

Astronomy 089: Stars, Galaxies, and the Cosmos

Summer 2020 (6 Wk 2)

Lecture: Asynchronously, plus several Thursdays 2:00-3:00PM

Recitation (with TA): Tues/Thurs 3:15-3:50PM

Instructor Office Hours: Tuesdays 4:00PM-5:00PM, according to need, or by appointment

Contact Information:

Instructor: Melanie L. Good

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Prerequisites: Any MATH course or MATH placement score 61 or higher

Textbook (recommended): *Astronomy: The Universe At A Glance* by Chaisson and McMillan ISBN 978-0-321-79976-0

Other Materials: Any scientific or graphing calculator

Course Description: This is a self-contained course for students not majoring in the physical sciences. The Universe in which we live is a 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 and their alien worlds 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 vision to cosmology and investigate the origin and ultimate fate of the Universe.

Course Objectives:

At the end of the course, students should be able to explain:

- 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 distant stars and galaxies using observations from the 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

Honor Code:

Students are expected to uphold the University's standard of conduct relating to academic honesty. Students assume full responsibility for the content and integrity of the academic work they submit. Students shall be guilty of violating the honor code if they:

1. represent the work of others as their own
2. use or obtain unauthorized assistance in any academic work
3. give unauthorized assistance to other students
4. modify, without instructor approval, an examination, paper, record, or report for the purpose of obtaining additional credit
5. misrepresent the content of submitted work

Any student violating the honor code is subject to receive a failing grade for the course and will be reported to the Vice President of Academic Affairs.

Additional Academic Integrity Information for Online Classes:

Online classes may appear to allow freer access to information from sources offering "tutoring" services or other help to students, but please be aware that the University Honor Code is expected to be upheld to the same degree for online classes as for in-person classes. Students who utilize online tutoring services, solutions manuals, videos, or other online resources to represent their own work are in violation of the above Honor Code, and will be subject to the same consequences as any academic integrity violation which would occur during an in-person class. Academic honesty is taken very seriously by the University and every effort will be made to ensure that all students enrolled in online courses are upholding the expectations of the University Honor Code.

(Special Note from Instructor: During the COVID-19 remote instruction in the Spring of 2020, students cheating on online physics exams were caught and received consequences described above and I will not hesitate to pursue any future cases of academic dishonesty. Assume that all online graded activities will be scrutinized for academic honesty.)

Grading Scheme:

- 20 % for Attendance/Participation
- 25 % for Recitation Work
- 15 % for Discussion Board
- 10 % for Allegheny Observatory virtual tour
- 20 % for Quizzes
- 10 % for Observing Logs

See below for description of each grading component.

Attendance/Participation (worth 20% of grade): Although most instruction will be conducted asynchronously, attendance during virtual office hours, Blackboard Collaborate meetings, and/or Zoom meetings will count towards part of your grade. To reflect that different students may have different technology constraints, the attendance will be flexible. Students must attend 3 synchronous activities, which will be conducted either through Blackboard Collaborate or Zoom. These activities can be chosen according to your preferences. Available synchronous activities to choose from include Thursday lecture meetings or the instructor or TA's virtual office hours, or any combination of these. Each of the 3 synchronous activities will be worth 5% of your grade. You are not required to show video or turn your audio on for your attendance to count—as long as your identity is confirmed to be in attendance, you will receive attendance for that activity. However, you must **participate in one** of the synchronous activities. This can be asking a question through audio or chat conversation, or answering a question through audio or chat conversation. This participation (asking or answering a question) will count for 5% of your grade, so that the 3 attendances at 5% each plus one participation at 5% equals 20% of your grade in total.

Recitation Work (worth 25% of grade): Your TA will assign worksheets for you to complete and submit via photo/scan to Courseweb. These worksheets will be open-ended and explore the topics being discussed in lecture more deeply. Partial credit for your answers may be given at the TA's discretion.

Discussion Board (worth 15% of grade): Each week, there will be 1-2 forums on Courseweb's Discussion Board for students to discuss the material you are learning that week and/or newsworthy astronomical events/discoveries. You will be expected to contribute to at least 5 of these discussions (Each contribution is worth 3% of your grade). To receive full credit the response should be genuine and relevant to the topic, not simply something along the lines of "that is a good point" or "I've been wondering that too."

Allegheny Observatory virtual tour (worth 10% of grade): Because it has been a standard usual course requirement that students tour the Allegheny Observatory, a "virtual tour" will be required during this time of remote instruction. Students must attend the virtual tour and submit a summary of what they learned about the observatory (via photo/scan submission on Courseweb).

Quizzes (worth 20% of grade): Several short, timed quizzes will take place on Courseweb. The quizzes will consist of multiple choice and/or true/false questions about the previous several lectures.

Observing Logs (worth 10% of grade): Students will be asked to keep observing logs of the night sky. No equipment is required in order to complete the logs, however, binoculars and/or telescopes may be used if students have access to them. Students may choose any 5 nights on which to observe (each worth 2% of grade). (Note: It is recommended that students do not procrastinate on this, because the session is only 6 weeks long and weather conditions could make observing the night sky difficult on many nights). Each log entry should state the observing conditions from the Pittsburgh Clear Sky Chart that night, the direction(s) the students was looking/observing, the approximate altitude of what was seen, and a description of what was seen, along with a labeled sketch or photo. Observations could include observations of the Moon, constellation identification, meteor showers, satellite fly-bys, etc.

Course Topics and Tentative Timeline:

- **Week 1**
 - Our place in the cosmos–“Long ago and far away” (Video Lectures 1-2)
 - Light and telescopes–“The tools we use” (Video Lectures 3-4)
- **Week 2**
 - Coordinate systems and time measurement–“Where and when?” (Video Lectures 5-6)
 - The Moon–“The lunatic in my head” (Video Lecture 7)
- **Week 3**
 - The Sun–“Del Sol” (Video Lecture 8)
 - Measuring the stars (Video Lecture 9-10)
- **Week 4**
 - Stars, their formation and evolution (Video Lectures 11-13)
- **Week 5**
 - Exoplanets–“Home away from home” (Video Lectures 15-16)
 - Galaxies–“Deep space” (Video Lectures 21-22)
- **Week 6**
 - Cosmology (Video Lecture 23)
 - Recent Discoveries and wrap up (Video Lecture 24)

(Note that missing lecture numbers reflect material that was removed because it is no longer covered by this course and/or was incorporated into previous lectures).

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.

Disability Services:

If you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and Disability Resources and Services no later than the second week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations.