

## ASTRON 0089: Stars, Galaxies, and the Cosmos

Term: 2214 (Spring 2021)

Meeting Time: Tuesdays and Thursdays, 01:15 - 02:30 PM \* see note below  
on the interwebs (<https://pitt.zoom.us/j/97608644446>, password: parsec)

**Instructor: Prof. Rachel Bezanson** (preferred pronouns: she/her)

hear me pronounce my name: <https://www.name-coach.com/rachel-bezanson>

<http://rachelbezanson.github.io>

[rachel.bezanson@pitt.edu](mailto:rachel.bezanson@pitt.edu) - Email is the preferred method of communication

Office: 308 Allen Hall (HA!) . . . the third floor of my house

**Office Hours:** Wednesdays 4-5 pm, Fridays 10:30-11:30 AM, or by appointment

<https://pitt.zoom.us/j/97107647623>, passcode: astronomy

If you cannot make my regular office hours, please contact me and we can arrange to meet at another time. I encourage you to use me as a resource - concepts in this course can be challenging and I want to help you work through them.

**Background:** I joined the Department of Physics and Astronomy at the University of Pittsburgh in Fall 2017. I am an observational astronomer and my research focuses on the formation and evolution of galaxies through cosmic time.

**What should you call me?** Dr. Bezanson, Prof. Bezanson, Dr. B, Prof. B – I'm pretty flexible. I will not respond to Miss/Mrs/Ms Bezanson or (in a classroom context) Rachel.

**Recitation Instructor: Ms. Lina Florez** (preferred pronouns: she/her)

[lina.florez@pitt.edu](mailto:lina.florez@pitt.edu) - Email is the preferred method of communication

**Office Hours:** Mondays 5 - 7pm or by appointment

Zoom link TBA

### Remote Instruction:

In order to mitigate the spread of the novel coronavirus and to provide a continued and sustainable mode of instruction, I will not be teaching face-to-face this semester.

### Course Description:

The Universe in which we live is an unimaginably vast and rich place that is understandable through the same physical laws that govern our existence here on Earth. By exploring topics from our nearest neighboring stars to the farthest galaxies newly formed after the Big Bang, this course will engage your mind to better understand our Universe and your everyday world. Through active and engaged participatory lectures, we will observe the cosmos and learn about the birth, life, and death of stars and their mysterious remnants: pulsars and black holes. From studying stars and our own Milky Way galaxy, we will expand our horizons to investigate the origin and ultimate fate of the Universe.

This is a self-contained course for students not majoring in the physical sciences. The course is mainly descriptive in nature, but some of the lectures will make use of simple arithmetic and mathematical skills since astronomy is at its heart a quantitative science. However, memorization of formulas will not be required. Don't worry if you feel your math skills are a little rusty – you'll have plenty of opportunity to practice them in recitation and homework exercises.

### Course Objectives:

By the end of this course, you should be able to explain, among other things:

- What the major motions of the Earth are, and how they relate (or do not relate) to the day and seasons
- Why the constellations seen in the sky vary over the course of the year
- How fundamental laws of nature can describe the motion of objects through space

- How we can measure the properties of distant stars and galaxies using observations from the Earth and space
- Why the Sun shines, and why it will not do so forever
- How stars form and die
- Where black holes come from, and how they bend space and time
- How the Milky Way Galaxy we live in is like or unlike other galaxies
- Why we believe many galaxies have black holes at their center
- What we know about what the Universe is made of, how it began, and its ultimate fate
- What factors may determine the abundance of intelligent life forms in the Universe

Additionally, by the end of the course, you should also be able to use proportional relationships to explain how one quantity of interest varies when another is changed (no calculators should be needed for this course, though you are welcome to use them).

Most fundamentally, in this class you should gain sufficient background to understand popular articles on astronomy such as those in common online news sources and explain them to your friends and family. We live in exciting times, and the pace of scientific discovery will only continue to increase.

### **Textbook:**

Primary Textbook: Astronomy: At Play in the Cosmos, Second Edition, by Adam Frank, **Please purchase with Smartwork5, Video Game, and Interactive Simulations. I strongly recommend purchasing via inclusive access (via the Pitt bookstore) where the whole package will be \$49.12** <http://www.pittuniversitystore.com/SiteText.aspx?id=45005>. Without purchasing the homework system you will not be able to complete the homework quizzes or receive that component of the grade.

Recitation Workbook (**required**): Learning Astronomy by Doing Astronomy, Second Edition, by Stacy Palen and Anna M. Larson **Again, this workbook should be purchased from the bookstore - either in person or they can ship. The cost is \$5 at the bookstore as opposed to ~ \$30 at other retailers.**

### **Course Organization:**

This class will be delivered entirely online, structured such that students who cannot attend at class times can still take part in it fully. I expect that lectures will be recorded in segments which will be posted well ahead of class times (so they can be viewed regardless of your location this semester). After each week, you will complete a brief homework quiz to assess whether you are meeting the class' learning goals and help me find out if there is any material students are having trouble with.

Class time will then be used for live, recorded Zoom sessions to answer any questions students have about the posted lectures (either from class discussion boards or asked live), discuss recent quiz questions people may have found difficult, etc. These synchronous meetings will also include highlights from recent Recitations will focus on working in smaller groups on lecture tutorials which are intended to help you learn the most important material in the class. These lecture tutorials will be submitted as homework assignments following recitations. For students who cannot attend recitations, there will be a separate discussion board for each group on Canvas that can be used to work together on the lecture tutorials. Students are expected to have read the relevant sections of the textbook (listed on Canvas) before watching the relevant lecture videos. Lectures and recitation activities are a supplement to the textbook, not a replacement.

We will deviate from these expectations if technology requires, however.

### **Grading Policy:**

Your overall grade in the class will be computed as:

- **40%** Exams (15% each for the higher 2 grades, 10% for the lowest grade)
- **20%** Homework quizzes (short weekly interactive quizzes via Smartwork5, lowest **three** will be dropped): Late homeworks will be marked down by 10% each 24 hour period after the deadline. Extensions will only be granted in extreme circumstances and students are encouraged to use their dropped assignments accordingly. If you read this sentence, send me your favorite astronomy-themed meme (rachel.bezanson@pitt.edu) and I will increase this to four dropped assignments.
- **20%** Recitation activities: These activities will be completed collaboratively during recitation sections and then individual write-ups will be submitted via Canvas. Grading of these assignments will include some credit for attendance at recitation. To allow for flexibility, the lowest 2 grades on these assignments will be dropped.
- **15%** Exam Review guides - posted to discussion boards *and* submitted to Canvas (5% each)
- **5%** Course evaluation surveys: These surveys will ask questions related to the organization of the course and provide me with information about how I can improve in the midst of the semester. Full credit will be assigned for all submitted surveys.

## A note on Flexibility and Understanding:

To say that the current climate is full of uncertainty and challenges beyond the usual is an understatement. To whatever extent possible I commit to providing as much flexibility and support as I can throughout the semester. I have built in a number of "dropped assignments" in lieu of lenient late policies. If you think any of these expectations seem insurmountable, please speak up and I will try to be as accommodating as possible.

## Canvas:

The University of Pittsburgh provides a web-based resource called Canvas, which is a portal to web sites for individual courses. A Canvas site for this course has been created and there you can view announcements, send email to the instructor, and download course material such as the syllabus and in-class slides or recordings. Reading and homework assignments will all be announced on Canvas. To access Canvas go to <https://canvas.pitt.edu/>. Use your Pitt email username and password to login to Canvas. If you have forgotten your username and password or need to set up an account, contact the help desk at 412-624-4357, or 4-HELP. Once you have logged into the system simply click on the link for this course to access the available material.

## What to do if you miss a class?

**Lectures:** I will not take attendance during synchronous lectures but I encourage you to either join all classes via zoom. You are strongly encouraged to view *all* lectures and recorded materials at the course pace.

**Recitation:** Recitation activities will be conducted synchronously, largely in breakout rooms. Attendance in these sessions is required and will be included in grades for this section of the course. If you will not be able to participate in recitation sections regularly, please discuss the matter ASAP and we will attempt to configure an asynchronous alternative.

## Course Topics:

Here is a rough outline of topics covered in ASTRON 0089, which will likely be modified according to student interests and pacing as the semester progresses.

<b>Topics discussed</b>	<b>Reading</b>
<b>Week 1:</b> Introduction to the Introduction	(due before class) Chapter 1
<b>Week 2:</b> Celestial motions as observed from Earth	Chapter 2
<b>Week 3:</b> Gravity and orbits	Chapter 3
<b>Week 4:</b> Light and Telescopes	Chapter 4
<b>Week 5:</b> Sun as a star	Chapter 10
<b>Week 6:</b> —	
Feb 23	No Class - Student Self-Care Day
Feb 25	**** <b>Exam #1</b> ****
<b>Week 7:</b> Other stars and how to study them	Chapter 11
<b>Week 8:</b> The ISM and forming new stars	Chapter 12
<b>Week 9:</b> Stellar Lives and Deaths	Chapter 13
<b>Week 10:</b> Down the (Rabbit) Black Holes	Chapter 14
<b>Week 11:</b> The Milky Way	Chapter 15
Mar 30	**** <b>Exam #2</b> ****
<b>Week 12:</b> Other Galaxies and the Universe	Chapter 16
<b>Week 13:</b> The Large Scale Structure of the Universe	Chapter 17
<b>Week 14:</b> Cosmology and the History of Everything	Chapter 18
**** <b>Exam #3</b> during Finals Week (April 29, 2021, 10 - 11:50AM) ****	

## Exams:

Three exams will be given during the semester; they will each cover approximately one-third of the course material. The exams will be a mix of short essay and multiple-choice questions. The use of books, notes or other written materials, calculators, and browsing the internet are prohibited. All exams will be online. The exams will not be proctored, so I am placing enormous trust in you to obey the rules of the exam. All students must practice academic integrity as laid out by the University. Integrity and honesty are qualities that will serve you well in all aspects of life, and class is no different.

As noted in the grading policy, the lowest of these three grades will be down-weighted in calculating your overall grade at the end of the term.

**Dates:** Exam #1: February 25, 2021, Exam #2: March 30, 2021, Exam #3: April 29, 2021 (10 - 11:50AM)

## Academic Integrity:

The integrity of the academic process requires fair and impartial evaluation on the part of faculty and honest academic conduct on the part of students. To this end, students are expected to conduct themselves at a high level of responsibility in the fulfillment of the course of their study. It is the corresponding responsibility of faculty to make clear to students those standards by which students will be evaluated and the resources permissible for use by students during the course of their study and evaluation. The educational process is perceived as a joint faculty-student enterprise which will perforce involve professional judgment by faculty and may involve - without penalty - reasoned exception by students to the data or views offered by faculty.

Cheating/plagiarism will not be tolerated. Students suspected of violating the University of Pittsburgh Policy on Academic Integrity, from the February 1974 Senate Committee on Tenure and Academic Freedom reported to the Senate Council, will be required to participate in the outlined procedural process as initiated by the instructor. A minimum sanction of a zero score for the quiz or exam will be imposed. For details, refer to the University Guidelines on Academic Integrity ([https://provost.pitt.edu/sites/default/files/academic\\_integrity\\_guidelines.pdf](https://provost.pitt.edu/sites/default/files/academic_integrity_guidelines.pdf)).

## Diversity, Equity, and Inclusion:

I consider this class to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability - and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. The University of Pittsburgh does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin, ancestry, genetic information, marital status, familial status, sex, age, sexual orientation, veteran status or gender identity or other factors as stated in the University's Title IX policy. The University is committed to taking prompt action to end a hostile environment that interferes with the University's mission. For more information about policies, procedures, and practices, see: <https://www.diversity.pitt.edu/>

[civil-rights-title-ix-compliance/policies-procedures-and-practices](https://www.pitt.edu/civil-rights-title-ix-compliance/policies-procedures-and-practices). I ask that everyone in the class strive to help ensure that other members of this class can learn in a supportive and respectful environment. If there are instances of the aforementioned issues, please contact the Title IX Coordinator, by calling 412-648-7860, or e-mailing [titleixcoordinator@pitt.edu](mailto:titleixcoordinator@pitt.edu). Reports can also be filed online: <https://www.diversity.pitt.edu/civil-rights-title-ix-compliance/make-report/report-form>. You may also choose to report to a faculty/staff member; they are required to communicate this to the University's Office of Diversity and Inclusion. If you wish to maintain complete confidentiality, you may also contact the University Counseling Center (412-648-7930).

### **Disability Resources:**

If you require special accommodations or classroom modifications, please notify both your instructor and Disability Resources and Services by the end of the first week of the term. The office of Disability Resources and services is located in 140 William Pitt Union, (412) 648-7890, [drsrecep@pitt.edu](mailto:drsrecep@pitt.edu), (412-228-5347 [voice or TDD]), and their website is at <http://www.drs.pitt.edu>. If you have a physical, learning, or emotional disability, please let me know as early as you can so that appropriate accommodations can be made.

### **Email Communication:**

Each student is issued a University e-mail address ([username@pitt.edu](mailto:username@pitt.edu)) upon admittance. This e-mail address may be used by the University for official communication with students. Students are expected to read e-mail sent to this account on a regular basis. Failure to read and react to University communications in a timely manner does not absolve the student from knowing and complying with the content of the communications. The University provides an e-mail forwarding service that allows students to read their e-mail via other service providers (e.g., Hotmail, AOL, Yahoo). Students that choose to forward their e-mail from their [pitt.edu](mailto:pitt.edu) address to another address do so at their own risk. If e-mail is lost as a result of forwarding, it does not absolve the student from responding to official communications sent to their University e-mail address.

### **Syllabus Addendum – Natural Science General Education Requirement**

This course fulfills one Dietrich School of Arts and Sciences Natural Science General Education Requirement (GER) as described for the GERs starting Fall 2018 (term 2191). That GER reads as follows: *Three Courses in the Natural Sciences*: These will be courses that introduce students to scientific principles and concepts rather than offering a simple codification of facts in a discipline or a history of a discipline. The courses may be interdisciplinary, and no more than two courses may have the same primary departmental sponsor.

### **Please Take Care of Yourself!**

Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep, and taking time to relax. Despite what you might hear, using your time to take care of yourself will actually help you achieve your academic goals more than spending too much time studying. All of us benefit from support and guidance during times of struggle. There are many helpful resources available at Pitt. An important part of the college experience is learning how to ask for help. Take the time to learn about all that's available and take advantage of it. Ask for support sooner rather than later – this always helps. If you or anyone you know experiences any academic stress, difficult life events, or difficult feelings like anxiety or depression, we strongly encourage you to seek support. Consider reaching out to a friend, faculty or family member you trust for assistance connecting to the support that can help.

The University Counseling Center is here for you: call 412-648-7930 and visit their website.

If you or someone you know is feeling suicidal, call someone immediately, day or night: University Counseling Center (UCC): 412 648-7930 University Counseling Center Mental Health Crisis Response: 412-648-7930 x1 Resolve Crisis Network: 888-796-8226 (888-7-YOU-CAN) If the situation is life threatening, call the Police: On-campus: Pitt Police: 412-268- 2121 Off-campus: 911

(updated: March 2, 2021)