Ph 101  ORDER OF MAGNITUDE PHYSICS  Winter 2007

Meets Tue and Thur 2:30–4:00 in 269 Lauritsen
Website: http://www.its.caltech.edu/~oom/

Prof: Sterl Phinney
125 Bridge Annex
x4308 esp AT tapir

TAs: Chao Li  Chris Wegg
165 W. Bridge  165 W. Bridge
x8651, lichao@caltech  x8649, wegg@caltech

Office hours: 4-6pm Tue  7-9pm W in 124 Bridge

Texts: none suitable

Things we hope you’ll learn:
– How to make estimates for fun and profit.
– How to decide what physical or other effects are important in a given situation, or to understand how some system works the way it does.
– How to decide what terms in complicated equations can be omitted or simplified.
– How to figure out the general features of the solutions to equations, without actually solving the equations.
– How to have fun using physics to understand the world around you, and to ask questions about it.

Rough syllabus
Week 1 – Estimation,
  2 – Dimensional analysis, scaling, simple problems
  3 – Similarity solutions, atoms
  4 – Bulk properties of materials
  5 – Approximation and simplifying differential equations
  6 – Biomechanics
  7 – Waves and fluids
  8 – Weather, oceans and atmospheres, climate change.
  9 – *Class vote: possible topics below or suggest others.
10 – *Class vote

* Biology: evolution, metabolism, lifetime, neurons, information processing.
* Sound, the ear, musical instruments, acoustics, recording
* Astro/physics: experiment design, estimating unwanted effects, estimating cross sections, reaction rates, nuclear reactors and bombs, astrophysical objects: stars, planets, cosmology etc.
Homework - There will be one problem set per week, handed out Thursdays and due in class the following Thursday.
- The problem sets are intended to be fun. Therefore, if you spend more than 1/2 hour on any problem, and still feel lost, come see one of us for a hint, or the number you need but can’t find.
- One problem each week will be to invent a problem of your own. Good ones will be used as examples in class, or will appear on subsequent problem sets. You don’t have to know how to answer a problem to submit it—we’ll see if we can figure it out.

Homework policy - You may verbally discuss the problems with other students, the TAs or us, but your final solution should be thought through and written by you alone.
- You may not consult solution sets handed out in previous years.
- You may not look at anyone else’s written solutions (whether on paper or a blackboard). Reading or copying someone else’s solution a) will not teach you anything, and b) will be construed as an honor code violation.
- Some of the problems may have answers you could look up in a book. In the same spirit as above, don’t. It spoils the fun. You are supposed to be learning how to think creatively. It is permitted to look up equations or numbers that you need for the problems. Just don’t go looking for complete solutions.
- Problem sets will be due at the beginning of class the Wednesday of the week after they are passed out. Solution sets will generally be available on the day the homework is due. Late homework will not be accepted, except in unusual circumstances and by prior arrangement with one of the professors.
- Graded homework will be returned in class. Dead homework and assignments may be collected from a box in the Theoretical Astrophysics interaction room (124 Bridge Annex).

Midterm Exam - none
Final Exam - The final will be closed book, closed notes. You will be permitted only to use the sheet of constants handed out in class.

Grading - Homework will be worth 60% of the grade, and final will be worth 40% of the grade.