

## APh 77 Organization, Winter 2007 Senior Laboratory in Applied Physics

**Instructor:** Prof. Paul Bellan, 126 Watson, x4827, pbellan@its.caltech.edu

**Secretary:** Connie Rodriguez, 128 Watson, x4854, conniemr@its.caltech.edu

**Location:** 265 Watson. Lab phone number is x2800.

### Experiments/Teaching Assistants:

	<i>Experiment Name</i>	<i>Teaching Assistant</i>	<i>TA Email</i>
1	Plasma Waves	Auna Moser	auna@gps.caltech.edu
2	Blackbody Radiation	Auna Moser	auna@gps.caltech.edu
3	X-ray Diffraction	William Chueh	chueh@caltech.edu
4	Fiber Optics	Bao Ha	hab@caltech.edu
5	Fluid Turbulence	Bao Ha	hab@caltech.edu
6	Atomic Force Microscopy	Bao Ha	hab@caltech.eduhab@caltech.edu
7	Analog Electronics	Bao Ha	hab@caltech.edu

**Analog Electronics is a pre-requisite for Atomic Force Microscopy.**

**Grading:** Grading will be by TA's and reviewed by Prof. Bellan and will be based on the scheme tabulated below:

Prelab questions	5 points
Performance in lab (experimental)	5 points
Lab report (written)	15 points

### Lab handouts:

Lab handouts, provided on a CD-ROM, contain prelab questions which should be completed prior to attempting to work in the lab. There may be updates during the term, so check with your TA.

### Lab books

Every student is to have two lab books, so that the student can use one while the other is being graded. The lab book is to be used to take notes and record data and information during the lab sessions. This will form the basis for generating the laboratory report for each experiment.

**Typical sequence for doing an experiment:**

1. Read the handout on the experiment and consult with the TA if you need help understanding some issue.
2. Answer the pre-laboratory (prelab) questions. Prelab questions are to be completed without collaboration between lab partners or between lab partners and other students. The only exception to this non-collaboration policy is that students can obtain advice from other students on where to find relevant information. These answers to the prelab questions must be neatly written or typed so that a copy can be provided to the TA for grading purposes.
3. Make an appointment with the relevant TA during the first week of the experiment to meet in the lab at a mutually convenient time. At this meeting:
  - a. Give the TA your answers to the prelab questions. If a student shows up at the meeting without having completed the prelab questions or without having the answers available to provide to the TA, the TA will cancel the meeting (i.e., send the students away), and deduct 2 points from the grade of the unprepared student. You will then have to schedule another meeting with the TA.
  - b. Ask the TA questions about anything you do not understand.
  - c. The TA will provide guidance on the initial operation of the experiment and will offer advice on any important issues pertaining to the laboratory exercise that are undocumented.
4. Complete the experiments at times which are suitable for your schedule. Record the time you are in the lab in the lab book and record information about what you did in your laboratory book. This information should be sufficiently complete and clear so that a person other than yourself can understand in detail what you did and what results you obtained. Operation of the experiment and collection of data will typically be done collaboratively between lab partners. Write a concise analysis/summary without collaboration and place this at the end of your lab book.
5. Tidy up the laboratory space so that it is ready for the next group.
6. Hand in your lab report by putting it in the marked file box in 265 Watson and inform the TA via email that it is ready to be graded.

**Keys and security:**

Every student will be issued a key to Room 265 Watson by Eleonora Vorobieff who is in Room 106 Watson. Grades will not be issued if keys are not returned to Eleonora and a \$25 charge will be made to your student account. Students must follow all safety precautions and warnings regarding the experiments.

**Malfunctioning equipment:**

If something is broken, please report it immediately via email to the TA and copy the message to Prof. Bellan so that it can be repaired.

**Computers:**

Make personal folders on computers and save your data there. Transmit your data via the network to another computer for safekeeping and analysis. Do not place any software on the computers without permission from the TA's or Prof. Bellan. Do not use the lab computers for purposes other than APh77.

**Partners and Sections:**

Students will work in pairs subject to the collaboration policy listed on page 2. Each pair will work on one experiment for two weeks and will do four experiments during the term. There is no time available for make-up sessions.

**Section A Calendar:**

	Lab report due date
1st Experiment	Jan 25
2 <sup>nd</sup> Experiment	Feb 8
3 <sup>rd</sup> Experiment	Feb 22
4 <sup>th</sup> Experiment	Mar 7

**Penalties for late submission of lab reports:**

Late 1-3 days: 2 points off

Late 4-6 days: 4 points off

Late 6-10 days: 6 points off

Not scheduling initial TA

meeting during the first week

of the experiment: 5 points off

These penalties may be waived for a valid reason by the TA provided (i) a new firm date for submission is arranged and (ii) Dr. Bellan is informed by the student by e-mail of the change and of the TA's approval. *TA's may only extend the due date by one week.*

## **List of Reserved Books**

(3 hours daytime, or overnight after 10pm)

### **Fluid**

1. I. G. Currie, *Fundamental Mechanics of Fluids*, McGraw Hill, 1993, 2nd Ed.
2. Sabersky, Acosta, & Hauptmann, *Fluid Flow: A First Course in Fluid Mechanics*, Macmillan, 1989, 3rd Ed.

### **X-ray**

1. B. D. Cullity, *Elements of X-ray Diffraction* (Addison-Wesley, 1967)
2. A. Guinier, *X-ray Diffraction* (W. H. Freeman, 1967)
3. W. B. Pearson, *Handbook of Lattice Spacings and Structures of Metals*, (Pergamon, 1967).

### **Blackbody**

*The Feynman Lectures on Physics*, (Addison-Wesley, 1965), Vol III.

### **Analog Electronics**

P. Horowitz and W. Hill, *The Art of Electronics* (Cambridge University Press), 1989 2<sup>nd</sup> edition

## Scheduling worksheet

Please return this sheet to Prof. Bellan at the end of the organizational meeting.

Name (print **clearly**): \_\_\_\_\_

Student account number (to be charged \$25 if key not returned) \_\_\_\_\_

So or Jr or Sr or Gr (circle)

Check which description is correct for you:

- Registered in class, definitely taking class
- Not yet registered, definitely taking class
- Not registered, thinking about taking class, not sure

APh option or \_\_\_\_\_

Address: \_\_\_\_\_

Telephone \_\_\_\_\_

email: \_\_\_\_\_

Who (if anyone) do you want to be your partner? \_\_\_\_\_  
(Attach your sheets together. Check that your preferences are similar.)

Preferences for experiments **Rank all of them**  
(if you have taken the class before, state which experiments you did before)

	Experiment Name	Choice (1 for 1 <sup>st</sup> choice, etc.)	Check here if you did this experiment before
1.	Plasma Waves		
2.	Blackbody		
3.	X-ray Diffraction (*pre-req for High-T <sub>c</sub> )		
4.	Fiber Optics		
5.	Fluid Turbulence		
6.	Atomic Force Microscope*		
7.	Analog electronics (*pre-req for AFM)		

You will shortly be notified by email of the final schedule, which will be assembled taking into account everybody's preferences.