Astronomy 302 Section 001

Observational Astronomy

Mon/Wed/Fri 10:00 –10:50 PM, Steward 204

Description of Course

Astronomy 302 is a course intended for those who desire to pursue a career in astronomy or related technology fields. The course will cover the theoretical and technical aspects that underpin astronomical observations, and include hands-on experience at professional astronomical telescopes. Students will design and carryout a research project in small groups using the CCD camera on the 61" Kuiper telescope on Mt. Bigelow, and will have the option to conduct spectroscopic observations at the 90" Bok telescope on Kitt Peak. Data will be reduced by standard astronomical software packages and by custom software written by students. Results from the project will be written up as a formal research project, and presented in class. This class will require a substantial time investment from the student and may be quite challenging.

Course Prerequisites or Co-requisites

The course assumes a minimum preparation of:

- CSC 110 or ECE 175 or PHYS 105A or PHYS 305
- PHYS 142 or PHYS 162H
- MATH 122B or MATH 125
- ASTR 250

ASTR300A/B are not required prerequisites, but many students will benefit by taking them before 302.
Potential students who are unsure of their level of preparation should consult the instructors.

Instructor and Contact Information

Dr. Chad Bender, cbender@arizona.edu Steward 486
Dr. Elizabeth Green, egreen@arizona.edu
Office Hours: Bender: (in-person) Mon 3-4pm, Wed 1pm-2pm, zoom by appt.; Green: by appt.
Course Website (D2L): https://d2l.arizona.edu/d2l/home/1404589

Course Format and Teaching Methods

The course will be comprised of lectures, labs, graded homework, a semester project, and exams. Monday and Wednesday meetings will be lecture based. Friday meetings will be lab sessions. There will be approximately six homework assignments throughout the semester, due every other week. There will be observing sessions, scheduled on Friday, Saturday, (and optional Sunday) nights throughout the semester. Dr. Bender will lead the classroom lectures, labs, homework, and exams. Dr. Green will lead the observing.

Course Objectives and Expected Learning Outcomes

- Students will gain a practical understanding of observational astronomical techniques at Radio to UV wavelengths.
- Students will be able to plan and execute astronomical observations.
- Students will develop skills related to interpretation and communication of results based on astronomical data.

Required Texts or Readings:

- *Observational Astronomy*, Birney, Gonzalez, and Oesper, 2nd Edition (NOTE: The 1st edition is substantially out of date and is not suitable for this class)
- *A practical guide to data analysis for physical science students*, Lyons (available digitally via the UA Library)
- Some of the material covered in this course is not contained in the textbooks. Your lecture notes will serve as your primary reference for those lectures.

Additional Useful Texts:

- Data Reduction and Error Analysis for the Physical Sciences, Bevington
- Practical Statistics for Astronomers, Wall & Jenkins
- Handbook of CCD Astronomy, Howell
- Tools of Radio Astronomy, Wilson, Rohlfs, Huttemeister, Sixth Edition

Required Special Materials:

This course includes a laboratory component that utilizes computers for data analysis and reduction. Students should bring a laptop computer to class on Fridays. If you do not have a suitable computer, please contact the instructor ASAP. Computers or tablets are allowed during Monday/Wednesday lectures to facilitate note taking as long as the computer use is not disruptive to those around you.

Required Extracurricular Activities:

Students will participate in one or more required observing runs to the 61" telescope on Mt. Bigelow. These trips are scheduled for Friday and Saturday nights throughout Feb/Mar, and will be overnight to facilitate student data collection. Transportation will be provided. An additional (not overnight) trip to Kitt Peak is optional.

Assignments and Examinations:

Exams are closed book, closed notes, and designed to fit within the time slot allocated.
Midterm Exam: February 26, 10:00 am – 10:50 am
Semester Project Reports: April 22
Final Exam: May 3, 10:30 am – 12:30 pm
https://www.registrar.arizona.edu/courses/final-examination-regulations-and-information
http://www.registrar.arizona.edu/schedules/finals.htm

Grading Scale and Policies

The course is given for standard (ABCDE) grades. A: >90%; B: >80%; C: >70%; D: >60%
Grading will be based on a mid-term exam (20%); a final exam (30%) divided roughly 2/3 on the material since the mid-term and 1/3 comprehensive for the course; a semester project (30%), and homework and class participation (20%).
Late homework will deduct 20% per day.
Homework may be turned in in person in class, or uploaded to D2L. Scans or photographs of neat hand written answers are acceptable. Typed answers are also accepted, but not required. Any required special accommodations must be reached prior to the deadline.
University policy regarding grades and grading systems is available at:
http://catalog.arizona.edu/policy/grades-and-grading-system
Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively.

Schedule Topics/Activities

See the course schedule spreadsheet posted on D2L for a list of lecture & lab topics, homework & exam dates. All dates (except for exam dates) are subject to revision.

Absence and Class Participation Policy

If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
Notify your instructor(s) if you will be missing a course meeting or an assignment deadline.
Non-attendance for any reason does **not** guarantee an automatic extension of due date or rescheduling of examinations/assessments.
Please communicate and coordinate any request directly with your instructor.
If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.

Classroom Behavior Policy

Students are asked to refrain from disruptive conversations with people sitting around them during lecture, or other activities that are disruptive to the class environment. Students observed engaging in disruptive activity will be asked to

cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Safety on Campus and in the Classroom

For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview
Also watch the video available at
https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy000000000003560

Use of Artificial Intelligence in the Classroom

In this course any and all uses of generative artificial intelligence (AI)/large language model tools such as ChatGPT, Dall-e, Google bard, Microsoft Bing, etc. will be considered a violation of the Code of Academic Integrity, specifically the prohibition against submitting work that is not your own. This applies to all assessments in the course, including homework, labs, and the semester project. This course policy is driven by the learning goals and desired learning outcomes for this course, which include independent planning, analysis, interpretation, and communication of results based on astronomical data. These learning goals are incompatible with current AI software, and attempts to use them would not only defeat much of the course purpose, but would also risk submitting work with truly incorrect conclusions. The following actions are prohibited:

- Entering all or any part of an assignment statement or test question as part of a prompt to a large language model AI tool
- Incorporating any part of an AI-written response in an assignment
- Using AI to summarize or contextualize reading assignments or source materials
- Submitting your own work for this class to a large language model AI tool for iteration or improvement

University-wide Policies

Academic advising: If you have questions about your academic progress this semester, please reach out to your academic advisor (https://advising.arizona.edu/advisors/major). Contact the Advising Resource Center (https://advising.arizona.edu/) for all general advising questions and referral assistance. Call 520-626-8667 or email to advising@.arizona.edu
Life challenges: If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at (520) 621-2057 or DOS-deanofstudents@email.arizona.edu.
Physical and mental-health challenges: If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520) 621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.
Threatening Behavior Policy: The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.
Students with Disabilities: Accessibility and Accommodations: At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, https://drc.arizona.edu) to establish reasonable accommodations.
Code of Academic Integrity: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity. The University Libraries have some excellent tips for avoiding plagiarism, available at
http://www.library.arizona.edu/help/tutorials/plagiarism/index.html.
UA Nondiscrimination and Anti-harassment Policy: The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy
Confidentiality of Student Records: http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa
Subject to Change Statement: Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.