



PTY568 Exoplanets: *Discovery & Characterization*

Kuiper Space Sciences 434, time: Tues/Thurs 2:00 – 3:15pm

Description of Course

This course will cover observational and theoretical ideas pertinent to planets orbiting stars other than the Sun. Discovery and characterization techniques will be emphasized along with associated theory. The format will alternate from traditional lectures, guest lectures by local or visiting experts, and student-lead presentations.

Learning Outcomes

Upon the completion of this course you will be able to compare and contrast exoplanets on the basis of mass, age, equilibrium temperature, gravity, abundances, habitability and orbital properties. You will be able to rank exoplanets by relative difficulty of discovery and atmospheric characterization. You will also possess the fundamental knowledge necessary to construct a complete model atmosphere and transit spectrum sufficient to interpret spectroscopic observations.

Course Prerequisites or Co-requisites

All students enrolled in the astronomy, physics, planetary science, and optical science PhD programs are welcome to take this class. Exceptions can be made on a case-by-case basis.

Instructor and Contact Information

Prof. Travis Barman
Office: Kuiper Space Sciences 436
Office hours by appointment
Email: barman@lpl.arizona.edu

Course Topics

Part 1 (Exoplanet Discovery)

Introduction & Background

Radial Velocity

Transit

Direct Imaging

Exoplanet distributions (mass, period, etc.)

Part 2 (Exoplanet Atmospheres)

Atmospheric Structure and Radiative Transfer

Chemistry and Opacities

Lessons learned from Brown Dwarfs

Part 3 (Exoplanet Characterization)

Bulk Structure and Composition

Transits: Secondary Eclipses & Irradiated Atmospheres

Transits: Spectroscopy

Direct Imaging: Giant Planet Evolution

Direct Imaging: Giant Planet Spectroscopy

Special topics (TBD)

Absence and Class Participation Policy

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>

Flex in-person:

- This class is scheduled to be taught in the FLEX IN-PERSON modality.
- **Meeting times for remote teaching:** We will be meeting remotely until the University notifies us that in-person meetings may commence. We will meet via Zoom twice weekly as a group for lectures, discussion and group activities. Time will nominally be Tuesday/Thursday 2 to 3:15pm. The class will be notified in advance of any changes to this schedule.
- **Meeting times and patterns for in-person teaching:** In the unlikely event that the COVID-19 situation permits teaching on campus an announcement will be made regarding the time and place for in-person lectures. Lectures will continue to be live streamed, recorded and made available on D2L. Note: it will be possible to complete the course and all course activities remotely even after campus reopens.
- **Face coverings are required in our classroom:** Per UArizona's [Administrative Directive](#), face coverings that cover the nose, mouth, and chin are required to be worn in all learning spaces at the University of Arizona (e.g., in classrooms, laboratories and studios).
- **Physical distancing is required in our classroom:** During our in-person class meetings, we will respect CDC guidelines, including restricted seating to increase physical distancing and appropriately-worn face coverings. Per UArizona's [Administrative Directive](#), face coverings that cover the nose, mouth, and chin are required to be worn in all learning spaces at the University of Arizona (e.g., in classrooms, laboratories and studios).
 - The [Disability Resource Center](#) is available to explore [face coverings and accessibility considerations](#) if you believe that your disability or medical condition precludes you from utilizing any face covering or mask option. DRC will explore the range of potential options as well as remote course offerings. Should DRC determine an accommodation to this directive is reasonable, DRC will communicate this accommodation with your instructor.
- **Classroom attendance:**
 - 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 instructors if you will be missing an in person or online course.
 - [Campus Health](#) is testing for COVID-19. Please call (520) 621-9202 before you visit in person.
 - Visit the [UArizona COVID-19](#) page for regular updates.
- **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.

- **Exams:** All exams/assignments will be “take home” and submitted electronically.
- **Equipment and software requirements:** For this class you will need daily access to the following hardware: [laptop or web-enabled device with webcam and microphone]; regular access to reliable internet signal; ability to download and run the following software: [web browser, Adobe Acrobat, etc.].
- **Remain flexible:** If pandemic conditions warrant, the University may require that we continue remote operations throughout the semester. If that is the case, we will notify you by D2L Announcement and email that we are maintaining remote operations.
- **Remote / online only after Thanksgiving:** After the Thanksgiving holiday, we are scheduled to move to remote teaching.
- **Lecture recordings are only available through D2L.** Students may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulation. Therefore, students accessing unauthorized recordings or using them in a manner inconsistent with UArizona values and educational policies are subject to suspension or civil action. An example of unauthorized use is accessing a course recording on an external site (e.g., YouTube). Another example of unauthorized use is posting course videos to external sites.
- Class recordings are considered part of the students’ educational record and will not be shared with anyone outside of the class

Required Texts or Readings

A reading list will be updated through the semester and provided on D2L

Assignments and Examinations: Schedule/Due Dates

Projects: There will be two to three projects involving exoplanet data and/or numerical modeling. Basic coding skills are required (you will not need to be an expert programmer but some previous experience will be helpful). Students may discuss any aspect of the projects with other classmates, but the final product should be the result of individual work. A written summary of the project will be submitted along with all source code.

Class participation and presentations: Students will present papers relevant to the current lectures (approved ahead of time) to the class. Students will be graded on their presentations as well as the questions and discussions they raise during other student presentations (or guest lectures). You will be called upon to ask a question at the end of guest lectures and student presentations. Class presentations will be conducted via Zoom unless the COVID-19 situation permits in-person on campus meetings.

Final Examination: None

Grading Scale and Policies

50% of your grade will be based presentations/participation and 50% on several projects.

The grading scale will be as follows:

90 – 100	A
80 – 89.9	B
65 – 79.9	C
50 – 64.9	D
< 50	E

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. 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.

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>.

Accessibility and Accommodations

Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit <http://drc.arizona.edu>.

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate. Be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

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>.

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>

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies> Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

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.