

Meets MWF 1-2pm in Cahill building's Hameetman auditorium

Website: <http://www.its.caltech.edu/~oom/>

Prof:	Sterl Phinney 316 Cahill x4308 esp@tapir	David Stevenson 172 South Mudd x6193 djs@gps
TAs:	Kaveh Pahlevan 158 S. Mudd x5823, kaveh@gps	Timothy Dulaney 457 Lauritsen x6692, dulaney@caltech
Office hours: Fri 2-4pm, 103 Downs		
TAs:	Jing Luan 356 Cahill x???, jingluan@caltech	

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 (order may change)

Week Mar 30 – (DJS, DJS, ESP) Estimation, Dimensional analysis, scaling

Apr 6 – (ESP,ESP,ESP) More scaling, Bulk Properties of materials

Apr 13 – (DJS, DJS, ESP) Bulk properties of materials,

Apr 20 – (ESP, DJS, DJS) Human cooling and exercise, water waves

Apr 27 – (DJS, DJS, ESP) Waves and acoustics.

May 4 – Biomechanics, human exercise limits

May 11 – Weather, oceans and atmospheres, climate change.

May 18 – *Class vote: **possible topics below** or suggest others.

May 27 – *Class vote

- * Economics, industry and finance.
- * Tricks for general ODE and PDE equations.
- * Biology: evolution, metabolism, lifetime, neurons, information processing.
- * Sound, the ear, musical instruments, acoustics, recording
- * Bombs, guns, torpedos, nuclear reactors, supernovae and other things that go bang.
- * Birds, airplanes, helicopters, spacecraft, lift, drag, boundary layers, turbulence, Kolmogorov spectrum.
- * astrophysical objects: stars, planets, cosmology

Homework

- There will be one problem set per week, handed out Mondays and due in class the following Monday.
- 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 *Monday* of the week after they are passed out. Solution sets will generally be available on the day the homework is due.

Late homework. Unless excused by the Deans (e.g. for medical reasons), late homework will have the score reduced by 15% for each day it is late (i.e. on day 1 the score will be multiplied by 0.85, on day 2 by 0.7, etc), with no credit for homework more than a week late. If you are on travel, send the homework to the TAs via scanner/email or FAX.

- Graded homework will be returned in class. Dead homework and assignments may be collected from a box in the Theoretical Astrophysics interaction room (319 Cahill).

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.