensor, angular momentum, kinematics, equations of motion, Euler equations

9.  12/2 – 12/6  Weakly Non-linear Systems and Review  Reading: H&F Chap 10
   Stability of mechanical systems, parametric resonance