

## ASTRON 1263: Techniques of Astronomy (2018 Fall Term)

**Canvas Web Site:** This course will utilize *Canvas*, including email within *Canvas*.

**Lecture Instructor:** Prof. David Turnshek ([turnshek@pitt.edu](mailto:turnshek@pitt.edu)).

**Allegheny Observatory Manager:** Mr. Lou Coban ([coban@pitt.edu](mailto:coban@pitt.edu)).

**Teaching Assistants:** Ms. Helena Richie ([helenarichie@pitt.edu](mailto:helenarichie@pitt.edu)) and Lou Coban ([coban@pitt.edu](mailto:coban@pitt.edu)).

**Lectures:** 6:30 - 7:20 pm (102 Thaw Hall). Lectures will be given remotely and automatically recorded for those who can't attend. The TA will be present to moderate and facilitate interactions.

**Course Organization on *Canvas*:** Module 1 (Syllabus, Canvas Organization, and Submitting Assignments), Module 2 (AO Observing Projects and Info), Module 3 (AO Manuals and Links), Module 4 (Homework Assignments), Module 5 (Timed Exams), Modules 6 through 13 (Lecture Notes). **Note that all information for separate Monday or Thursday evening Lab sections, and the W-option section (PHYS 1661), will be integrated into one *Canvas* course.** These other sections won't be published in *Canvas*.

**Allegheny Observatory (AO) Lab:** This will no longer happen at 7:30 – 11:30 pm on Monday or Thursday nights for designated sections due to social distancing requirements during the pandemic. Ten observing groups with 2 students per group will be designated; one group will have 3 students. On clear nights up to 2 groups will be permitted in the AO, but only if they're using 2 different telescopes. It's possible for in-person and totally remote student to form an observing group. Lou will run the AO observing schedule, declare whether it's a clear night by 3pm, post that information, and arrange for a bus for students who don't want to arrange their own transportation to AO at their expense. See information in *Canvas Module 1*. While students can arrange their own transportation to AO at their own expense, a bus will be available on weeknights if a student indicates they need one, but the bus company has reserved the right to cancel the bus if a driver is unavailable. If Lou declares a clear weeknight, and a student has indicated they want to ride the bus to AO, a bus will depart from campus in front of Allen Hall at 7:30 pm, and return after observing is finished. For students who can arrange their own transportation, it may also be possible for them to observe in-person on weekend nights, otherwise participation will have to be remote. Therefore, Lou will also schedule appointments for remote observing, even when there are no in-person observers. Helena, who will be remote, will oversee remote observing on the 16-inch (e.g., remote observers can share screens with her). Lou, who will be at the Observatory, will fix problems at the telescope and oversee all in-person observing and also oversee remote observing on all telescopes except the 16-inch. **You must pay attention to Lou's schedule to avoid observing chaos.**

**Data Processing and Measurements.** You'll have to process your data and measurement it. See *Module 3 for AO Manuals and Links that provide information on processing and measuring data.*

**Monday and Thursday night Zoom Sessions.** In addition to the scheduled observing at AO, I will invite all students who signed up for Monday or Thursday Lab nights to a zoom session at 8:00 pm. These zoom sessions will be informal and will not be recorded. I will end the zoom session after I have collectively addressed student questions. If a student or student group wants to zoom with me after I have ended the 8:00 pm session, we can start another zoom session. W-Option students will also meet with me during these times.

**Office Hours:** All "office hours" (with instructor or TAs) are by appointment and should be set up by email within *Canvas*.

**Required Written Course Materials:** This includes Modules 6 through 13 in *Canvas* (Lecture notes) and information posted in *Canvas* Module 3 (AO Manuals and Links). They provide the needed information to do observing exercises/projects, homework assignments, and exams. For students planning a future career in an astronomy-related field, a good reference textbook to own is *To Measure the Sky: An Introduction to Observational Astronomy* by Frederick R. Chromey (check Amazon).

**Grading:** 45% of the grade will be based on lectures and 55% will be based on AO work. AO observations will be done in groups, but students in a group will be graded individually.

- 15% Lecture Class: 3 HW Assignments (due dates to be announce; submit with gradescope)
- 15% Lecture Class: Timed Exam 1 (in-class, date to be announced; submit with gradescope)
- 15% Lecture Class: Timed Exam 2 (in-class, date to be announced; submit with gradescope)
- 10% AO: Observing Exercise 1 (16" CCD astrometric calibration; submit with gradescope)
- 10% AO: Observing Exercise 2 (16" 2-color OBAGKM CCD photometry; submit with gradescope)
- 15% AO: One Main Observing Project (see list; submit with gradescope)
- 10% AO: Remote Presentation of Main Project (8:00 – 10:00 pm, Monday Nov 16 and Thursday Nov 19; submit slides with gradescope)
- 10% AO: Participation, especially observing activities.

**Submission of AO Observing Exercises/Projects in Lab Notebook Style:** Each student is required to document AO observing activities. This should be written up by each student (not the group) in lab notebook style for all three observing projects; however, observing log tables can be identical for students in the same group. I recommend using MS Word, which will enable you to add tables, graphs, images, etc. Module 2 has details of what should be in the document (but also see below). As explained in Module 1, **observing exercise and project documents should be submitted within Canvas using gradescope.** Some examples of the kinds of details that should appear in the write-up are: (1) observing log table (see an example observing log Table in module 2, which you could cut and paste into your own Word document), (2) how you processed the collected raw data files, (3) the names of the processed data files which you should save, (4) a description of the measurements made on the processed data files, (5) the results of the measurements, (6) relevant tables/graphs/images, (7) a concise summary of your findings, (8) what you could do (if anything) to improve your experimental work. The most important thing to remember, which applies to writing up all experimental research, is that you should provide enough information in your write-up to allow an independent researcher to repeat your work.

**Submission of Homework Assignments and Exams.** Similarly, **the three homework assignments (see Module 4) and the two timed exams (see Module 5) should be submitted using gradescope** (see Module 1).

**Broad List of Lecture Topics (Canvas Modules 6 through 13):**

1. Intro to AO and Some Basics
2. Astronomical Coordinates and Time
3. Statistics and Errors (General)
4. Statistics and Errors (Astronomical Observations)
5. CCD Photometry in the UV, Optical, IR Context
6. Spectroscopy
7. Magnitude and Flux Calibrations
8. Other Telescopes and Wavebands: gamma-ray, x-ray, UV, optical (visible), IR, microwave, radio

**Possible Main Observing Projects (see Module 2):**

1. Determination of the Mass of a Planet (16-inch)
2. Light Curves of Eclipsing or Pulsating Stars (16-inch)
3. Color-Magnitude Diagram of a Cluster to Determine Cluster Age (16-inch)
4. Confirmation of Exoplanet Transit (need transit ephemeris + precision photometry) (16-inch)
5. Color Imaging of Various Types of Nebulae or Star Clusters (Astrograph on 16-inch)
6. Fast Imaging to Achieve Higher Spatial Resolution (30-inch, possibly 13-inch)
7. Spectroscopy of Stellar Types (10-inch)
8. Student Designed Project (TBD)

**W-Option for ASTRON 1263:** Up to 5 departmental majors can take the W-Option to meet their writing requirement (1 credit – sign up for PHYS 1661), with preference given to those majoring in Physics and Astronomy. If you are one of the W-Option students, I will work with you individually (either M or Th evenings or by appointment). The paper should include the following: abstract, introduction of the topic stating some background and the paper’s aim, description of the observations, data processing, data analysis, discussion and summary of results, and references. Tables, images, and graphs should be included as needed. Your 1-credit W-Option grade will be based on the paper alone, not your overall ASTRON 1263 grade. I will review drafts of your paper with specific progress deadlines throughout the term.

**University COVID-19 Statement.** In the midst of this pandemic, it is extremely important that you abide by public health regulations and University of Pittsburgh health standards and guidelines. If in class, at a minimum, this means you must wear a face covering and comply with physical distancing requirements; other requirements may be added by the University during the term. These rules have been developed to protect the health and safety of all community members. Failure to comply with these requirements will result in you not being permitted to attend class in person and could result in a Student Conduct violation. For the most up-to-date information and guidance, please visit [coronavirus.pitt.edu](https://coronavirus.pitt.edu) and check your Pitt email for updates before each class.

**Academic Integrity.** Students in this course will be expected to comply with the University of Pittsburgh’s Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam.

**Disability Services.** If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, [drsrecep@pitt.edu](mailto:drsrecep@pitt.edu), (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

**Code of Conduct.** Communication is key to a productive learning environment, and we can maintain productive communication by exhibiting respect for one another. The success of the course for yourself and others depends on all of our commitment to behavior that demonstrates respect for differences, understanding towards others and a willingness to listen and learn. For these reasons, it is unacceptable to harass, discriminate against, or abuse anyone because of race, ethnicity, gender, disability, religious affiliation, sexual orientation, or age. If you witness or are subject to such harassment, please report it to the instructor or to the Office of Diversity and Inclusion.

**Title IX.** Legal text: “No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance.” As a professor I am a mandatory reporter, and I am required to report violations of Title IX that I observe or am made aware of to the Title IX office. Title IX violations include, but are not limited to, sexual harassment, sexual violence, and verbal or sexual abuse. Within the classroom, behavior in violation might appear as: suggestive jokes or innuendos, inappropriate touching, and unwanted sexual behavior or advances, but my capacity and obligation to report does not end at the classroom.