

Discover the Universe
AST-1002
Section 0425 (Class number 11870), Spring 2020

Instructor: Dr. Francisco Reyes

Office: Room 12 Bryant Space Science Center

Telephone: 352-294-1885

Email: freyes@astro.ufl.edu

Lecture time and place: Tuesday 4rd period (10:40-11:30 AM), Thursday 4-5 periods (10:40 AM-12:35 PM), PUGH 170

Office hours: Tuesday 12:00 -1:00 PM, Thursday 2:00-3:00 PM (Or by appointment)

Class web site: www.astro.ufl.edu/~freyes/classes/ast1002/index.htm

Required Text: *Astronomy: A Beginner's Guide to the Universe*, Eight Edition by Chaisson & McMillan, Pearson Press. We will be using "Mastering Astronomy" for all the homework.

Purchase the e-copy of the book that include access to "Mastering Astronomy"

Pre-requisites and Co-requisites: None

Credits: 3

Course Content: This course offers a broad overview of modern astronomy. We will examine how observation, experimentation and exploration have led to our present day understanding of the universe we live in. Although this is essentially a non-mathematical science course, a very basic knowledge of mathematics is required. Our goal is to help you gain a physical understanding and an appreciation of the cosmos and more generally of scientific method. Along the way, we will also use and practice critical thinking skills and learn how to formulate empirically testable hypotheses. (P)

The topics we will cover include:

- Motions of the sky
- A historical development of our understanding of the solar system: An example of the scientific method
- Light and telescopes
- The properties of the planets within our solar system
- The nature and lives of stars
- The nature of our Milky Way Galaxy
- Properties of other galaxies
- The origin and fate of the Universe
- The search for extraterrestrial life.

General Education:

This course meets the requirements for a General Education physical science (P) course.

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.

General Education Student Learning Outcomes:

- Students demonstrate competence in the terminology, concepts, methodologies and theories used within the discipline.
- Students communicate knowledge, ideas, and reasoning clearly and effectively in written or oral forms appropriate to the discipline.
- Students analyze information carefully and logically from multiple perspectives, using discipline specific methods, and develop reasoned solutions to problems.

Course Learning Objectives:

- To provide students with a broad overview of modern astronomy. This will be accomplished through lectures and weekly reading assignments. Students will be able to define common astronomical terms and explain basic concepts and theories for a range of astrophysical phenomena.
- To teach the students the scientific process and how we can understand the Universe using basic physical laws derived on Earth. This will be accomplished through lectures and in-class discussions as well as homework assignments. Students will gain an understanding of how the scientific method is applied to the field of astronomy.
- To review the major scientific developments in astronomy and summarize their impacts on society and our environment such as recognizing our place in the Universe, comparing energy sources, and how atmospheric effects of planets influence climate change. Students will be able to critically evaluate the difference between good science and bad science. Evaluations will be based on in-class discussions, exams and an observing project.
- To teach scientific reasoning. Scientific reasoning is the use of logic, observations, and critical thinking to interpret the world around you. This will be accomplished through in-class discussions, homework assignments and the observing project. Students will formulate empirically-testable hypotheses derived from the study of physical process and phenomena and apply logical reasoning skills through scientific criticism and argument. These skills will serve you well in your daily lives regardless of what career you pursue.

- To improve the scientific literacy. Literacy is the basic concepts and terminology of science is necessary if you wish to follow science stories in the news or make informed decisions (such as voting) on issues that pertain to science. This will be accomplished through in-class discussions about current news topics in astronomy and as part of the observing project.
- To help students learn to communicate scientific ideas clearly and effectively using oral, written or graphic forms. This will be done through in-class discussions (oral) and as the written component of the observing project.

Grading Information:

See <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> for general UF grading policies. Your grade for the course will be based on the following:

In class exams – (2 exams -15% each)	30%
Cumulative Final Exam	30%
Observing Project	20%
Homework	20%

Grading scale:

Letter Grade	% Points	GPA	Letter Grade	% Points	GPA	Letter Grade	% Points	GPA
A	≥90	4.0	B-	77 - 79	2.67	D+	64 - 66	1.33
A-	87 - 89	3.67	C+	74 - 76	2.33	D	60 - 63	1.0
B+	84 - 86	3.33	C	70 - 73	2.0	D-	56 - 59	0.67
B	80 - 83	3.0	C-	67 - 69	1.67	E	≤ 55	0

Examinations (60% of grade): Two in-class examinations will be given during the semester. Each of these in-class exams will be worth 15% of your grade. The Final exam (30% of grade) will be comprehensive and given during final period. The in-class exams and final will each consist primarily of multiple-choice questions.

Telescope Observing Project (20%): One of the most enjoyable aspects of Astronomy is actually observing the sky either with the eyes, binoculars or a telescope. Students are expected to attend an observing session at the campus observatory. These take place every clear Friday evening during the semester (directions to the observatory and times are provided in lecture and on the class web site). You must complete an observing form (download from the class web site) describing what the objects that you observe through the telescopes actually look like and explaining their astronomical significance. You must also obtain a special token from the staff at the observatory and attach it to your form. Remember to put your name on your form. This report will be graded and will contribute to 20% of your grade. *Do not wait until the due date - it may be cloudy!*

Homework (20%):

Homework will be used during the semester to facilitate and reinforce students understanding of the course material and encourage critical thinking.

Attendance, Class Participation and Conduct Policy:

- Attendance at lectures is expected.
- Students should arrive on time and not get ready to leave until the lecture is finished.
- Reading assignments will be given approximately once each week. These will consist of reading pages/chapters from the textbook. Students will read material that will be covered by the lecture the following week.
- In order to stimulate critical thinking and gauge how well you understand the material, questions based on the lectures, reading assignments and projects/homework will be posed in class. Students should participate in the lecture by answering these questions and also by asking your own questions.
- *Use of mobile phones and computers (for purposes other than note-taking) are prohibited during the lectures*

Make-up Policy:

Students are expected to complete all requirements by the specified due dates. If a student misses class or an assignment due to an excused absence as specified in the undergraduate catalog and provides the instructor with timely notification, they will be allowed a reasonable time to make up the missed work. The format of a make-up test/exam will be at the discretion of the instructor.

Course Evaluations:

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/>.

Academic Honesty Policy:

- This is an excerpt 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.”

- Cheating is not tolerated in this class. Everyone in this class is expected to follow the University of Florida Honor Code: *We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.* Any student caught cheating will automatically fail the course and the case will be referred to the Honor Code Chancellor.
- On all work submitted for credit by students at the university, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

Accommodations for Students with Disabilities:

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodations. Students with disabilities should follow this procedure as early as possible in the semester.

UF Counseling Services:

- On-campus resources are available at the UF Counseling & Wellness Center (392-1575) for students experiencing personal or stress related problems.

Exams, critical and important dates

- Review for Exam #1, Thursday February 6th
- Exam #1, Tuesday February 11th 10:40 AM, Pugh 170
- Deadline for Telescope observing project report (A-J), Thursday March 12th
- Deadline for Telescope observing project report (K-T) Thursday March 19th
- Review for Exam #2 Thursday March 19th
- Exam #2 Tuesday March 24th 10:40 AM, Pugh 170
- Deadline for Telescope observing project report (U-Z), Thursday April 2nd
- Review for Final Exam, Tuesday April 21th
- Final Exam, Thursday April 30th at 7:30 AM (Pugh 170)
- The homework and the deadline for homework will be announced in class

Tentative Course & Lecture Schedule (Subject to Change)

Lecture Date	Lecture Content	Weekly Reading Assignment
Week 1	Charting the Heavens – An introduction to basic concepts in astronomy such as distances, constellations, Sun-Moon-Earth configurations that result in Moon phases and Solar and Lunar eclipses	Chapter 0
Week 2	The Copernican Revolution. Modern Astronomy & Understanding the Solar System – Learn how the scientific method has been used over hundreds of years to interpret the motions of planets and understand the nature of our Solar System	Chapter 1
Week 3	Properties of Light and Matter & Tools of Astronomy – Learn the nature of light and how astronomers observe various light wavelengths with telescopes to learn about astrophysical phenomena	Chap 2,3
Week 4	Earth & Moon – Learn about the Earth and Moon as well as their relationship to each other and Moon exploration	Chap 5
Week 5	Terrestrial Planets – Properties of the inner planets are discussed and compared to Earth	Chap 6
Week 6	Jovian Planets – Properties of the outer gas giants are discussed and compared to Earth	Chap 7
Week 7	Moons, Rings, and Plutoids–Learn about the nature of these other constituents of the Solar System which reveal clues about our planetary system and formation	Chap 8
Week 8	Formation of the Solar System – Asteroids, Meteors & Comets. Using the scientific method and observations discussed in this class, we discuss likely scenarios for the formation of our Solar System and the origin of these small bodies. Planets beyond the solar system. Detection and properties of exoplanets	Chap 4
Week 10	Measuring and Properties of Stars – Learn the properties of stars and how they are measured, including some distance determination techniques. Discover how color-magnitude diagrams are used to determine ages and binary star systems to estimate stellar masses.	Chap 10

Week 11	Sun, Nuclear Fusion and the Interstellar Medium – Properties of the Sun and the process of nuclear fusion are discussed. Learn properties of the material between the stars known as the ISM	Chap 9,11
Week 12	Star Formation & Stellar Evolution – Discover how the stars form out of the ISM. Follow the timeline for a typical, Sun-like star from infancy to death	Chap 12
Week 13	Stellar Remnants, White Dwarfs, Neutron Stars & Black Holes – Learn about the dense remnants of high mass stars and discuss the unusual gravitational effects observed near Black Holes	Chap 13
Week 14	The Milky Way & other Galaxies – Learn the properties of our Milky Way galaxy and how the scientific method has been used to learn the nature of this large system of stars, gas and dust. Discover the different types of galaxies in the Universe and how they compare to the Milky Way	Chap 14,15
Week 15	Galaxies & Dark Matter – Discover the importance of dark matter and how it has been identified in galaxies and larger scale structures. Learn about galaxy interactions and mergers and galaxy evolution	Chap 16
Week 16	Cosmology & Life in the Universe – Learn how we observe the effects of the Big Bang around us today including the cosmic microwave background, universal expansion and acceleration, the curvature of space and the formation of structure, leading to the existence of life in the Universe	Chap 17,18
Exam Week	Final Exam	Cumulative – all chapters