



## **Physics 157: Astronomy Instrumentation and Data Analysis Lab**

**To be offered Spring Quarter 2012 and in alternate years  
(CRN 93273)**

**Professor: Tony Tyson  
TA: Andrew Bradshaw**

An advanced lab course in experimental physics covering: statistics, electronics, photon counting, CCDs, optics, imaging, spectroscopy, data processing, data exploration and analysis, and scientific writing. The course closely parallels Phy 122, except that you will use astronomical instrumentation for two of your experiments and reports. Prerequisites: astrophysics specialization in physics major; Phy 102 or 104B; 105A; 110A; 110B & 115A (at least concurrently), plus scientific programming. **This course satisfies the physics advanced lab requirement for Astrophysics Specialization majors only. Admission by PTA.**

TR 3:10-4:00pm Lecture in 154 Roessler  
TR 4:10-7:00pm Lab in 154 Roessler  
With at least 3 of the Lab sessions at the  
Hutchinson 14-inch telescope from 9-11:30 p.m.  
(weather permitting)

**Enrollment limited to 8-10 students – priority to  
Astrophysics Specialization majors for whom it satisfies a  
major requirement**

*PTA-signature of Professor Boeshaar required for enrollment*

Please e-mail [boeshaar@physics.ucdavis.edu](mailto:boeshaar@physics.ucdavis.edu) now if interested in taking Phy 157 Spring Quarter in lieu of Phy 122 Winter Quarter.

# Physics 157 – Advanced Astrophysics Laboratory

## Policies

### Course Goals

1. Learn how to perform scientific experiments.
2. Learn tricks to control and estimate errors.
3. Learn how to write a good scientific report.

## Professors

**Pat Boeshaar**            **233 Physics**  
**Tony Tyson**            **514B Physics**

## Teaching Assistant

**Andrew Bradshaw**    **512 Physics**

## .Recommended Texts

1. Philip R. Bevington and D. Keith Robinson, Data Reduction and Error Analysis for the Physical Sciences, 2nd edition, McGraw-Hill, 1992.
2. A. C. Melissinos, Experiments in Modern Physics, 2nd edition. Academic Press, 2003
3. Ian S. McLean, Electronic Imaging in Astronomy, 2nd edition. Praxis Publishing, 2008

## Laboratory Manuals

Go to the [Experiments](#) section.

## Grading Policy

The photon counting experiment is worth 10 points; the exams, homework, and lab books are worth 20 points; each of the two other experiments is worth 35 points. Note that you will need to fully understand the photon counting experiment in order to get a passing grade on your two main experiments.

**NO LATE REPORTS WILL BE COLLECTED.**

## **Physics 157    Lab Calendar 2012**

Not shown below are unannounced quizzes (dates TBD).

### **Week 1**

(Tue. April 3)    Data and [Error Analysis](#).  
Pre-lab Homework due. Homework 1 assigned.  
(Th. April 5)    [Photon Counting](#).  
Homework 1 due. Homework 2 assigned.

### **Week 2**

(Tue. April 10) [Electronics Lab 1](#)  
Homework 2 due.  
(Th. April 12) [Electronics Lab 2](#)

### **Week 3**

(Tue. April 17) Exam  
Photon Counting Report due. Tour Telescope.  
(Th. April 19) [CCD Lab](#)

### **Week 4**

(Tue. April 24) Begin 1st experiment.  
(Th. April 26)

### **Week 5**

(Tue. May 1)  
(Th. May 3)

### **Week 6**

(Tue. May 8) Systematic Error  
(Th. May 10) Prep for Experiment 2  
                  CCD Data Processing  
(Fri. May 11) Experiment 1 Report due.

### **Week 7**

(Mon. May 14)  
(Tue. May 15) Start your Observing Experiment  
(Th. May 17) Electronics 3 (Melissinos pp 113-122)

### **Week 8**

(Mon. May 21)  
                  Corrected Experiment 1 Report due at 4PM.  
(Tue. May 22) CCD Data Analysis 1  
(Th. May 24)

### **Week 9**

(Tue. May 29) CCD Data Analysis 2  
(Th. May 31)

### **Week 10**

(Tue. June 5)  
(Th. June 7) Last Lecture.

Observing, Observing Project Final Report due June 14.

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