

ASTR 101: Descriptive Astronomy

Fall 2022

Instructor:	Dr. Matthew Route
Office Hours:	T 1:30-2:30 pm and F 3:30-4:30 pm, or by appointment in Lewis 121B
Website:	https://physics.olemiss.edu/route/
Lectures:	M/W/F 2:00pm-2:50pm, Bryant 209
Textbook:	<i>The Essential Cosmic Perspective, 8th Ed.</i> (2018) by Bennett, J., Donahue, M., Schneider, N., & Voit, M. (ISBN 978-0134446431). (Older text versions are okay, but note differences in text and problem sets as will be mentioned in class.)
Other Materials:	-TopHat subscription for in-class participation. -A scientific calculator that has trigonometric functions and can handle scientific notation for labs and exams. This does not include a smartphone calculator app.

Course Description

This course is a one-semester introduction to astronomy. Topics include the motion of objects in the night sky, orbital motion, observational techniques, light, the solar system, stars, and galaxies. The course is primarily lecture-based and does not include a lab, but some observations through the telescope are included.

Course Objectives

After taking this course, students should know and understand the following key concepts.

- The evolution of our thinking in what the night sky consists of, how it operates, and why these changes occurred.
- The physical laws that underpin the functioning of the Universe and our ability to perceive objects and phenomenon within it, including gravitation, energy, and the nature of light.
- The physical properties of the objects that constitute the Universe, including planets, stars, and galaxies.
- The origin, evolution, and fate of the Solar System.
- The origin, evolution, and ultimate fate of the Universe.
- Unanswered questions that remain at the frontiers of astronomy.

This course will emphasize the following critical thinking components.

- Science is a “living” process and mode of thinking that can be applied to many problems, not simply a collection of facts and theories.
- Conceptualizing complex issues and problems.
- Interpreting data and appraisal of evidence, especially within various theoretical frameworks.

Students will develop the following competencies by the conclusion of this course.

- Proficiency in using mathematics as a “language of science” to enable comparison and evaluation of objects, phenomenon, and theoretical frameworks.

Evaluation		Grading Scale	
Classroom Activities	15%	93 to 100%	A
Homework	15%	90 to <93%	A-
Three Midterm Exams	45%	87 to <90%	B+
Comprehensive Final Exam	25%	83 to <87%	B
		80 to <83%	B-
		77 to <80%	C+
		73 to <77%	C
		70 to <73%	C-
		67 to <70%	D+
		63 to <67%	D
		60 to <63%	D-
		<60%	F

Classroom activities will consist of TopHat questions, group assignments, and surveys.

Policies

Course-specific Policies

Attendance is not mandatory, but is highly encouraged and strongly correlated with excellent performance in the course. During the first two weeks, scan your ID card before entering the lecture classroom. Scored classroom activities will occur during nearly every lecture session.

Communications. The TAs and I will respond within 24 hours during business days, and within 48 hours on weekends.

Course Materials will be posted to Blackboard. Modifications to the syllabus will be announced in class and revisions posted to Blackboard. Homework assignments, in-class activities, and their respective solutions will be posted to Blackboard.

Technology Use in the Classroom. In order to foster an environment conducive to learning, the usage of cell phones, tablets, laptops, etc. are prohibited during lecture except when being used to answer TopHat questions.

Homework will be posted to Blackboard by noon on Monday, announced in lecture, and due by 5 pm that Friday.

Late and Missed Work. For late work, you will lose 10% of an assignment's value for each day it is late, up to a limit of one week. After that time, assignments may be turned in and evaluated for correctness, but a score of zero will be assigned. If you miss a lab for a university-approved reason (illness, university athletics, etc.), arrange a makeup lab with your TA. Missing more than 3 labs will result in a final grade of F for the course. No make-up exams will be given unless arrangements are made in advance. Your lowest score for each category (classroom activities for a day, homework, and laboratory exercises, but **not** exams) will be dropped, no questions asked.

Grade Disputes. You may dispute your grades on classroom activities, homework, labs, etc. up until the corresponding midterm exam, but not afterwards. For example, grades received on activities covering chapters 1-5 may be disputed up through the exam on the evening of 16 September, but not afterwards. This will facilitate your learning and not getting too far behind on material, while expediting the delivery of accurate grades.

Final Project. Choose an astronomy topic that we have talked about (or alluded to) during the semester and research its controversial past or unresolved future. Email me with your proposed idea. Use 3 references that do not include the textbook to develop the idea. Then create a 3-4 minute video (or write a 5 page report, double spaced, including figures and references) that describes the issue, how it developed, and how the scientific process contributed/will contribute to its resolution.

Course Tips.

- A college class is like a snack machine: you get out what you put into it.
- The preface of the textbook gives a rule of thumb as to how much time you should spend on this course. Although it may seem excessive, it is a good estimate if you want to do well.
- When studying for this course, set your smartphone and computer aside. Do as much reading and problem-solving on paper before going to any electronic device. You will find your ability to understand and retain information improves by leaps and bounds.
- Show all your work. For calculations, start with the algebraic equation and show your steps. Showing steps allows partial credit to be given even if the final answer is wrong.
- Include units. There is a huge difference between 10 cm, 10 AU, and 10 parsecs.
- Label diagrams and axes on plots.

University-wide Policies

Academic Conduct. You are encouraged to cooperate with your classmates and discuss course materials. However, dishonesty, cheating, plagiarism, or knowingly furnishing false information to the university in any way are regarded as serious offenses. Students are responsible for knowing and adhering to the academic integrity policy of the University of Mississippi listed in the [Student Academic Conduct and Discipline Policy](#). Students who violate academic integrity policies will be subject to the appropriate sanctions.

COVID-19/ Infectious Diseases Policy. If students test positive for COVID-19 at any health care facility, they must [report it to the Student Health Center](#) (or call 662-915-7274). Students with COVID-19 should follow the CDC's [COVID-19 exposure guidelines](#), seek medical attention by a healthcare provider, and contact their instructor to let them know that they will be missing class due to a health-related issue.

If you need to isolate due to contracting COVID-19 at any point this semester, email me and your TA as soon as possible. We will determine how best to help you continue your progress in the course. You will have access to texts, course content, and our Blackboard course site. The [University Health Center COVID-19 FAQs](#) provides more information on isolation protocols, as does the CDC's [Isolation and Precautions](#) website.

Non-Discrimination Policy. It is the policy of the University of Mississippi not to discriminate against anyone on the basis of race, color, religion, sex, national origin, handicap, age, sexual orientation or being a veteran. Students are encouraged to freely examine and exchange diverse ideas both inside and outside the classroom.

Disability Access and Inclusion. The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation, or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Barriers may include, but are not necessarily limited to, timed exams and in-class assignments, difficulty with the acquisition of lecture content, inaccessible web content, and the use of non-captioned or non-transcribed video and audio files. If you are registered with SDS, you must log in to your [Rebel Access portal](#) to request approved accommodations. If you are NOT registered with SDS, you may [apply for disability services](#).

Verification of Class Attendance. The University requires that all students have a [verified attendance/participation](#) at least once during the first two weeks of the semester for each course. Students without verified attendance will be dropped from the course and their financial aid amended accordingly.

Tentative Schedule

Date	Topic and Events	Textbook
22 Aug	Introduction to Modern Astronomy, Scale of the Universe	xx-xxiv, 1.1
24 Aug	History of the Universe, Spaceship Earth, Math review*	1.2-1.3
26 Aug	Patterns in the Sky, Seasons	2.1-2.2
29 Aug	Ancient Mysteries of the Moon and Planets	2.3-2.4
31 Aug	Ancient and Classical Astronomy	3.1-3.2
2 Sep	The Scientific Revolution	3.3-3.4
5 Sep	Labor Day Holiday	-
7 Sep	Physics: Motion and Energy	4.1-4.2
9 Sep	Physics: Gravitation	4.3-4.4
12 Sep	Physics: Properties of Light and Matter, Spectroscopy	5.1-5.2
14 Sep	Telescopes: Properties and Types	5.3
16 Sep	1st Midterm Exam	Ch. 1-5
19 Sep	Overview of the Solar System	6.1
21 Sep	Solar System Formation <i>22 Sep: Autumn Equinox!</i>	6.2-6.4
23 Sep	Terrestrial Worlds: The Earth, Interior and Surface Processes	7.1
26 Sep	Terrestrial Worlds: The Moon, Mercury, Venus, and Mars	7.2-7.4
27 Sep	Terrestrial Worlds: Climate and Habitability	7.5
28 Sep	Gas Giants: Structure, Composition, and Magnetism	8.1
30 Sep	Gas Giants: Moons and Rings	8.2-8.3
3 Oct	Classification of small bodies, asteroids, comets	9.1-9.3
5 Oct	Pluto, the Kuiper Belt, and Impact Risks	9.4-9.5
7 Oct	Exoplanets: Detection and Characterization	10.1-10.2

10 Oct	Exoplanets: Formation of Other Solar Systems, Open Questions Deadline to Withdraw	10.3,+
12 Oct	The Sun: Structure, Composition, and Fusion	11.1-11.2
14 Oct	The Sun: Magnetism and Star-Planet Interactions	11.3
17 Oct	The History of Life on Earth	19.1
19 Oct	The Search for Life in the Solar System and Beyond	19.2-19.5
21 Oct	2nd Midterm Exam	Ch. 6-11, 19
24 Oct	Stars: Observational Properties	12.1
25 Oct	Stars: Patterns and Ages	12.2-12.3
26 Oct	Stars: Birth and Low-Mass Stellar Evolution	13.1-13.2
28 Oct	Stars: High-Mass Stellar Evolution and Multiplicity	13.3-13.4
31 Oct	Stellar Remnants: White Dwarfs and Neutron Stars <i>Halloween and Taurid Meteors!</i>	14.1-14.2
2 Nov	Stellar Remnants: Black Holes	14.3-14.4
4 Nov	The Milky Way: Components and Structure	15.1-15.2
7 Nov	The Milky Way: Formation <i>7/8 Nov: Total Lunar Eclipse!</i>	15.3-15.4
9 Nov	Galaxies: Types and Distances	16.1-16.2
11 Nov	Galaxies: Evolution	16.3
14 Nov	Galaxies: Supermassive Black Holes and AGN	16.4
16 Nov	3rd Midterm Exam	Ch. 12-16
18 Nov	Cosmology: Big Bang Theory; Eras of the Universe <i>17/18 Nov: Leonid Meteor Shower!</i>	17.1
21-25 Nov	Cosmology: Observational Evidence	17.2
28 Nov	Cosmology: Geometry and Inflation	17.3-17.4
29 Nov	Thanksgiving Break	-
30 Nov	Cosmology: Dark Matter	18.1-18.2
2 Dec	Cosmology: Structure Formation, Dark Energy, and the Fate of the Universe	18.3-18.4
5 Dec	Final Exam (4:00 pm, Bryant 209)	Everything

Additional Resources

- PBS NOVA's [Universe Revealed](#) Series. Episodes include "Age of Stars," "Milky Way," "Alien Worlds," "Black Holes," and "Big Bang." Episodes without the compass icon are available for free. If there is an episode you are interested in but its paywalled, check back periodically.
- PBS NOVA's [The Planets](#) series. Episodes include "Inner Worlds", "Mars," "Jupiter," "Saturn," and "Ice Worlds" (see above note about paywalled episodes).
- [Astronomy magazine](#) website. Learn about current events by signing up to their free email newsletter, delivered once a week on Friday. Interesting events in the night sky are listed under Observing/The Sky This Week.
- [Science News](#) website. Learn about news across the sciences, including physics and astronomy, by signing up to their free email newsletter delivered once a week on Thursday.