Astronomy 3019: Astronomy & Astrophysics 2

Course Dates for Spring 2024:
January 8 – April 24

Lecture Times and Locations:
Mondays, Wednesdays and Fridays: 3:00 PM – 3:50 PM(8) in LIT 0121

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Course Website:	Canvas/E-Learning

Textbook: You must purchase the required text, *Foundations of Astrophysics*, by Ryden and Peterson (https://www.cambridge.org/us/academic/subjects/physics/astrophysics/foundations-astrophysics?format=AR), which is available in hardback (ISBN 978-1-108-83195-6) or ebook (ISBN 978-1-108-935-012-9). This is the same text used for AST3018: Astronomy and Astrophysics 1. Other references may be used for supplemental information throughout the course.

Brief Description: This is an introductory course in Astronomy and Astrophysics designed for students majoring in astronomy, physics, math, or engineering. This course pairs with AST 3018, discussing about half of the major topics in astronomy. While the other course focuses on stellar astrophysics and the interstellar medium, this course primarily focuses on planetary science, relativistic phenomena, Galactic and extragalactic astrophysics, and cosmology.

General Education Course Description

AST 3018 & 3019 are GenEd physical science (P) courses.

Physical science courses provide instruction in the basic concepts, theories and terms of the scientific method in the context of the physical sciences. Courses focus on major scientific developments and their impacts on society, science and the environment, and the relevant processes that govern physical systems. Students will formulate empirically-testable hypotheses derived from the study of physical processes, apply logical reasoning skills through scientific criticism and argument, and apply techniques of discovery and critical thinking to evaluate outcomes of experiments.

A minimum grade of "C" is required for general education credit.

As the list of topics above demonstrates, the course covers not only the Universe and the bodies in it – planets, moon, stars, galaxies, etc. – but also how we know about those things, making use of our understanding of the underlying physics of orbits and radiation. The course will focus on major scientific developments in astronomy & astrophysics and their impacts on society and the environment.

The **Student Learning Outcomes** for a GenEd physical science course in astronomy:

I. Content — assessed through all graded categories below

- Know the basic concepts, theories, and terminology of natural science and the scientific method in astronomy.
- Know the major scientific developments in astronomy and the impacts on society and the environment.
- Know relevant processes that govern physical systems in astronomy.

II. Critical Thinking — assessed through all graded categories below

- Formulate empirically-testable hypotheses derived from the study of physical processes in astronomy.
- Apply logical reasoning skills effectively through scientific criticism and argument in astronomy.
- Apply techniques of discovery and critical thinking effectively to solve experiments and to evaluate outcomes.

III. Communication — assessed through the class project, a data analysis project with a writeup

- Communicate scientific findings clearly and effectively using oral, written, and/or graphic forms.
- Write effectively in several forms, such as in research papers and laboratory reports.

Detailed Description of the Graded Course Structure

Worksheets: Worksheets will be assigned during most classes to give you an opportunity to review the material and give the instructor the opportunity to check your comprehension of the material. Worksheets typically will be due at the end of the class they are assigned and are not accepted late. Class participation is expected and will greatly help you complete this work.

The number and frequency of these assignments is at the discretion of the instructor. The lowest few (depending on the total number given) will be dropped or counted as extra credit for your final grade (this action is completed at the very end and does not show up in the Canvas gradebook). Given this lenient policy, please do not contact the instructor to make up this work unless you have a serious ongoing problem, which should be an excused absence consistent with university policy: **https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/**.

Homeworks: Problem sets will be regularly assigned throughout the semester. Late homework may be penalized up to 10% per day; exception: when answers must be posted promptly for exam studying, no late homework after that point will be accepted. The assignment with the lowest grade will be dropped.

Working in groups is allowed for homeworks and (usually strongly encouraged) for worksheets, although if you do, discuss the problem/solution and then write your own answers without looking at the other students' paper; also write the names of the people you worked with on the submitted homework. Each student is required to show all work and submit separate homework solutions. No emailed work.

Exams: There will be one midterm exam and a final exam, both taken in the normal classroom. The midterm exam will cover material from approximately the first half of the class (topics/chapters will be provided when appropriate) and the final exam will primarily cover material after the midterm exam. The midterm exam will be during normal class time about halfway through the semester. The final exam is scheduled for 5/2/2024 at 3:00 PM – 5:00 PM. Bring a working scientific calculator without memory capability, at least two pencils (with erasers), and your ID with you to all exams.

Project: A handout and discussion to explain the project fully will be provided when appropriate. All guidelines including due dates will be provided in the handout.

Extra Credit: A handout and discussion to explain the extra credit options will be provided early in the semester. All guidelines including due dates will be provided in the handout.

Course Grade Summary Breakdown: Each of the components of class described above will be assigned the following weights to determine your final score:

- Worksheets: 15%
- Homeworks: 35%
- Midterm Exam: 15%
- Final Exam: 20%
- Project: 15%

Score	Grade	Score	Grade	Score	Grade
90% – 100%	A	77% – 79%	B−	64% – 66%	D+
87% – 89%	A−	74% – 76%	C+	60% – 63%	D
84% – 86%	B+	70% – 73%	C	57% – 59%	D−
80% – 83%	B	67% – 69%	C−	< 57%	E

Grading Scale: (https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx)

Class/University Policies

- Please put your phones and, unless you are taking notes, your laptops away during class: no Facebook, Twitter, texting, etc.
- You may need to make calculations, so you should always have available a scientific calculator in addition to your usual materials for taking notes.
- Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting disability.ufl.edu/students/get-started. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester. Classroom accommodations can only be provided after appropriate verification.
- Responsible citizenship among college students includes honesty and integrity in classwork; regard for the rights of others; and respect for local, state, and federal laws as well as campus standards. Students are responsible for understanding the standards of the "Code of Student Conduct" and the Student Handbook. From the Academic Honesty Guidelines and Student Conduct Code in the University of Florida Undergraduate Catalog: "Academic Honesty: The university requires all members of its community to be honest in all endeavors. A fundamental principle is that the whole process of learning and pursuit of knowledge are diminished by cheating, plagiarism, and other acts of academic dishonesty. In addition, every dishonest act in the academic environment affects other students adversely, from the skewing of the grading curve to giving unfair advantage for honors or for professional or graduate school admission. Therefore, the university will take severe action against dishonest students. Similarly, measures will be taken against faculty, staff, and administrators who practice dishonest or demeaning behavior." Any student caught cheating will be referred to the Honor Code Chancellor.
- Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from

GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Campus Resources

Health and Wellness

- *U Matter, We Care*: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.
- *Counseling and Wellness Center*: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services.
- *Student Health Care Center*: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.
- *University Police Department*: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).
- *UF Health Shands Emergency Room / Trauma Center:* For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

Academic Resources

- *E-learning technical support*: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.
- *Career Connections Center*: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.
- *Library Support*: Various ways to receive assistance with respect to using the libraries or finding resources.
- *Teaching Center*: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.
- *Writing Studio:* 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.
- *Student Complaints On-Campus*: Visit the Student Honor Code and Student Conduct Code webpage for more information.
- *On-Line Students Complaints*: View the Distance Learning Student Complaint Process.

Tentative Course Schedule

Week #	Week Starting (# of Classes)	Lecture #'s	Planned Schedule of Chapters and Topics	Homework Assignments
1	01/08 (3)	1 – 3	Course Introduction; Requisite Review	
2	01/15 (2)	4– 5	Chapter 8: Overview of the Solar System	
3	01/22 (3)	6 – 8	Chapter 9: Earth and Moon	Homework 1
4	01/29 (3)	9 – 11	Chapters 9 – 10: Earth and Moon – The Planets	
5	02/05 (3)	12 – 14	Chapter 10: The Planets	Homework 2
6	02/12 (3)	15 – 17	Chapters 11 – 12: Small Bodies in the Solar System – The Solar System in Perspective	Homework 3
7	02/19 (3)	18 – 20	Chapter 12 (Exoplanets)	Homework 4
8	02/26 (3)	21 – 23	Relativity; Midterm Exam	
9	03/04 (3)	24 – 26	Relativity; Chapter 18 Stellar Remnants	Homework 5
10	03/18 (3)	27 – 29	Chapters 19: Our Galaxy	Homework 6
11	03/25 (3)	30 - 32	Chapter 20: Galaxies	
12	04/01 (3)	33 - 35	Chapter 21: Active Galaxies	Homework 7
13	04/08 (2)	36 –38	Chapter 22: Clusters and Superclusters	No class 4/8 for eclipse
14	04/15 (3)	39-41	Chapter 23: Cosmology	Homework 8
15	04/22(2)	42-43	Chapter 24: History of the Universe	
16	12/11	The final exam is 5/2/2024 at 3:00 PM – 5:00 PM.		

Assignment Notes for the Course Schedule in the Table Above
(see also the detailed description of the graded course structure above)

- Regular textbook readings are assigned according to the schedule of the content.
- Worksheets are assigned and completed during most lectures.
- Homeworks are typically due in one week with the due date provided on each assignment.
- The class project will be assigned immediately after completing Chapter 12 and will be due approximately a couple weeks before the last day of class. A separate handout thoroughly describes all project instructions and due dates.

Course Content Summary

Review and Course Introduction: A review of the syllabus, course expectations, mathematics and physics pre- and co-requisities; a review of basic astronomy concepts and material needed from AST3018.

Chapter 8: An overview of planetary properties (mass, size, distance, temperature, composition, etc.) and how these modeled, measured, and set by the nebular theory that describes the formation of the solar system.

Chapter 9: Geological and atmospheric properties of the Earth and Moon, which helps with understanding the properties of the rest of the planets.

Chapter 10: Geological and atmospheric properties of the planets and their moons and how they compare to our detailed understanding of the Earth and Moon system.

Chapter 11: Properties of the leftover planetesimals in the solar system.

Chapter 12: Properties of exoplanets and how we know them.

Relativity: A quantitative understanding of the basics of Einstein's special theory of relativity and a brief qualitative understanding of the general theory of relativity.

Chapter 18: A description of white dwarfs, neutron stars, and black holes, extremely compact stellar remnants.

Chapter 19: The content, structures, and motions in our Milky Way Galaxy, including the elusive nature of dark matter.

Chapter 20: The larger context of the galactic populations in the universe, including their colors, brightnesses, morphologies, and motions.

Chapter 21: A description of supermassive black holes, the massive gravitational engines commonly found in the cores of galaxies.

Chapter 22: The properties of the largest scale structures in the universe, groups, clusters, and superclusters of galaxies.

Chapter 23: How we model the motion of our universe, the elusive nature of dark energy, and what this tells us about the past and future.

Chapter 24: Applying our laws of physics to describe the earliest times to the Big Bang.