

PC 133: Astronomy – Block 8, 2015–16

Course website: <https://canvas.coloradocollege.edu/courses/15431>

Welcome to our introductory course to Astronomy! The course covers physical phenomena across the widest range of physical sizes possible, from the atomic creation of spectral lines to the expansion of the Universe. By the end of this course you will know about the movement of stars and planets in the heavens, our solar system, the formation and evolution of stars, and galaxies throughout cosmic time.

This course requires basic knowledge of algebra and geometry, but no calculus or previous physics. We will review some math concepts in class, but students are responsible for seeking out help from the instructor or the Quantitative Reasoning Center (QRC) if needed.

The goal of this course is to understand, not memorize. Any formulae or facts you need on quizzes and exams will be provided, but it is your responsibility to apply those formulae appropriately.

STAFF

Natalie Gosnell – lecture

Email: natalie.gosnell@coloradocollege.edu

Phone: 303-513-7288 (cell)

Office: Barnes 221

Dimitri Klebe – lab

Email: Dimitri.Klebe@coloradocollege.edu

Zoe Pieratt – Learning Assistant

Email: Zoe.Pieratt@coloradocollege.edu

TEXTBOOK

The book for this course is *Astronomy: A Beginner's Guide to the Universe*, 7th edition, by Chaisson and McMillan (ISBN-13: 978-0-321-81535-4). You may purchase the book from the CC bookstore or from other sources. You do not need access to any online materials.

A note on the edition: Astronomy is a dynamic scientific field, with major discoveries continually changing our understanding of the Universe. The 7th edition is several years old, and therefore does not include some recent exciting results. The newest edition is only months old, though, and so there are no used copies available. Due to the ever-increasing cost of textbooks, I've opted to use the older edition with more economically-priced used copies available online. I will augment the material when necessary to include great discoveries that occurred since the publication of our edition.

You may find the (free) planetarium software Stellarium to be helpful for placing astrophysical objects into context. You can download it here: <http://www.stellarium.org/>

CLASS MEETINGS

Our class will meet daily from 9:00am–12:00pm in Olin 270A. We will always have a 15-minute mid-morning break. Class meetings will include some lecture as well as in-class activities and demonstrations intended to aid your understanding of the material.

READING AND HOMEWORK ASSIGNMENTS

Reading and homework problems are assigned every day, with the assigned reading completed before the start of class (i.e. the reading for Tuesday should be completed before 9am on Tuesday). Make the most of the reading by treating it as an interactive endeavor. Complete the “Concept Check” questions throughout each chapter to check your understanding (the answers are in the back of the textbook). You must take ownership for learning the material, as lecture alone cannot cover every topic included in this course.

Assigned homework problems will not be collected daily. This gives you flexibility to complete the problems on a schedule that best enhances your own learning. Four “Problems” (randomly selected) will be graded from each set you turn in, but you are expected to complete every Problem assigned. The assignments also include “Review and Discussion” and “Conceptual Self-Test” questions. These are not required, but you are *strongly encouraged* to complete these questions as well. Unless you make previous arrangements, you must turn in the homework when it is due. The block plan moves too quickly to accept late assignments.

Problems will be graded accordingly to the following scale:

0 (0%) = little to no effort, or a completely wrong answer indicating a complete lack of understanding

1 (70%) = some effort but the answer is substantially wrong or missing important concepts, indicating a lack of understanding of the material

2 (85%) = a good answer, substantially correct and indicating a substantial effort and understanding of the material

3 (100%) = a fully correct answer, indicating a thorough understanding of all concepts

Your learning will be often be enhanced by working with a partner or in a group on the assigned problems. You are encouraged to this; however, be sure that at the end of group session you understand the problems and your write-up is entirely your own. While doing homework you may not consult solution sets obtained from any source.

Homework solutions will be posted online after each due date.

IN-CLASS ACTIVITIES

Class sessions will include a variety of activities including worksheets, problems, and group activities. Your performance and/or participation in these activities will collectively be worth 15% of your grade. There are no make-up opportunities for in-class activities. If you miss class you will receive no credit for the activity that day. The single lowest grade for in-class activities will be dropped from calculating this portion of your grade.

TEST AND FINAL EXAM

There are two “midterm” exams on the 2nd and 3rd Mondays each worth 20% of your grade, and a final exam on the last Wednesday worth 30% of your grade. The final exam will be comprehensive. We will give you credit for learning throughout the course; your final exam score will replace any and all midterm exam grades that are lower.

There are no makeup exams. Except under dire circumstances, if you miss the final exam you will fail the course.

All tests are closed book. You may use a calculator and a provided reference sheet. We will provide any formulae or unit conversions needed to complete the exam. I will be available in my office for the duration of the exam if you have any questions, although I reserve the right to not answer your question (or instead ask you a leading question in response).

LABS

The goals of the laboratory portion of this course are to:

- explore how we know what we know and how the scientific method works;
- give you direct experience observing astronomical objects and analyzing your observations;
- give you the opportunity to develop your quantitative reasoning skills.

You will each attend six lab sessions during the block. Each lab will be offered twice; you will have to sign up for lab times to ensure labs do not become too crowded. Labs will begin at 8:30pm and will, on average, take about 90 minutes from start to finish. The specific labs on a given day will depend on the weather. All labs will begin (cloudy or clear) in the classroom. Observation labs will then proceed upstairs to the Barnes observation deck and observatory on the fifth floor. Computer labs will proceed to the Barnes PC Lab on the west end of the main floor. If you have a personal laptop, download the free planetarium software “Stellarium” (<http://www.stellarium.org/>) to have available for all observing labs. Make sure that your lab group has at least one laptop with Stellarium installed.

There is no percentage of your grade that corresponds to labs, but **you must complete all six labs in order to pass the course.**

HONOR CODE

Science is a social enterprise, and we encourage you to work with your peers on homework, in-class activities, labs, studying for exams, etc. For your homework assignments, you should, however, be certain that you have your own understanding of every problem assigned and the problem write-ups should be entirely your own. Using homework solutions obtained from any source is not permitted. For in-class activities, although you will work in groups, the final write-up should be entirely your own. Lab checkouts will be done in pairs/groups, but the lab instructor will make sure each student understands the lab.

As evidence of your commitment to the Honor Code please write “Honor Code upheld” and sign your name on all exams.

It is the student's responsibility to clarify any situation not explicitly addressed here. If you encounter a situation not covered, assume it is inappropriate until you ask the instructor and are explicitly told otherwise. Suspected honor code violations will be referred to the Honor Council without exception.

DISABILITY ACCOMMODATIONS

If you experience any kind of disability, whether apparent or non-apparent, learning, physical, or cognitive, and you need some accommodations in this course please feel free to speak with me privately as soon as possible to discuss reasonable accommodations for your access needs. Given the pace of the block plan, retroactive accommodations are often impossible. If you have not already done so, please register with Accessibility Services (Armstrong 211, 719-227-8285), the office responsible for coordinating accommodations and services for students with disabilities.

TUTORING SERVICES

The Quantitative Reasoning Center (QRC) employs students with quantitative backgrounds, including physics majors, as tutors. They provide drop-in tutoring as well as one-on-one tutoring and group problem-solving sessions. This course has an assigned Learning Assistant with a specific expertise in astronomy and is available for tutoring and review sessions. Students interested in tutoring should contact the LA directly. Learn more about the QRC here: <https://www.coloradocollege.edu/offices/colketcenter/qrc/>

COURSE GRADE

Your grade will be computed using the following formula:

Homework: 15%

In-class activities: 15%

Midterm exams: 20% each (40% total)

Final exam: 30%

Successful completion of all six labs is mandatory to pass the course. The lowest in-class activity grade will not be included. The final exam grade will replace any lower midterm exam grade(s).

SCHEDULE

R&D: Review and Discussion, *CST*: Conceptual Self-Test, *P*: Problems

“*P*” questions are **required**. You are *strongly encouraged* to complete the “*R&D*” and “*CST*” questions, but they will not be graded.

	Reading	HW Assignment	Other
Week 1			
Mon 4/18	Charting the Heavens: Ch 0	<i>R&D</i> : 6, 9; <i>CST</i> : 2, 9, 10, 11; <i>P</i> : 1, 4, 5, 9, 10	Lab 1, 8:30pm
Tues 4/19	Copernican Revolution: Ch 1	<i>R&D</i> : 14, 15; <i>CST</i> : 6, 13, 15; <i>P</i> : 1, 4, 6, 7, 8	Lab 1, 8:30pm Astro Ambassador #1
Wed 4/20	Light and telescopes: Ch 2, Ch 3	(Ch 2) <i>R&D</i> : 1; <i>CST</i> : 4, 9, 12; <i>P</i> : 1, 4, 6, 9, 10 ; (Ch 3) <i>P</i> : 3, 5	Lab 2, 8:30pm HW days 1–2 due at 5pm
Thurs 4/21	Earth and terrestrial planets: Ch 5.1–3, 5.6–8; 6.1–5, 6.8, Water on Mars: S1	(Ch 5) <i>R&D</i> : 4, 5; <i>CST</i> : 12; <i>P</i> : 2, 4 (Ch 6) <i>R&D</i> : 12; <i>CST</i> : 13; <i>P</i> : 1, 2, 3, 10	Lab 2, 8:30pm
Fri 4/22	Jovian planets and exoplanets: Ch 7 and Ch 4.4, Exoplanet Detection: S2	(Ch 7) <i>R&D</i> : 5, 10, 15; <i>CST</i> : 7, 13; <i>P</i> : 1, 2, 3, 8, 10	HW days 3–5 due at 5pm Visiting speaker: Jim Paradise (Lockheed Martin, NASA representative)
Week 2			
Mon 4/25	None	None	EXAM Lab 3, 8:30pm
Tues 4/26	The Sun: Ch 9	<i>R&D</i> : 4, 12; <i>CST</i> : 3, 10, 14; <i>P</i> : 2, 6, 8, 9	Lab 3, 8:30pm Astro Ambassador #2
Wed 4/27	Measuring the Stars: Ch 10	<i>R&D</i> : 10, 15; <i>CST</i> : 5, 9, 10; <i>P</i> : 2, 3, 4, 9, 10	Lab 4, 8:30pm
Thurs 4/28	The Interstellar Medium and star formation: Ch 11	<i>R&D</i> : 12, 13; <i>CST</i> : 3, 10, 12; <i>P</i> : 3, 4, 7, 9, 10	Lab 4, 8:30pm
Fri 4/29	Stellar evolution: Ch 12; 13.1–2, 13.5–6, Grav Waves: S3 , video	(Ch 12) <i>R&D</i> : 2, 10; <i>CST</i> : 8, 12, 14; <i>P</i> : 3, 5, 8 (Ch 13) <i>R&D</i> : 9; <i>P</i> : 4, 7	HW due at 5pm
Week 3			
Mon 5/2	None	None	EXAM Lab 5, 8:30pm
Tues 5/3	The Milky Way Galaxy: Ch 14	<i>R&D</i> : 11, 13; <i>CST</i> : 2, 10, 13; <i>P</i> : 1, 3, 4, 5, 6	<i>Honors Convocation</i> Lab 5, 8:30pm Astro Ambassador #3
Wed 5/4	Normal and Active Galaxies: Ch 15	<i>R&D</i> : 3, 11; <i>CST</i> : 1, 8, 14; <i>P</i> : 2, 4, 5, 6, 8	Field trip?
Thurs 5/5	Galaxies and Dark Matter: Ch 16	<i>R&D</i> : 2, 9; <i>CST</i> : 2, 10, 13; <i>P</i> : 5, 6, 8, 9, 10	Field trip?
Fri 5/6	Cosmology: Ch 17	<i>R&D</i> : 5, 6, 11; <i>CST</i> : 9, 12; <i>P</i> : 4, 3, 5, 7, 10	HW due at 5pm
Week 4			
Mon 5/9	Life in the Universe: Ch 18	<i>R&D</i> : 7, 8, 14; <i>CST</i> : 9, 11, 14; <i>P</i> : 3, 7, 8, 10 ; Drake Equation Sheet	HW due at 5pm
Tues 5/10	Review session	None	
Wed 5/11	None	None	8:00am FINAL EXAM