

# AST 443/PHY 517–Observational Techniques

## General Information

**Instructor:** Kenneth M. Lanzetta ([kenneth.lanzetta@gmail.com](mailto:kenneth.lanzetta@gmail.com))

### TAs

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**Credits:** 4 for AST 443, 3 for PHY 517

**Meeting time and place:** MW 7:00–9:00 PM, ESS 450, plus laboratory time (which will be substantial and contingent upon weather)

### Required texts

- *Measuring the Universe*, G. Rieke (Cambridge University Press, 2012)
- *Practical Statistics for Astronomers*, J. V. Wall and C. R. Jenkins (Cambridge University Press, 2008)

**Prerequisites:** AST 203 or AST 205 for undergraduate students (may be taken concurrently), no prerequisites for graduate students

## Course Description

This course covers observational techniques in astronomy and astrophysics.

The format of the course is roughly 3/4 lab and 1/4 lecture.

The lab component of the course involves obtaining and analyzing astronomical data with optical- and radio-wavelength telescopes. Three observational experiments will be conducted, focusing on optical-wavelength photometry, optical-wavelength spectroscopy, and radio interferometry. Students will be expected to set up and calibrate equipment, obtain data, analyze data, and write journal-style reports.

The lecture component of the course covers data analysis techniques, telescope and detector technology, and photometric, spectroscopic, and interferometric techniques.

For the last of the three observational experiments, students will write telescope observing proposals. These proposals should specify a testable hypothesis and justify technical feasibility of the proposed measurements. These proposals will be peer reviewed by other students. The peer evaluations will serve to both assess the quality of the proposals and the abilities of the evaluators to discern quality proposals.

Students will describe one observational experiment in a short oral presentation.

## Course Grades

Course grades will be based on lab work and reports (20% for each of three labs), data analysis assignments (15%), observing proposal (10%), oral presentation (10%), and peer-review evaluation process (5%).

Further, there may be possibilities of "extra credit" of up to 10% for significant contributions to relevant aspects of the course infrastructure, including lab write ups, analysis code, hardware improvements, etc. See me for details.

## Course Policy

Late assignments up to one week old will be accepted with a 25% penalty; late assignments more than one week old will not be accepted.

## Lab Reports

Lab reports *must* be written in the AASTeX version of LaTeX, which is described [here](#).

## Observing Proposals

Each student will write an observing proposal for third (final) observational experiment. Details are as follows:

- Length is four pages maximum, with up to two pages of figures and tables (including object list). Use 12 pt font, 1 inch margins, and single spacing.
- The proposal will be due at 5 PM on November 2, 2015, by email.
- The proposals will be discussed in class on November 9, 2015.
- There is a mandatory [proposal cover sheet](#).
- Proposals must be written in LaTeX, using this [proposal template](#).
- Here is an [example proposal](#).
- Here are proposal [review instructions](#) and [grade sheet](#).

## Oral Presentations

Each students will make an oral presentation describing one of the three observational experiments they have conducted over the course of the semester. The oral presentation session will be scheduled at a later date.

## Equipment

- **14-inch telescope:** The Department operates an observatory housing a 14-inch Meade LX200-ACF telescope. This telescope will be used for the imaging and spectroscopic components of the course. Here are the [telescope manual](#) and [step-by-step instructions](#). Note that the current telescope manual refers to using the CCDOps software for CCD Imaging observations, while you will be using CCDSoft, which allows more flexibility with guiding.
- **Visible-light CCD camera:** Imaging observations with the 14-inch telescope will be taken with the SBIG STL-101E CCD camera. The CCD camera is mounted on the back end of the telescope and is controlled through a laptop computer. A set of standard broad-band BVRI and narrow-band H-alpha filters are available. Here are the [summary information sheet](#), [specifications](#), [operations manual](#), [CCDSOFT quick-start guide](#), and [CCDSOFT v. 5 manual](#).
- **Visible-light spectrograph:** Spectroscopic observations will be obtained with a spectrograph that offers moderate (500–5000) spectral resolution between 3500 and 9500 Angstroms. Here are the [manual and specifications](#), [manufacturer's website](#) (auf Deutsch, with a sketch of the optical path), and [step-by-step instructions](#).
- **Radio telescope and interferometer:** The department operates a two-element radio interferometer, which employs 1-m aluminum mirrors to combine light onto a single 1-m commercial satellite

dish. The interferometer has an adjustable 2- to 10-m baseline, and the reflective elements are well suited for observations at cm wavelengths. Single-disk radio observations can also be obtained by fligging the satellite dish by 180 degrees and pointing it away from the aluminum mirrors. Here are the [draft description](#) and [step-by-step instructions](#).

## Computing Resources

Check out a list of relevant computing resources [here](#).

## Experiments

### General guidelines

- The guidelines are nearly identical to those described in the [course notes](#) for PHY 445/515. *This is mandatory reading.*
- Additional guidelines specific to AST 443/PHY 517 are described [here](#). *This is also mandatory reading.*

Check out a description of the experiments [here](#).

## Stony Brook Policies

### ACADEMIC INTEGRITY

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another persons work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary/>

### ELECTRONIC COMMUNICATION

Email to your University email account is an important way of communicating with you for this course. For most students the email address is [firstname.lastname@stonybrook.edu](mailto:firstname.lastname@stonybrook.edu), and the account can be accessed here: <http://www.stonybrook.edu/mycloud>. *It is your responsibility to read your email received at this account.* For instructions about how to verify your University email address see this: <http://it.stonybrook.edu/help/kb/checking-or-changing-your-mail-forwarding-address-in-the-epo>. You can set up email forwarding using instructions here: <http://it.stonybrook.edu/help/kb/setting-up-mail-forwarding-in-google-mail>. If you choose to forward your University email to another account, we are not responsible for any undeliverable messages.

### RELIGIOUS OBSERVANCES

See the policy statement regarding religious holidays at <http://www.stonybrook.edu/registrar/forms/RelHolPol%20081612%20cr.pdf>. Students are expected to notify the course professors by email of their intention to take time out for religious observance. This should be done as soon as possible but definitely before the end of the add/drop period. At that time they can discuss with the instructor(s) how they will be able to make up the work covered.

### DISABILITIES

If you have a physical, psychiatric/emotional, medical or learning disability that may impact on your ability to carry out assigned course work, you should contact the staff in the Disability Support Services office (DSS), 632-6748/9. DSS will review your concerns and determine, with you, what accommodations are necessary and appropriate. All information and documentation of disability is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website <http://www.stonybrook.edu/ehs/fire/disabilities.shtml>.

### **CRITICAL INCIDENT MANAGEMENT**

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students' ability to learn. See more here: <http://www.stonybrook.edu/sb/behavior.shtml>.