

# Introduction to Astronomy Laboratory

## Astronomy 008

### Department of Physics at Lehigh University

### Fall 2016

**Laboratory Instructors:** Jonathan Bartz, Lewis Lab 308, x84915, jml612  
Erin Blauvelt, Lewis Lab 303, x83937, ekb215

**Astr 8 (Lab) Professor:** Gary DeLeo, Lewis Lab 412, x83413, lgd0  
**Astr 7 (Course) Professor:** John Loomis, Lewis Lab 401, x83910, jol206

This one-credit laboratory is designed to accompany the three-credit course, Astr 007, Introduction to Astronomy. Although the course (007) can be taken without the laboratory (008), the reverse is not permitted. Students registered for Astr 008 must be enrolled concurrently in Astr 007.

The Astronomy Laboratory will provide you with hands-on experience relating to many of the topics discussed in lecture, and introduce new material not covered in lecture. You are expected to have read the appropriate instructions in the laboratory manual, available in the University Bookstore, prior to each laboratory meeting.

Your laboratory notebook is to be kept as a diary in which you record all aspects of your experiment. The first page must be a table of contents, listing the name and starting page of each experiment. Each write-up should begin with the title of the experiment, the date, and the name of your partner (if working in pairs). Your entries in the notebook must be clear, legible and meaningful. If you wish to re-write something, simply draw a line through the old text or data. You will not lose credit for making such changes; the grader will simply ignore crossed-out information. And, always make full use of the space available.

You should record what you do as the experiment progresses, using the procedural sections of the laboratory instructions as a guide. When recording data, it is best to make tables. ***The answers to any questions posed in the instruction sheets should be recorded at the appropriate place in your notebook.*** Conclude every experiment with a brief essay that summarizes what you have learned; the laboratory manual will guide you on important points to consider in your discussion. This essay is crucial because it is here that you demonstrate your understanding of the material. Science is much more than the careful collection of data; it is a thoughtful analysis that makes the collected data meaningful.

Each laboratory will be graded on the basis of 10 points maximum. Your grade will be based on how well you performed and analyzed the experiment and, particularly, on how well you communicated what you did through your notebook entries. Laboratory notebooks will be collected at the end of each laboratory session. **You are required to do all of the experiments, and to be present for all of your scheduled laboratory meetings. Make-ups, if any, must be done during the week in which the experiment is set up. The only valid excuses are medical or family emergencies, or required university service. Advance notice is requested, and all arrangements must be made through your instructor. Unexcused labs will be assigned a zero grade.**

**SEVERAL OF THE LABS WILL INVOLVE THE USE OF COMPUTERS SITUATED AT EACH LAB TABLE. THESE COMPUTERS ARE TO BE USED ONLY FOR THE REQUIREMENTS OF THE LAB. THEY MAY NOT BE USED FOR EMAIL, SURFING THE WEB OR FOR ANY OTHER PURPOSE THAN THE WORK OF THE LAB!**

The laboratory manual for Astr 008 may be purchased in the University Bookstore. Several meetings will be conducted at night for telescopic viewing of the moon, planets, and stars. Each of these required observational sessions will be run (i.e., available) over several nights, from which students may select one to attend. Correspondingly, no meetings will be held on several of your regularly scheduled lab days.

**Your schedule of fall 2016 classes should indicate that you are enrolled in either section 60, 61, 62, or 63 of Astr 008. Sections 60 and 63 meet from 7:10 to 10:00 PM, and sections 61 and 62 meet from 1:10 to 4:00 PM, all in Lewis Lab (LL) Room 221 on the weekdays indicated below:**

<b>Section</b>	<b>Meeting Day</b>	<b>Meeting Time</b>	<b>Date of First Meeting</b>
<b>60</b>	<b>Monday</b>	<b>7:10-10:00 PM</b>	<b>September 5</b>
<b>63</b>	<b>Tuesday</b>	<b>7:10-10:00 PM</b>	<b>September 6</b>
<b>61</b>	<b>Wednesday</b>	<b>1:10- 4:00 PM</b>	<b>September 7</b>
<b>62</b>	<b>Friday</b>	<b>1:10- 4:00 PM</b>	<b>September 9</b>

The Astronomy Laboratories consist of two types of meetings, both required. “Regular Laboratory Meetings” are those that take place in LL Room 221 during the scheduled meeting times and days described above. “Observational Laboratory Meetings” involve telescopic observations, and will be scheduled in the evenings as weather and the placement of celestial objects permit. The schedules for both types of laboratory meetings are attached, and also available on Course Site.

**You will need to purchase and bring the following materials to each laboratory session:**

- Introduction to Astronomy Laboratory Manual
- Laboratory Notebook: Roaring Springs Lab Notebook 77-648, or similar (located in the Bookstore by the course textbook, and also in the general supply area and by the checkout counters)
- Ruler (about 30 centimeters, preferably clear plastic) – *also required for Astr 007 lecture*
- Basic Scientific Calculator (should have sin, cos, ... functions) – *also required for Astr 007 lecture*
- The Miller Planisphere (in the Bookstore, by the course textbook)

***Accommodations for Students with Disabilities:***

*If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, Williams Hall, Suite 301 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.*

***The Principles of Our Equitable Community:***

*Lehigh University endorses The Principles of Our Equitable Community... [http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity\_Sheet\_v2\_032212.pdf]. We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.*

## **Final Competencies:**

Students will understand the apparent motion of astronomical bodies in the sky in terms of the actual motions of the earth, moon, and planets, along with the coordinate systems used to quantify these motions.

Students will be able to render planetary orbits if provided with orbital parameters such as semi-major axes and eccentricities, as well as the reverse. These will be related to Kepler's Laws.

Students will be able to relate the statistical characteristics of lunar craters to the history of meteoroid impacts. This in turn is related to the history of small bodies in the inner solar system.

Students will understand the relationship between spectral lines and the identity of elements and molecules, especially as they relate to stellar atmospheres. Through computer simulations, they will be able to identify stellar types using spectroscopy.

They will understand the basic concepts of optics used in the construction of astronomical telescopes, including limitations such as resolving and light-gathering power. They will be able to construct a telescope using lenses and mirror and identify its magnification.

Students will learn how to measure the apparent brightness of stars and their colors using computer simulations as well as standard light sources in the lab. In the lab activity, they relate apparent and absolute measures of brightness to the distance of the source. On the basis of the data acquired in simulated stellar measurement, they can determine the stellar characteristics needed to appropriately place these stars on the HR diagram, which relates color index to absolute brightness. They will be able to relate these characteristics to stellar evolution.

Again through the use of simulated observational measurements, students will be able to determine the expansion rate of the universe.