ASTRONOMY 0089: STARS, GALAXIES, AND THE COSMOS
Spring 2025
SYLLABUS

INSTRUCTOR: Prof. Sandhya Rao
Office: 317 Allen Hall
Email: srao@pitt.edu (or email me using Canvas Inbox)
Office hours: Monday 1:30 PM – 3:00 PM or by appointment

LECTURE: 102 Thaw Hall
TuTh: 2:30PM – 3:45PM

TA: Marcos Tamargo
Email: met228@pitt.edu

RECITATIONS:

Thursday	4:00-4:50 pm	103 Allen Hall
Thursday	5:00-5:50 pm	105 Allen Hall
Friday	2:00-2:50 pm	11 Thaw Hall
Friday	3:00-3:50 pm	11 Thaw Hall

CANVAS: Our course will be hosted on Canvas, the learning management system that all classes at Pitt now use (canvas.pitt.edu). Firefox and Chrome browsers work best. If you are registered for this class, you already have access to our Canvas page. I will organize all materials for the class into modules, one module per chapter. There is also a Canvas app that you can download onto your phone or tablet. All course materials will be accessible through the app as well. You should check Canvas often. Keep your notifications on so you don't miss postings and deadlines.

TEXTBOOK: *Astronomy 2e* from OpenStax, Print ISBN 9781711470573, Digital ISBN 9781951693503, www.openstax.org/details/astronomy-2e

The textbook is available for free online, in web view and PDF format. You can also purchase a print version, if you prefer, from OpenStax on Amazon.com at this link https://www.amazon.com/dp/1711470570?&linkCode=sl1&tag=openstax00-20&linkId=f03cddbc01a29efdeb9c8eb35e22be8f&language=en_US&ref_=as_li_ss_tl.
You can use whichever online format you want. Web view is recommended.

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. Students who are interested in an Astronomy or Physics and Astronomy major should take ASTRON 113 instead. This class fulfills a Dietrich School Natural Science General Education Requirement and a School of Computing and Information Polymathic Contexts: Science NonSeq. General Education Requirement. 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. Less than ten percent of your grade will be based on answers that require basic arithmetic calculations.

Part of this course includes an evening tour of the **University of Pittsburgh's Allegheny Observatory**. The purpose of this trip will be to tour the facility and make observations of the night sky with historical and modern telescopes, weather permitting. A percentage of your course grade will be based on participation in one of these field trips. There will be free buses from Allen Hall to the Observatory on Tuesday and Wednesday nights starting in March. You will sign up online. You must go with the class on the bus. Arranging your own transportation or bringing friends along is prohibited. The trip will last 3 hours. **If you have a class-scheduling conflict on both Tuesday and Wednesday evenings, please come and see me as soon as possible.**

COURSE OBJECTIVES: The principal goal of this course is for students to gain sufficient knowledge to easily understand astronomy-related news or popular articles. You will also appreciate how science is done and how we gain knowledge about the world around us through observation and inference. I am committed to making this an enjoyable and successful semester for you. Many of the things you will learn in this course will amaze you. To understand them, you will learn some basic ideas of physics and how we have come to know the Universe we live in. It's a journey. Be engaged and enjoy it!

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

- what is the process of science and why is it important
- what the major motions of the Earth are, and how they relate to the day and seasons
- why the constellations seen in the sky vary over the course of the year
- how we can measure the properties of stars and galaxies using observations from Earth and space
- why the Sun shines, and why it will not do so forever
- how the Sun and other stars form and die
- where black holes come from, and the effect they have on space and time
- how the Milky Way Galaxy we live in is similar to (or different from) other galaxies
- why we believe many galaxies have black holes at their centers
- why we believe that dark matter and dark energy exist in our Universe
- what the main constituents of the Universe are, how it began, and what its ultimate fate will be

COURSE ORGANIZATION

RECITATIONS: Recitation work is an important component of this course, and your attendance is mandatory. Recitations account for 20% of your grade. Your lowest recitation score for the semester will be dropped. If you are unable to make a recitation due to a medical or other emergency, then that is the recitation that will be dropped. If you need to miss more than one recitation for an emergency, you will have to provide me and your TA with a note from your doctor or advisor. Attendance will be taken during recitations and you will not be allowed to complete recitation worksheets on your own outside of class.

HOMEWORK: You can access homework assignments through Canvas. Homework will be assigned every week and will be due every Sunday before midnight. A small penalty will be applied for late submissions to motivate you to stay on track. Exceptions will be granted in special cases. Homework is worth 15% of your grade. Your lowest homework score will be dropped.

CLASS PARTICIPATION: We will use Top Hat to keep you engaged in class. You can click on the Top Hat tab on our Canvas page to get integrated. You can also use the Top Hat app and enter our class code (538735). You will answer clicker questions during lecture to assess your understanding of the material that is being presented. Your scores will be tallied at the end of semester and will count as extra credit. You will also get a few other opportunities for extra credit during the semester. You can accumulate a maximum of 5% to add to your score as extra credit.

EXAMS AND EXAM POLICY: Three exams will be given; they will each cover approximately one-third of the course material. Each exam is worth 20% of your grade. There is no cumulative final exam. The exams will consist of multiple-choice questions. The use of books, notes or other written materials, calculators, and browsing the internet are prohibited. 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.

EXAM DATES:

- **Exam 1: Tuesday, February 11**
- **Exam 2: Tuesday, March 18**
- **Exam 3: Tuesday, April 22**

GRADING SCHEME: The final grade will be determined from the curve of the distribution of final percentage grades. Obtaining >90% of points guarantees an A, >80% of points guarantees a B, >70% of points guarantees a C, and >60% of points guarantees a D. If you are taking the class pass/fail, you need to achieve a score equivalent to a C or higher to receive a passing grade.

- Three Exams: 60%
- Recitation: 20%
- Homework: 15%
- Observatory Trip: 5%

Your Well-being Matters
College can be an exciting and challenging time for students. Taking time to maintain your well-being and seek appropriate support can help you achieve your goals and lead a fulfilling life. It can be helpful to remember that we all benefit from assistance and guidance at times, and there are many resources available to support your well-being while you are at Pitt. You are encouraged to visit Thrive@Pitt to learn more about well-being and the many campus resources available to help you thrive.

If you or anyone you know experiences overwhelming academic stress, persistent difficult feelings and/or challenging life events, you are strongly encouraged to seek support. In addition to reaching out to friends and loved ones, consider connecting with a faculty member you trust for assistance connecting to helpful resources.

The University Counseling Center is also here for you. You can call 412-648-7930 at any time to connect with a clinician. If you or someone you know is feeling suicidal, please call the University Counseling Center at any time at 412-648-7930. You can also contact Resolve Crisis Network at 888-796-8226. If the situation is life threatening, call Pitt Police at 412-624-2121 or dial 911.

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, including dictionaries and programmable calculators. To learn more about Academic Integrity, visit the Academic Integrity Guide for an overview of the topic. For hands- on practice, complete the Academic Integrity Modules.

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 Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, 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.

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