***General Astronomy* (AST 10 – Summer 2020 session A – 4 units)**

Instructor
Dr. Gaspard Duchêne (Astronomy Dept.)
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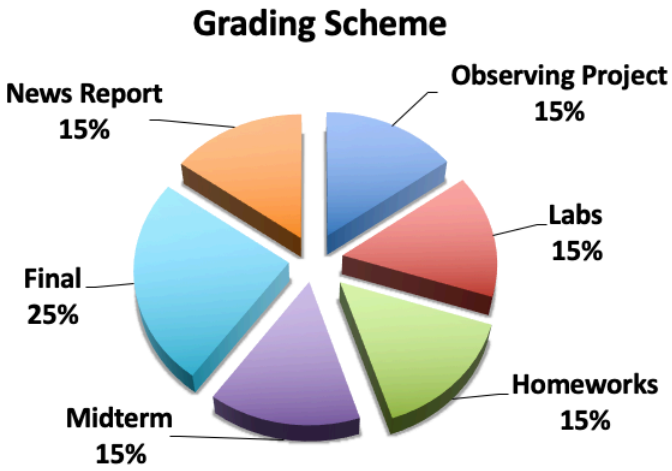
Textbook
J. Bennet, M. Donahue, N. Schneider & M. Voit: *The Cosmic Perspective (9th edition)* *Editor's link*

Class organization
Class: MTuWTh 2-3pm, via Zoom
Office Hours: Time TBD, via Zoom

Grading
Based on a combination of weekly homework sets, three lab experiments, an independent observing project, a "news report", a midterm and a final. **A bonus (up to 5%) is available for active participation on the class's online forum/discussion board.**



Monday	*Tuesday*	*Wednesday*	*Thursday*	*Friday*
May 25	**May 26**	**May 27**	**May 28**	**May 29**
Memorial Day No Class	**The Bases of Astronomy**			**HW Set 1 due**
	Introduction; Course Overview	The Night Sky; The Scientific Method **Lab1 due**	Key Physics: Energy, Forces, Matter	
June 1	**June 2**	**June 3**	**June 4**	**June 5**
	Planetary Systems			**HW Set 2 due**
Key Physics: Light; Astronomer's Tools	The Solar System; The Main Planets	Planets: Structure and Geology	Planets: Atmospheres	
June 8	**June 9**	**June 10**	**June 11**	**June 12**
Planetary Systems		**Stars in our Galaxy**		**HW Set 3 due**
Planetary Systems; Minor Bodies	Extrasolar Planets; Planet Formation **Lab 2 due**	The Sun	Stellar Diversity	
June 15	**June 16**	**June 17**	**June 18**	**June 19**
MIDTERM	**Stars in our Galaxy**			**HW Set 4 due**
	Star Formation; Stellar Evolution	Supernovae Stellar Remnants	Black Holes	
June 22	**June 23**	**June 24**	**June 25**	**June 26**
Galaxies			**The Universe**	**HW Set 5 due**
The Milky Way	Galaxy Diversity; Galaxy Evolution	Supermassive Black Holes; Dark Matter **Lab 3 due**	Expanding Universe; Dark Energy	
June 29	**June 30**	**July 1**	**July 2**	**July 3**
The Universe	**Life**	*Review Session* **Observing Project due**	***FINAL EXAM***	**Session ends**
Big Bang; Cosmology **News Report due**	Life in the Universe; Interstellar Travel			

Course overview

Astronomy 10 is a class that attempts to cover the incredible breadth of the Universe we inhabit. Given that our knowledge of the cosmos spans billions of light-years (quite a distance to travel in 6 weeks!), we will be moving very quickly. We will begin with familiar objects such as our Earth, Sun, Moon, and Milky Way before moving to exotic, space-bending phenomena like neutron stars, black holes, quasars, and dark matter. We will discuss how astronomers have used the scientific method for several centuries to understand what they see in the sky, and broach topics like extra-solar planets and the mysterious, gravitationally-repulsive "dark energy" that have only been discovered in our own lifetimes.

In order to explore these subjects, we will use the mechanical language of our universe: physics. Because this course fulfills the physical science requirement for UC Berkeley, we will be using physical laws and relations to understand the behavior of astrophysical objects and systems (the orbits of the planets around the Sun, the interactions of light with matter, etc.). However, there are no physics prerequisites to this class, and we will develop the tools we need as we go. You will be expected to have high-school experience with algebra and geometry (squares and square roots, scientific notation, ratios, etc.), and these topics will be reviewed as they are introduced.

In addition to providing you with some science credits, I hope that this class will affect the way you think about science and the place of our Earth in this vast and fantastic Universe. The class will emphasize how our understanding of the cosmos continues to evolve; how theories are constantly tested, strengthened, and rejected; and how technology is advancing astronomy. We also will apply our understanding to make actual astronomical measurements ranging from the rotation of the Sun to the expansion of the Universe. By the end of the class, you will read a science article in your favorite news outlet and understand the importance of the results well beyond the original short story. Indeed, this will be one of your class assignments! Most of all, I hope you find yourself asking "Why?" about more of what you see around you.

Remote course organization

I am reasonably confident that no one (including myself!) would enjoy 8 hours per week of me talking to a silent classroom. This is even more true in the virtual classroom where starring at a screen for two hours is probably the best way to ensure that students "tune out"! Luckily for us all, a huge body of research has shown that interactive lectures increase learning for students at all levels. With the goal of maximizing 1) your absorption of class material and 2) your grades, as well as to adjust for the current global situation, lecture material will be provided through three complementary avenues:

- Textbook reading assignments and several pre-recorded short "lecture videos" (and associated slides) will be posted online well ahead of class time; you will be expected to have read/viewed this before lecture class time.
- Aside from practical/logistical announcements, class time will be devoted to interactive activities, including class polls, think-pair-share exercises and class-wide conversations; these sessions will be recorded for those who miss the session.
- The recording of the interactive sessions, and sometimes a couple of additional pre-recorded short "lecture videos" (and associated slides), will be posted online after class.

Office Hours and additional support

Office hours are meant to be the time for you to ask clarifications about materials covered in class or in homework sets. ***No new material will be introduced during office hours***. A schedule of weekly office hours (held virtually) will be determined by popular vote on the first day of class. ***Attendance is not mandatory but strongly encouraged***.

Aside from these face-to-face meetings, the best avenue to get help on a specific topic is to make use of the discussion board and forum features of the class website. Questions, comments, suggestions, …, can be posted at any time and immediately reach all students in the class (in addition to me), providing value for the whole class. To encourage the use of these features, I will take note of your *active online participation* (including by asking questions) and this will constitute ***a bonus of up to 5% on top of your final grade***.

I am also happy to answer questions asked via email at any time of day, but you may find that my replies outside of my in-office hours are both slower and shorter.

Homework

There will be 5 weekly homework assignments covering both lecture and reading material. The lowest homework score for each student will be dropped from the average. Homework assignments will include a mix of multiple-choice questions, true/false statement and open-ended questions. Each assignment ***must be turned in by 11:59pm PDT on Friday*** of the week it is due; you will submit it via the course website (or via email as a back-up solution). To keep up with the compressed summer session schedule, late homework will incur a steep penalty. In return for your timeliness, homework will be returned and reviewed on the Monday after it is due. It will be very important to review your returned homework, as frequently missed homework questions may spur related questions on the midterm or final exams.

Observing project

Astronomy is an empirical science, i.e., it is based on observations. To bring this point home, one the course assignments is an individual observing project to be chosen from a set of four options (including both day-time and night-time projects). Detailed instructions will be provided during class. This project relies exclusively on naked eye observations; the use of binocular or telescopes is not needed and, indeed, would make the project more difficult. Each project focuses on how much the astronomical sky changes over the course of several weeks. As a result, the longer the time baseline you have between your observations, the more likely you are to see the sky change. You should therefore start the project early on in the session. The project will be graded based on the number of observations performed as well as on the student's effort to obtain and describe quality observations. A short (500-words maximum, plus graphic/tabular material) summary will be ***due the day before the final exam***.

Lab projects

You will complete three short experiment-based projects, ***during the first, third and fifth week of the session***. These activities, conducted in small groups (3-4 students each), are geared towards improving your problem-solving abilities and your practical understanding of the scientific method. Each project typically requires between 1 and 2 hours to complete, although this will vary based on the practical limitations of remote meetings (it is possible to conduct the project in two sittings if necessary). I will provide practical tips on how to conduct these activities and offer additional dedicated office hours. You will have a two-day window (Tu-W for Labs 1 and 3, M-Tu for Lab 2) to complete this activity, at the end of which each group will turn in a single report.

News Report

I hope that this class will change the way you think about the Earth and the sky and will expand your understanding of the key questions in modern astronomy. To aid in this goal, you will be completing a "news report" project during the course of the session. In this project, you will pick a recent (published in 2020) news article about an astronomy topic of your choice from the printed/electronic media and will prepare a 1000-word report in which you put the discovery in the context of the class. Explaining the methodology used to make the discovery and how the discovery relates to fundamental physics principles and to other topics discussed in class are the aspects that will be expected of your report. The full report will be ***due on the first day of Week 6*** in order to avoid overloading yourself towards the very end of the session. While several students could pick the same news story to cover, each student must turn its own report that demonstrates independent work, even though you might have exchanged thoughts with other students.

Midterm/Final

There will be one ***midterm on the Monday of Week 4*** (June 15th) and a ***final exam on the last day of class*** (Thursday July 2nd). Each will be cumulative and contain a similar diversity of question styles as the weekly homework. The exam will be made available electronically and you will have a fixed time to complete it once you start it. The number of questions will be such that you will have plenty of time to complete the exam in the allotted time. Make-ups will not be allowed, except under extreme circumstances. The midterm and final will be open-book in order to focus on conceptual understanding rather than memorizing facts or equations related to the course.

Grading Policy

Final grades will be assessed based on the weighted average of course components (see graphics on the first page). Letter grades will be assigned based on the criteria in the table below. ***Grades will not be curved***: it is mathematically possible for every student to get an A in this course, although this will require both a mastery of the course material and full engagement with the various course activities. Students taking the class Pass-Fail must achieve at least 70% for a passing grade.

Percentage	Letter Grade	Grade Point	Percentage	Letter Grade	Grade Point	Percentage	Letter Grade	Grade Point
94-100	A	4.0	80-82	B-	2.7	67-69	D+	1.3
90-93	A-	3.7	77-79	C+	2.3	64-66	D	1.0
86-89	B+	3.3	74-76	C	2.0	60-63	D-	0.7
83-85	B	3.0	70-73	C-	1.7	< 60	F	0.0

I understand that your grades are an important part of your experience of this course, and I will work hard to grade assignments and exams fairly and accurately. If you believe there has been an error, please go through the following steps:
1) Read the solution in detail.
2) Tally up the number of points you believe you were wrongly denied.
3) Write out your reasoning for each error you think has been made.
4) Submit the assignment back to me for a complete re-grading. Re-submitted assignments will not be accepted more than 4 days after they are returned to you (i.e., no later than the due date for the next homework assignment).

Special Accommodations

If you require any special accommodations for the lectures, group activities, or exams in this course, please let me know early in the session. If you would prefer not to discuss the details of the situation with me, you can get a letter from the Disabled Students Program (DSP; http://dsp.berkeley.edu), which will allow me to accommodate your needs with no questions asked. We will do our best to ensure that you can have full access to the content of the course within the constraints imposed by the fully remote set up of this Summer's course. In addition, the campus Academic Accomodations Hub provides a variety of resources for students in need of support, help, accommodation, …

Honor Code

Students should know and uphold the official campus honor code: "As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others." Further information on the honor code can be found at http://asuc.org/honorcode. Two honor code areas of particular importance are academic honesty and harassment. The detection of cheating will result in severe academic consequences. Cheating is broadly defined as submitting another person's work (whether a classmate's or content from the internet) as if it were your own. Work done as a group and material collected from other resources should be clearly identified as such. The Astronomy Department's official policies on cheating will apply at all times and may be found at http://astro.berkeley.edu/programs/undergraduate-program/policy-on-academic-misconduct.

Harassment on the basis of race, color, national origin, age, gender identity, and/or sexual orientation and identity will not be tolerated. In particular, sexual harassment is unacceptable and unlawful. Sexual harassment is defined as unwelcome sexual advances, requests for sexual favors, and other verbal, nonverbal, or physical conduct of a sexual nature. Note that these definitions of harassment include conduct outside of class as well as online. If you observe, or are victim of, behavior that you believe to be harassment, sexual or otherwise, you should know that there are many resources available on campus to report and act on such behavior; a detailed overview is available on the Astronomy Department website (at http://astro.berkeley.edu/department-resources/reporting-harassment).

I want to emphasize that the honor and conduct codes are all the more important in a fully remote course. I will be particularly vigilant to any instance of misconduct during the session.