

ASTR1040-010 Accelerated Introductory Astronomy 2

Fall 2019

TuTh 9:30am - 10:45am, Duane G125

Recitation Sessions: Tu 12:00 - 12:50pm, Tu 1:00 - 1:50pm, W 1:00 - 1:50pm
Duane D142

Evening help sessions (optional): 9/11, 9/25, 10/23, 11/20, 12/13
6:00 – 8:00pm, Room TBD

Prof. Mark Rast: Laboratory for Atmospheric and Space Physics (LASP)
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 Office Hours: TuTh 11:30am – 2:30pm or readily by appointment
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Ms. Adalyn Fyhrie (Teaching Assistant):
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 Office Hours: Tu 3:00 – 4:00pm,
 Duane D220 (the Astronomy Help Room)
 or readily by appointment
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ASTR-1040 (4) Accelerated Introductory Astronomy 2

Covers principles of modern astronomy summarizing our present knowledge about the Sun, stars, birth and death of stars, neutron stars, black holes, galaxies, quasars, and the organization and origins of the universe. May require nighttime observing sessions at Sommers-Bausch Observatory. Required in ASTR major/minor. Includes a recitation. Students may receive credit for only one of ASTR 1020, 1040, 1200, or 1120. Similar to ASTR 1020 and 1200 but taught at a higher intellectual level including a significant amount of quantitative analysis. Approved for GT-SC2. Approved for arts and sciences core curriculum: natural science.

Prerequisites: Requires prerequisite course of ASTR 1010 or ASTR 1030 and MATH 1300 or APPM 1350 or APPM 1340 and APPM 1345 (all minimum grade C-). If you do not meet these requirements please come and speak with me right away.

Important Dates:

August 27: First day of class
September 11: Optional evening (6 – 8pm) math/physics help session, Room TBD
September 11: Last day to drop a course without tuition/fee charges and without W grade
September 24, 25: Recitation sessions meet in Fiske planetarium (no late arrivals)
September 25: Optional evening (6 – 8pm) review session for first midterm exam, TBD
September 26: First MIDTERM exam
October 22, 23: Recitation sessions meet in Fiske planetarium (no late arrivals)
October 23: Optional evening (6 – 8pm) review session for second midterm exam, TBD
October 24: Second MIDTERM exam
November 19, 20: Recitation sessions meet in Fiske planetarium (no late arrivals)
November 20: Optional evening (6 – 8pm) review session for third midterm exam, TBD
November 21: Third MIDTERM exam
December 12: Last day of class. Homework D/N due.
December 13: Optional evening (6 – 8pm) review for final exam, Duane TBD
December 14: FINAL exam (comprehensive) 1:30 – 4:00pm, Duane G125

Course web pages are accessible via Canvas (<https://canvas.colorado.edu>).

There you will find copies of this syllabus, the lecture slides (posted *after* each lecture), homework assignments, homework solutions and grades.

Course Goals:

- Prepare you for major/minor studies in astronomy/astrophysics.
- Understand *how* we know what we know about the universe.
- Gain knowledge and appreciation of the physical universe, and understand what the current limits to our understanding are.
- Learn critical thinking skills: learn to think, reason, and argue scientifically, using logic, observation, and evidence.

Course Description: This course is taught in three sections. The first focuses on the properties of time, space, light and atoms, and discuss how telescopes are used to observe astronomical objects. The second looks at the Sun as a typical star, easy to observe in detail because of its proximity, and other stars and their evolution. We study how stars form out of interstellar matter and what happens to them late in life (supernovae, white dwarfs, neutron stars, and black holes). Finally, in the third section, we study the vast groupings of stars into galaxies, the properties of spiral and elliptical galaxies and exotic objects like quasars, and the clustering of galaxies into large groups. This leads us directly to the study of the large-scale structure of the universe and cosmology. The universe is an astonishingly beautiful place. The more one understands about how it works the more breathtaking it is. Equally astonishing, perhaps, is how we have come to know the things that we know about the universe, and how much more there remains yet to be discovered.

Class Format: Informal. Clickers and demos will be used to stimulate discussion and interactivity. I encourage you to voice your ideas and questions in class, and/or send them to me for “Daily Mail” (mark.rast@lasp.colorado.edu).

Textbooks: *The Cosmic Perspective*, 9th Edition, Bennett, Donahue, Schneider, and Voit (required). Many assignments will use the resources provided on the web site <http://www.masteringastronomy.com>. You must create your own personal account. The class ID is **ASTR1040010FALL2019**. Run the introductory tutorial (under “Assignment List”) and be sure you understand how the interface works. Also note that there are excellent tutorials, end of chapter quizzes, and other helpful material in the study area of this site. An *Introduction to Modern Astrophysics*, 2nd Edition, Carroll and Ostlie is on 24 hour reserve at Norlin library, and is especial helpful for Parts C of the homework assignments.

Clickers: A student response system is required for this course. Clicker questions will be a regular part of this course and contribute to your overall grade. Clicker questions will receive *0pts for no answer, 1pt for an incorrect answer, and 2pts a correct answer*. Discussion with your neighbor when answering clicker questions is *strongly encouraged*. Debate with others improves your understanding. Your worst four days of clicker score will be dropped. This will allow for missed class due to illness, family emergency, etc. You must register your clicker. Clicker (and other OIT) tutorials: <http://www.colorado.edu/oit/tutorial>.

NOTE: Using someone else’s clicker or using two clickers at the same time is a violation of the CU Honor Code.

Course Schedule (tentative): The course aims to cover the following topics:

| | <u><i>The Cosmic Perspective</i></u> |
|--|--------------------------------------|
| 1. The astronomical perspective | Chapters 1, 2.1 |
| 2. Mass and energy, light and atoms | Chapters 4, 5, S2 |
| 3. Telescopes | Chapter 6 |
| 4. The Sun – our star | Chapter 14 |
| 5. Stars – birth and evolution | Chapters 15, 16, 17 |
| 6. Supernovae, black holes, and relativity | Chapters 18, S3 |
| 7. The Milky Way galaxy | Chapter 19 |
| 8. Other galaxies and galaxy evolution | Chapters 20, 21 |
| 9. Dark matter, dark energy | Chapter 23 |
| 10. Large scale structure and cosmology | Chapter 22, S4 |

Exams and Grading: The amount you learn in this class depends on how much thought and practice you put into it and how that effort is distributed over the term. An estimated 8 – 12 hours/week of reading, study, and homework outside of class is essential. Reading *before* the lecture covering the material is strongly advised.

Your grade will be based on the following:

- 35% comprehensive final exam (December 14th, 1:30 – 4:00 pm)
- 40% best two of three midterm exams (September 26th, October 24th, November 21st)
- 20% written and online homework (lowest two grades dropped)
- 5% lecture clicker questions (lowest 4 daily grades dropped)

Homework (both written and online elements) will be due at the beginning of class on the due date. You are *encouraged* to exchange ideas and work together on your homework, but the final product *must* be your own work. If you collaborated, indicated

names of partners on your homework assignment. No late homework assignments will be accepted. Your two lowest homework scores (except for Homework D/N, which you must complete) will be dropped without penalty.

No make-up midterm exams will be given. If you know in advance that you will miss two or more midterm dates or the final exam date for any legitimate reason (religious observance, school sanctioned trip, scheduled surgery, etc.) you must make arrangements with me at least one week before the first midterm exam (end of class September 19th). Exam absence, beyond the single dropped midterm exam, will be excused only for a very good reason (such as a verifiable illness or emergency) and only when confirmed, *in writing*, not later than one week after the absence. *There will be no makeup exams.*

Homework D/N: In addition to the weekly homework, you will be required to complete one additional assignment, “Homework D/N,” outside of class. *This homework cannot be dropped.* Homework D/N consists of *one* of the following

1. Attend an observing night at Sommers-Bausch Observatory and turn in nighttime observing logs for 2 deep sky objects. Print the observing log from Canvas and bring it to the observing session. You will look at the objects both through the telescope eyepiece and using a CCD detector. Following the observations, write-up your observations as described on the observation log. Include information in your write-up that connects with physical/astrophysical processes discussed in class.
2. Attend a public lecture on a *Stars and Galaxies* related topic and write a 2-page summary of the lecture (when, where, what, why interesting, how it related to what you have learned in class).
3. Write a 2-page summary of a recent *Stars and Galaxies* related astronomy news item. Include reference to the article, summary of its content, and how it relates to what you have learned in class.
4. Present (10 minutes) a mailbox item on a subject of relevance at the beginning of class. This will be explained in more detail in class as the semester progresses.

Homework D/N is DUE on the last day of classes, December 12th. Do not wait until the end of the semester to sign up for observing, attend a public lecture, find a current news item or give a mailbox presentation. DO THIS EARLY.

If you choose to attend an observing night, the Sommers-Bausch Observatory (SBO) has been reserved for the exclusive use of ASTR1040 at the dates and times below. You will need to arrive at the date/times below.

| DAY | DATE | START | MOON |
|-------|---------|--------|-------------------------|
| Tues | Sept 3 | 9:00pm | 21%, set 22:28 |
| Thurs | Sept 19 | 8:30pm | 77%, rise 22:14 |
| Tues | Sept 24 | 8:30pm | 27%, set 16:42 |
| Thurs | Oct 3 | 8:30pm | 26%, set 22:22 |
| Thurs | Oct 10 | 8:00pm | 89%, rise 17:31, bright |
| Tues | Oct 29 | 8:00pm | 2%, set 19:29, dark |
| Mon | Nov 18 | 7:30pm | 68%, rise 22:31 |
| Tues | Dec 3 | 7:30pm | 41%, set 23:29 |

Academic Honor Code: Honor is about integrity, ethical conduct, and pride in academic achievement and individual responsibility. Cultivating honor lays the foundation for lifelong integrity, developing in each of us the courage and insight to make difficult choices and accept responsibility for actions and their consequences, even at personal cost. The primary goal of this class is for you to learn, and cheating undermines that primary goal. **If you find yourself under circumstances or pressures that cause you to consider cheating, please come talk to me before doing so.**

***University life can be very stressful:**

**Need to talk?
Worried about a friend?
Call CAPS!**

**303-492-2277
(24/7 support)**

**Every fee paying student is
eligible for help from CAPS**

Contact Us

☎ 303-492-2277 (24/7 support)

CAPS Main Office

Fall hours

- Monday - Thursday: 8 a.m. to 6 p.m.
- Friday: 8 a.m. to 5 p.m.

Walk-in hours

- Monday - Friday: 10 a.m. to 4 p.m.

📍 Center for Community, Suite N352

Some important campus-wide policies:

Disabilities:

If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and <http://www.Colorado.EDU/disabilityservices>

Religious observance:

Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. For this class, I ask that you look at the calendar over the next few days and tell me by Thursday of next week (26 January 2012) or as soon as possible if you anticipate conflicting religious obligations for any scheduled class date or the day preceding (which would impact performance on the following day), so that together we can arrange accommodations well in advance of any potential impact. See full details at http://www.colorado.edu/policies/fac_relig.html.