

Astronomy 2291 – Basic Astrophysics & Planetary Astronomy

Autumn Semester 2016

Lectures: MWF, 12:40-1:35pm, 270 Journalism Building (JR270)

Professor: Richard Pogge

Office: 4059 McPherson Lab (292-0274)

Office Hours: Tues & Thurs 2:00-3:00pm or by appointment

E-Mail: pogge.1@osu.edu

Textbook: Ryden & Peterson, *Foundations of Astrophysics*

Course Web Page: Astronomy 2291 pages on [Carmen](#) (Canvas).

Course Objectives

Astronomy 2291 is the first semester of a two-semester introductory sequence designed for sophomore Astronomy and Astrophysics majors and minors, as well as for scientifically literate undergraduates who wish to learn basic astrophysics from a quantitative perspective. The major topics to be covered are (a) the historical development of modern astronomy, (b) the fundamentals of Newtonian gravity and optics as applied to astronomy, and (c) the structure and evolution of the Solar System.

To get the most from this class you should read the assignments in the book, attend and participate in lectures and class discussions and problem-solving sessions, and do the problem sets.

Problem Sets

Problem sets will be assigned at regular intervals, with a total of 4 assignments during the semester. Together they will count for 60% of your grade (10% per assignment). In general, **late homework will not be accepted for credit**, except with prior approval of the professor.

Examinations

There will be two closed-book, closed-notes in-class examinations scheduled for these dates:

Midterm Exam	Wednesday, October 12, in class
Final Exam	Thursday, December 15, 2:00-3:45pm

The midterm will cover topics from the first half of the class, and is worth 15% of the course grade. The final will be comprehensive and be worth 25% of the course grade. Combined the exams are worth 40% of your course grade.

Makeup exams will be allowed only under extraordinary circumstances such as severe illness or death of an immediate family member. If you know in advance that you will be out of town for an approved University activity, please contact the professor in advance to make alternative plans for taking the exam. Absences for medical emergencies will require a signed note from your physician. Absences to participate in approved University activities (teams, bands, ROTC, etc.) will require a signed letter from your coach, activity advisor, CO, etc. as appropriate.

However, if you miss the final exam, you will receive a failing grade unless you contact the professor by **5pm on Friday, December 16** and arrange for a make-up exam at the start of the Spring Semester. In the interim you will receive a grade of Incomplete until the make-up exam is graded.

Academic Integrity

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. To maintain the integrity of the academic process, we are adopting the following policies for this course:

- **Exams:** You must complete the midterm and final exams yourself, without any external help or communication, or use of unapproved sources. Exams will be closed-book, closed-notes. All physical constants and values you need shall be provided, you will be allowed use of a handheld scientific calculator (if using a calculator app on a smartphone, the phone must have all wireless functions disabled, i.e., “airplane mode”), and you may bring a single 8x11-inch sheet of paper with your own handwritten notes. Detailed instructions will be provided before each exam.
- **Homework Assignments:** Your written assignments, including any discussion posts, should be your own original work. In formal assignments, you should follow a clear and consistent style to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in, but no one else should revise or rewrite your work. While you are encouraged to work in study groups, even if an answer to a question is developed as a group, you must write the final answer down in your own words ("division of labor" is not permitted).
- **Reusing past work:** In general, you are prohibited in university courses from turning in work from a past class for your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with us first.
- **Fabricating research or results:** All work you undertake in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.
- **Collaboration and informal peer review:** The course will afford numerous opportunities for collaboration with your classmates. While study groups and peer-review of assignments is encouraged, remember that comparing answers on a quiz or assignment is not permitted. If you are unsure about a particular situation, please feel free to ask ahead of time.

Discussion & Communication Guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. Informality (including an occasional emoticon) is fine for non-academic topics only.
- **Tone and civility:** We seek to maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm or ironic statements that are often accompanied by facial expressions or gestures do not always come across as such to all persons.
- **Citing your sources:** When we have academic discussions, please cite your sources to support what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)

Academic Misconduct

It is the responsibility of the Committee on Academic Misconduct ([COAM](#)) to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct ([studentconduct.osu.edu](#)).

Classroom Etiquette

To help establish and maintain a courteous, respectful, and distraction-free learning environment in our classroom, I ask that everyone please observe these basic rules of classroom etiquette:

Use of cell phones and other wireless 2-way communication devices is prohibited.

During class, all cell phones and wireless 2-way communications devices must be **turned off and put away** (i.e., not in "silent ring" mode).

Use of Wireless Laptops, tablets, smart phones, or other networked devices is restricted to in-class exercises or note-taking.

During class, all laptops, tablets (iPads, etc.), smart phones, and all other wireless networked devices must be **turned off and put away unless performing a class-specific task**. If you require the use of assistive technologies for hearing or vision impairment, please contact the professor to make the necessary technical arrangements (e.g., AC power, clear sight-lines, etc.)

General Education Learning Goals and Outcomes

Goals:

Students understand the principles, theories, and methods of modern science, the relationship between science and technology, the implications of scientific discoveries and the potential of science and technology to address problems of the contemporary world.

Expected Learning Outcomes:

1. Students understand the basic facts, principles, theories and methods of modern science.
2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.
3. Students describe the inter-dependence of scientific and technological developments.
4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

Astronomy 2291 will meet these expected outcomes by:

1. Investigating the basic facts, principles, theories, and methods of modern science as practiced in the field of astrophysics.
2. Learning about the basic observations of the natural world that establish our empirical basis for the study of astrophysics.
3. Providing instruction in the problem-solving tools and approaches that integrate our application of the laws of physics with astrophysical situations revealed by observations.
4. Explaining the role that modern technology plays in our investigation of the universe, and how we obtained quantitative measurements of astronomical objects.

Topical Outline

The following topics will be covered in this class, by week. Readings are sections in the required textbook.

- Week 1 (8/24-26): Ptolemy, Copernicus, Galileo, & Kepler (§2.1–2.5)
- Week 2 (8/29-9/2): Proof of Earth's Motion, Newton's form of Kepler's Laws (§2.6 & 3.1)
- Week 3 (9/7-9): Orbital Mechanics (§3.2-4 + handout)
- Week 4 (9/12-16): Precession, Tides (§4.1-4.3 + handout)
- Week 5 (9/19-23): Atomic Structure & Processes, Distribution Functions (§5.1-5.3)
- Week 6 (9/26-30): Radiative Transfer, LTE, Blackbody Radiation (§5.4-5.7)
- Week 7: (10/3-7): Telescopes, Observatories, Detectors (§6.1-6.4, 6.7 + handout)
- Week 8: (10/10-12): Photon Detection (§6.5 + handout) – Autumn Break 10/14
- Week 9: (10/17-21): Solar System Overview (§8.1-8.3, §12.1)
- Week 10: (10/24-28): Earth as a Planet (§9.1-9.3)
- Week 11: (10/31-11/4): The Moon, Terrestrial & Jovian Planets (§9.4-9.5, §10.1-10.2)
- Week 12: (11/7-9): Giant Moons & Planetary Rings (§10.2-10.3)
- Week 13: (11/14-18): Asteroids, TNOs, & Pluto (§11.1-11.2 + handout)
- Week 14: (11/21): Comets, Meteoroids, & Dust (§11.3-11.4) – Thanksgiving Break 11/23-25
- Week 15: (11/28-12/2): Exoplanet detection (§12.3 + handouts)
- Week 16: (12/5-7): Exoplanet properties & Habitability (§12.4 + handouts)

Students with Disabilities

Students with disabilities that have been certified by Office of Student Life Disability Services (SLDS) will be appropriately accommodated and should inform the instructor as soon as possible of their needs. SLDS is located in room 098 Baker Hall, 113 West 12th Avenue; Phone: 292-3307, VRS: 429-1334; (ods.osu.edu). We will rely on SLDS to verify the need for accommodation and work with them to develop appropriate strategies. Students with disabilities who have not previously contacted SLDS are encouraged to do so by visiting the SLDS website and requesting an appointment. Please take care of this well in advance of the exams, as processing the paperwork takes time.