ASTR 170B1: The Physical Universe

Professor Chris Impey
ILC 140: Tues & Thurs 2:00-3:15pm

Teaching Team

Your instructor will be Chris Impey, University Distinguished Professor in the Department of Astronomy. I'll be ably assisted by a GTAs and an undergraduate TA. Email is a good way to reach us; we try to answer all messages within a day. You're welcome to see us outside office hours, but it's best to make an appointment first, by phone or by email.

Professor, Chris Impey: cimpey@as.arizona.edu, Steward Observatory Room 334. Phone: 621-6522, Office Hours: 3:00-4:00pm Monday; 11:00-12:00pm Thursday.

Graduate Teaching Assistant, Tenzin Sonam: tenzinsonam@email.arizona.edu, Steward Observatory Room 335, Phone: 621-2757, Office Hours: TBA.

Undergraduate Preceptors: Ross Eckley as the lead preceptor, and others to be recruited in the first week of class. Office hours to be announced on D2L.

Overview

ASTR 170B1 "The Physical Universe" is a Tier 1 course of the General Education program. It does not assume any prior knowledge of astronomy. Our class meets on Tuesdays and Thursdays from 2:00 to 3:15pm in Room 140 of the Integrated Learning Center. We will broadly cover all aspects of astronomy, from planets to cosmology. This will be a "flipped" class, which means lectures are videos that you will find online and class time will be used for hands-on activities and group work. The goal is to increase interaction and learning! In this learner-centered class the time we have together is mostly not used for lecturing but for group work, discussion, dialog in pairs, and engagement using clickers.

The weekly patterns of activities and student assignments in a flipped class are different from a conventional lecture class. You'll need to watch an hour or more of online lecture video before Tuesday's class and take an online quiz covering that material. Each Tuesday there will be a mini-lecture and you will do group activities, some writing, and discussions based on clicker questions. Each Thursday you will do an activity in groups of 3-4 that will last the entire class period. A significant part of the course grade will be awarded for an individual observing project, where you will present a poster on the day of the final. There will also be a small amount of extra credit available for an online survey early in the class. To do well in this class you need to put in a consistent effort over the whole semester.

Goals

This course has ambitious goals, but what's life without ambition? Few of you will become scientists, but you all live in a world that is being shaped and transformed by science. In this course, concepts will be more important than facts. The goals are to:

- Give a sense of the role of humans in the vast universe.
- Show the small set of physical theories that govern nature.
- Give a sense of the cutting edge of discovery in astronomy.
- Use teaching methods that engage you in your own learning.

Note that this last one involves you! Science doesn't happen through pure contemplation and learning doesn't happen by just listening. That's why the lectures are online and class time will be used for dialog, writing, labs, and small group activities. For most of these activities you will work in groups of four, and if it's a graded assignment all the members of the group get the same score. There will be reading quizzes online, designed to make sure you have understood the content of the video lectures (and actually watched them). The final major component of the class is an individual project, which takes you through picking an astronomical object that you might want to observe, writing a proposal, doing background research, requesting your own image from a robotic telescope network, and gathering the results into a paper and poster that you present at the end of the semester.

Class Materials

We'll use the UA course management system Desire2Learn (go to http://d2l.arizona.edu and follow the instructions for students). All class materials, including this syllabus, will be on D2L, and you will complete quizzes, submit projects, and find links to the course videos there. The price of textbooks is a real burden on students, so for background information on any of the course topics, we will use the extensive resources at the "Teach Astronomy" web site instead of a textbook (go to http://www.teachastronomy.com), which has 400 articles written by your professor that cover the subject matter of the class. To request images for the final project, we will use the MicroObservatory robotic telescope network (the telescope controls are at http://mo-www.harvard.edu/cgi-bin/OWN/Own.pl). The last web site you will need is for the citizen science project we will be participating in during our unit on galaxies (found at http://www.galaxyzoo.org).

Two items are required for this class: Lecture-Tutorials for Introductory Astronomy, 3rd edition ($35 to buy it or $23 to rent it from Amazon, at http://www.amazon.com/Lecture-Tutorials-Introductory-Astronomy-3rd-Edition/dp/0321820460, or $41 from the publisher at http://www.pearsonhighered.com/educator/product/Lecture-Tutorials-for-Introductory-Astronomy/9780321820464.page). You will also need (and may already have) a classroom response device, the Turning Technologies ResponseCard NXT, $54 new or $40 used from the UA Bookstore (http://uits.arizona.edu/services/classroom-response-devices).

Structure and Grades

There are no in-class lectures, so you will watch video lectures online using D2L, doing this ahead of time to be ready for the following week's activities. Each week there will be ***two*** graded D2L quizzes. The first is based on video lectures for the week. This quiz must be completed before 11am Tuesday. Class on Tuesday begins with a writing assignment and then consists of in-class worksheets that are completed in groups to help you make sense of the lecture videos and prepare you for Thursday's in-class activity. Thursdays will be dedicated to in-class activities to help you master the concepts of the week's major topics. These group activities will be handed in and graded with everyone in a group given the same score. The final assignment each week is a Summary graded quiz, completed by 11pm Sunday. There is a semester-long project, described separately below. Note: three Tuesday classes will meet in the Flandrau Planetarium. ***There are no exams or final.***

Grades are on a standard scale, with 90-100% an A, 80-90% a B, 70-80% a C, 60-70% a D, and below 60% a failing grade. This is absolute grading, so there will not be a curve and you're not competing with anyone else for your grade. Different categories of work will have similar mean scores. No late work will be accepted without a prior justification. You're welcome to appeal or query a score on any item but it must be done within a week of the score being posted on D2L.

There are **no make-ups** for individual assignments in this class but for both types of online quizzes only the highest 12 out of 14 scores will be used in the grade (where not doing a quiz counts as a zero). All in-class writing and group activities will be counted so if you don't come to class your grade will be adversely affected. On Tuesdays, we will use the classroom response devices, or "clickers" for you to answer questions about material from the course. Those responses are not graded, but your participation will be measured because you will register your clicker in D2L. Up to an extra 2% will be added to your grade if you come to class every Tuesday and participate fully; a fraction of that 2% will be added based on the proportion of questions you answer over the semester. Given this and the importance of the Thursday activities, the message is: **come to class!** There will be an online Science Literacy survey early in the semester that will count as 1% extra credit if you complete it; the survey is not graded. The contribution of different types of work to the final course grade is:

Type of Work	*Total #*	*When Due*	*Total %*
Video Quizzes Online	14	Tuesday by 11am	10%
Writing Assignment	14	Tuesdays in-class	10%
Group Activity Worksheets	14	Thursdays in-class	40%
Summary Quizzes Online	14	Sunday by 11pm	10%
Observing Project	1	Various (see next page)	30%
Clicker Participation Extra Credit	Many Q's	Tuesdays in class	2%
Extra Credit Online Survey	1	Early in the semester	1%

Things to remember about how to do well in the class:

- Come to class. If you miss more than a few classes, your grade will suffer.
- This is not a traditional lecture class, you will be actively involved throughout.
- Put in a consistent effort, this is not a class where you can catch up at the end.
- Stay on top of the video lectures and meet the deadlines for the online quizzes.
- Work efficiently and equitably in your group for all of the Thursday activities.
- Pay attention to the observing project, the largest component of the grade.
- The professor, TA, and preceptors are available, so get help if you need it!

Observing Project

The observing project is a semester-long final project that takes the place of a final exam. The goal is to produce a paper and then a scientific poster that will be presented to your fellow students on the last day of class and during the schedule time of the final.

1. The first component is an observing proposal describing the object you will observe and a description of why the object is significant or interesting (by Feb 10).
2. Next is submission of the image you requested from MicroObservatory (by Feb 26).
3. The third is a short draft paper about your object, including a description, history, and its significance (by April 7).
4. Then you will work that into a five-page final paper that discusses your object in more detail, with references or citations (by April 21).

To help you develop your paper, and for a small component of the project grade, you will complete two online "information literacy" tutorials hosted by the UA Library. The culmination of the project is when you present it to the class, in poster form, just as at a scientific conference. This will happen on the last day of class and, since there is no final, we'll also use the time set aside for that for poster presentations: Monday, May 11, 3:30-5:30pm in our classroom, ILC 140.

Conduct

Please do not eat, drink, carry on conversations, use cellphones, surf the Internet, or read newspapers in class. UA policy (see http://deanofstudents.arizona.edu/academicintegrity) prohibits all forms of academic dishonesty, including cheating, plagiarism, and fabrication; all students should be familiar with it and follow it in this class. Behavior is also governed by UofA policy (see http://deanofstudents.arizona.edu/disruptiveandthreateningstudents). When you sign an activity on Thursday, you are stating that you were actually there for the whole activity. Each observing project should be unique and done individually. We will use Turnitin.com within D2L to check for plagiarism in any work you submit online. If you need disability-related accommodations register and let me know (http://drc.arizona.edu).

Class Schedule

Week	Date	Topic	Assignments
1	Thurs. Jan. 15	Introductions and course overview	Get familiar with course in D2L
2	Tues. Jan. 20	History of Science I: Scientific Method	Video Quiz 1, In-Class Writing
	Thurs. Jan. 22		In-class activity, Summary Quiz 1
3	Tues. Jan. 27	History of Science II: Night Sky ***(class in Flandrau)***	Video Quiz 2, In-Class Writing
	Thurs. Jan. 29		In-class activity, Summary Quiz 2
4	Tues. Feb. 3	Modern Telescopes	Video Quiz 3, In-Class Writing
	Thurs. Feb. 5		In-class activity, Summary Quiz 3
5	Tues. Feb. 10	Atoms and Radiation	Video Quiz 4, In-Class Writing Project Observing Proposal Due
	Thurs. Feb. 12		In-class activity, Summary Quiz 4
6	Tues. Feb. 17	Matter and Gravity	Video Quiz 5, In-Class Writing
	Thurs. Feb. 19		In-class activity, Summary Quiz 5
7	Tues. Feb. 24	Solar System ***(class in Flandrau)***	Video Quiz 6, In-Class Writing
	Thurs. Feb. 26		In-class activity, Summary Quiz 6 Project Image Due
8	Tues. Mar. 3	Exoplanets	Video Quiz 7, In-Class Writing
	Thurs. Mar. 5		In-class activity, Summary Quiz 7
9	Tues. Jan. 10	Stars I: Stellar Evolution	Video Quiz 8, In-Class Writing
	Thurs. Mar. 12		In-class activity, Summary Quiz 8
	Mar. 14-23	**SPRING BREAK**	
10	Tues. Mar. 24	Stars II: Endpoints of Stellar Evolution	Video Quiz 9, In-Class Writing
	Thurs. Mar. 26		In-class activity, Summary Quiz 9
11	Tues. Mar. 31	Galaxies I ***(class in Flandrau)***	Video Quiz 10, In-Class Writing
	Thurs. Apr. 2		In-class activity, Summary Quiz 10
12	Tues. Apr. 7	Galaxy II: Large Scale Structure of the Universe	Video Quiz 11, In-Class Writing Project Draft Paper Due

	Thurs. Apr. 9		In-class activity, Summary Quiz 11
13	Tues. Apr. 14	Expansion and Big Bang	Video Quiz 12, In-Class Writing
	Thurs. Apr. 16		In-class activity, Summary Quiz 12
14	Tues. Apr. 21	Life on Earth and Evolution of Earth	Video Quiz 13, In-Class Writing Project Final Paper Due
	Thurs. Apr. 23		In-class activity, Summary Quiz 13
15	Tues. Apr. 28	Life in the Universe	Video Quiz 14, In-Class Writing
	Thurs. Apr. 30		In-class activity, Summary Quiz 14
16	Tues. May. 5	Final Projects – presentation of posters	Final posters due in D2L
FINAL EXAM	Mon. May 11 3:30-5:30	Final Project – presentation of posters (NOTE: during the final exam time slot)	

ENJOY THE CLASS!