

Astronomy 170B1, Section 3 - The Physical Universe

Fall 2019

Instructor:	Professor Daniel P. Marrone Email: prof.d.marrone@gmail.com Telephone: (520) 621-5175 Office: Steward Observatory, Room N314 Office Hours: Monday, 3:00 p.m. – 4:00 p.m. or by appointment
Teaching Assistants:	Chris Bilinski Email: cgbilinsk@gmail.com Office: Steward Observatory, Room T110 (Trailer outside) Office Hours: Wednesday 1:00 p.m.–2:00 p.m. or by appointment
Lectures:	Monday, Wednesday, most Fridays, 12:00 p.m. – 12:50 p.m. Steward Observatory, Room N210
Discussion Sections:	Dates as specified in schedule, 12:00 p.m. – 12:50 p.m. Held in Steward Observatory, Room N210 (other rooms, if needed due to class size): Steward Observatory, Room 204 Steward Observatory, Room 208
Midterm Exams:	Wednesday, September 25, in SO N210 Wednesday, October 30, in SO N210 Monday, November 25, in SO N210
Final Exam:	Friday, December 18, 10:30 a.m. – 12:30 p.m, in SO N210
Websites:	https://d2l.arizona.edu/ http://masteringastronomy.com/ (instructions below)

1. Overview

Course Description:

The Physical Universe is a survey of modern astronomy. Astronomy is a fast moving field covering an enormous range of phenomena and we will examine topics including: the Earth, our Solar System, distant planets, stars, galaxies, black holes, and the Big Bang. We will also use astronomy to learn about the nature of scientific inquiry, the process by which we learn about the world. This course is a Tier One General Education course in the Natural Sciences study area.

Course Objectives:

This course will familiarize you with large parts of astronomy and enable you to understand the context of astronomical research you may see reported in newspapers and magazines. More importantly, you will understand the scientific method and the way in which scientific reasoning increases our understanding of the natural world. Science plays an important role in modern society and scientific issues are constantly under public discussion; this course will help you critically evaluate the positions in these debates and form independent conclusions.

Course Format:

This course will meet on most Mondays, Wednesdays, Fridays for lecture periods. On occasion, as specified in the syllabus, the lecture will be replaced with discussion/laboratory sections. These will be in the main lecture hall or broken out to other classrooms as needed, depending on enrollment. Lectures will be as interactive as possible, interrupted with discussion and peer instruction. The laboratory sections will involve small group work.

Learning Outcomes:

The learning outcomes for Tier One GenEd courses are listed here:

<https://gened.oia.arizona.edu/content/tier-one-outcomes>

This course addresses the following learning outcomes:

- Understand the nature and application of physical science
- Apply ideas and processes beyond the classroom
- Recognize the complexity of many scientific issues
- Generate and analyze actual data, and use abstract reasoning to interpret these data
- Speak and write about scientific knowledge
- Appreciate the relative scale of objects, rates of change, linear and nonlinear growth
- Present data in tables, graphs and charts as well as performing appropriate mathematical calculations and data analysis
- Read and understand scientific literature from popular sources such as magazines and newspapers

Course Communications:

You will receive information about assignments, schedule changes, and any other course-related communications through D2L and/or email.

Required Textbook:

The required course text is:

The Cosmic Perspective, 8th Edition, by Bennett, Donahue, Schneider, & Voit

Access to the *Mastering Astronomy* website (for all homework) is also required

The course materials are being delivered digitally via D2L through the Inclusive Access program. Please access the text & software through D2L on the first day of class to make sure there are no issues in the delivery, and if you are having a problem or question, it can be addressed quickly.

You automatically have access to the course materials FREE through September 8, 2019. Even if you have not accessed the materials, **you must take action to opt-out if you do not wish to pay for the materials and choose to obtain them independently. The deadline to opt-out for a 15-week course beginning August 26th is 9:00pm MST, September 8, 2019.** If you officially withdraw from this course, you will automatically be “opted-out.” If you do not opt-out and choose to retain your access, the cost of the digital course materials (\$64.22) will appear on your October Bursars account. This is a savings of \$49.11 compared to purchasing a new hardcopy of the textbook.

Please refer to the Inclusive Access FAQs at this URL for additional information:
<https://shop.arizona.edu/textbooks/Inclusive.asp>

2. Grading

Your grade will be determined by the following components:

Midterms	30%	(best two out of three)
Final	12%	
Homework	30%	
Written Assignments	10%	
Laboratory Activities	8%	
Attendance/Quizzes	10%	

The percentage thresholds for letter grades will be:

A = 90% B = 80% C = 65% D = 50%

I reserve the right to make the grading slightly easier, but will not raise these thresholds.

Assignment/test grades will be final one week after they are visible on D2L, please bring questions, disputes, or mistakes to my attention immediately.

Midterms/Final:

There are three midterms. The lowest of your midterm scores will be dropped. Together, the midterms and final comprise nearly half of the course grade.

There are no make up exams. The dates for the midterms and final are listed on the first page and will not change. If you miss a midterm, it will count as your dropped test.

Homework:

Homework assignments will consist of problem sets on *Mastering Astronomy*. These problems are intended to reinforce the concepts addressed in lecture and in the readings.

Assignments will be due approximately weekly at the start of a class session. Late homework is accepted, but 10% of the credit is lost each day, until you reach 50%. To encourage you to complete the assignments, 50% credit is possible until the day of the final exam.

Extra points are often made available to assist you in learning the material and to help improve your overall homework score. However, you may not receive more than 100% on the homework portion of your final grade.

Written Assignments:

All Tier One and Tier Two General Education Courses are writing intensive (<https://gened.arizona.edu/proposal-guidelines/writing-requirement>). Over the course of the semester you will be asked to read articles on scientific research of interest to the course, taken from major publications and intended for a general audience. Your task will be to understand these articles and write about them. A grading rubric will be provided with the assignments. For the first assignment you will also review the rough draft of a peer and provide structured feedback to them. Pre-submission review of your writing will also be available from the TAs and Professor.

Laboratory Activities:

The Friday breakout sessions will provide supplementary instruction, scientific experiments, and group learning activities. You will turn in assignments from these activities that will become part of your grade. Because they rely on data gathering and/or group discussions you may not make up these activities. Excused absences will be accommodated.

Attendance/Quizzes:

Attendance is strongly encouraged, and is part of your grade. If the lectures and discussions are operating as intended, the interactions between us will be far more valuable to your success in this course than whatever time you could save by skipping class. You are expected to have read the textbook before lecture, and quizzes in class will be used to enforce this.

Notecards will be distributed in lecture to record your presence (and, occasionally, to give quizzes). Attending 75% of the lectures is good enough for full attendance credit. Turning in a card for someone else is not allowed and will be treated as a violation of the Code of Academic Integrity.

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 preapproved by the UA Dean of Students (or dean's designee) will be honored. See:

<http://policy.arizona.edu/employmenthuman-resources/attendance>

Extra Credit:

Extra credit opportunities will be announced in class. They will have a value comparable to homework assignments. Your extra credit is capped at 4% of the course grade.

3. Policies

Learning Support:

I want to ensure that you are able to succeed in this course. Over the semester I will provide frequent opportunities for direct feedback on the course, and will be able to see progress in learning through the homework and tests. The office hours for the TA and myself are listed on the first page, please make use of us.

Inclusion and Respect:

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

It is already UA policy that class rosters are provided to instructors with a student's preferred name. Students may share their preferred name and pronoun with members of the teaching staff and fellow students, as desired, and these gender identities and gender expressions will be honored in this course. As the course includes group work and in-class discussion, it is critical to create an educational environment of inclusion and mutual respect. In this class, to be inclusive of all gender identities and expressions, students will be referred to by their first or last names, the pronoun of their choice, or by default, the pronoun "they."

Students with Disabilities:

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.

Some accommodations, such as extra testing time, will require scheduling with the DRC and advance work on my part. You will remain responsible for scheduling a test-taking spot in the DRC well in advance of all tests (>1 week).

Classroom Etiquette:

In order to provide an environment conducive to learning and interaction, the following policies will be enforced:

- No eating or drinking (other than water) in the classroom
- Cell phones must be turned off and out of sight
- Laptops/iPads may be used for note taking only, in designated sections of the room.
- Late arrival and early departures are strongly discouraged and the disturbance they cause to neighboring students must be minimized

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.

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>

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>

Academic Dishonesty:

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>.

Presentation of any work other than your own is considered academic dishonesty. This includes copying test answers or homework assignments, other persons taking exams for you, or reference to any unauthorized materials during the exam. Any other technique that gains unfair advantage over other students is also considered academically dishonest. All students must be prepared to present valid picture identification if requested during an exam period.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent.

Violations to these and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. The consequences can range from loss of credit on an assignment to dismissal from the University, depending on the severity of the offense.

turnitin.com:

By continuing in this course, you are agreeing to submit your written assignments online to a plagiarism-prevention program called TurnItIn.com. When you set up your individual account with TurnItIn.com, make sure you understand and consent to all the terms that the program provides you at that point. You should note that TurnItIn.com will retain your writing (without your name or other identifying information) as part of their database so that students who plagiarize from it can be detected. Anyone who has concerns about TurnItIn.com may talk privately with me.

The University Libraries provide tips for avoiding plagiarism:

<http://new.library.arizona.edu/research/citing/plagiarism>.

Syllabus Changes:

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.

4. MASTERING ASTRONOMY

Opening an Account:

1. Go to <http://www.masteringastronomy.com>
2. Click on the "Student" button in the "Register Now" box at the right side of the page. Click "OK! Register now" on the following page.
3. In the "Enter Your Course ID" box enter **MARRONE19FALL**.
4. You should be taken to a page to sign in or create a Pearson account. On the right you should see "Your Course":
 ASTR 170B1, Fall 2019
 Course ID: marrone19fall
 Taught by Dan Marrone
5. You must now purchase access or use the code in your textbook to gain access.
6. IMPORTANT: when prompted, enter your **University of Arizona NetID**. This is the username you use for almost everything at the U of A.

5. Tentative Schedule

Week	Date	Lec/Lab/Other	Topic	Reading
1	08/26	Lec 1	Cosmic scales	1
	08/28	Lec 2	Seasons, sky	2.1-2.2
	08/30	Lec 3	Moon/eclipses	2.3-2.4
2	09/02	NO CLASS	Labor Day	
	09/04	Lec 4	Planetary motion, Science	3.1-3.4
	09/06	Lab 1	<i>Nature of Science</i>	
3	09/09	Lec 5	Kepler/Galileo	3.3
	09/11	Lec 6	Newton	4.1-4.2
	09/13	Lec 7	Energy/Gravity	4.3-4.5
4	09/16	Lec 8	Light	5.1-5.3
	09/18	Lec 9	Spectra	5.4
	09/20	Lec 10	Telescopes	6
5	09/23	Lab 2	<i>Spectroscopy</i>	
	09/25	Midterm #1	Lectures 1-10, Labs 1-2	
	09/27	Lec 11	Solar System Formation	7.1-7.2, 8.1-8.2
6	09/30	Lec 12	Terrestrial Planets	9.1-9.2
	10/02	Lec 13	Atmospheres	10.1,10.4-10.6
	10/04	Lec 14	Climate	10.6
7	10/07	Lec 15	Outer Planets	11
	10/09	Lec 16	Pluto	12.1, 12.4
	10/11	Lec 17	Leftovers	12.2-12.3, 12.5
8	10/14	Lec 18	Sun, First Essay Due	14.1-2
	10/16	Lec 19	Stars	15.1
	10/18	Lec 20	HR Diagram	15.2
9	10/21	Lec 21	HR Diagram	15.3, 16
	10/23	Lec 22	Low Mass Stars	17.1-17.2
	10/25	Lab 3	<i>HR Diagram</i>	
10	10/28	Lec 23	High Mass Stars	17.3-17.4
	10/30	Midterm #2	Midterm 1 + Lectures 11-23, Lab 3	
	11/01	Lec 24	Stellar Afterlife	18.1-18.2
11	11/04	Lec 25	The Milky Way Galaxy	19.1-19.2
	11/06	Lec 26	Galaxies	20.1-20.2
	11/08	Lec 27	Black holes	18.3, 19.4
12	11/11	NO CLASS	Veterans Day	
	11/13	Lec 28	Distances	20.2
	11/15	Lec 29	Expansion of the Universe, Second Essay Due	20.3
13	11/18	Lec 30	Dark Matter	23.1-23.3
	11/20	Lec 31	Dark Energy	23.4
	11/22	Lec 32	Big Bang	22.1
14	11/25	Midterm #3	Midterms 1&2 + Lectures 24-32	
	11/27	Lec 33	Cosmic Microwave Background	22.2
	11/29	NO CLASS	Thanksgiving	
15	12/02	Lec 34	CMB: Evidence for the Big Bang	22.2
	12/04	Lec 35	Inflation	22.3-22.4
	12/06	Lab 4	<i>Big Bang</i>	
16	12/09	Lec 36	Other planetary systems	13.1-13.2
	12/11	Lec 37	Life	24.1, 24.3
	12/18	Final	All Lectures and Labs	