

## **AST 180: Introduction to Astronomy**

### **General Information**

- Department: Astronomy and Planetary Science
- Course: AST 180: Introduction to Astronomy, Class Number 3218, Section 001
- Term: Fall 2023
- Total Units of Course Credit: 3
- Pre- and Co-Requisite(s): None
- Mode of Instruction: In-Person
- Meeting Time: Monday/Wednesday/Friday 11:30am-12:20pm
- Location: Cline Library Rm 102

### **Instructor Information**

- Instructor: Prof. Jasmine Garani
- Preferred Contact Method: Canvas Messaging
- Email: [jasmine.garani@nau.edu](mailto:jasmine.garani@nau.edu)
- Office Hours: Monday 10-11am, Thursday 2-3pm
- Office Location: Physical Sciences, Room 225 B
- Zoom office hours may be requested if needed

### **Course Purpose**

This course will provide an introduction and overview of the fundamental topics in Astronomy and Planetary Science. These topics will include origins and current state of the solar system, the life cycle of stars, the Milky Way and evolution of galaxies, and the origins of the universe.

This course satisfies the Science and Applied Science Liberal Studies requirement as well this course requirement for the B.S. of Astronomy.

### **Course Objectives and Learning Outcomes**

This course has several objectives and learning outcomes that will be addressed during the lecture and assessed through in-class assignments, homework, and examinations. By the end of the semester, students will be able to:

- Demonstrate understanding of physics concepts including velocity, momentum, angular momentum, gravity, and energy.
- Explain and have a sense for the scales of the solar system, galaxies, and the universe.
- Explain the basic structure of the solar system, stars, and galaxies with an understanding of the different types of stars and galaxies as well as techniques used to observe these objects.
- Apply appropriate physics concepts to simple quantitative calculations related to the

- solar system, stars, and galaxies and evaluate the answers for physical viability.
- Perform estimation and unit conversion type calculations quickly to evaluate a problem.
  - Demonstrate an understanding of the scientific method and how scientific research is conducted.

## **Required Materials & Technology**

### **1. Top Hat**

In the navigation bar on the left side of the Canvas course, click the link labeled “Top Hat 1.3” and follow the instructions. You should have received an invitation to join the course, but if not, the join code is 871341. Top Hat is now FREE for all NAU students. You should not be asked to pay when you sign up. If you are, please contact me immediately.

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email ([support@tophat.com](mailto:support@tophat.com)), the in-app support button, or by calling 1-888-663-5491.

### **2. OpenStax: Astronomy e-text**

The textbook for this course is FREE. You can access it both through Top Hat and Canvas.

You can also download the e-text to read offline, however note that questions are ONLY accessible in Top Hat. The text can be downloaded from this link:

<https://openstax.org/details/books/astronomy>

## **Assessment**

Students WILL be assessed through a series of in-class assignments, homework, examinations, and attendance.

**Attendance:** Success in this course is strongly dependent on student participation and attendance. Attendance will be taken via a Top Hat question during the class. Attendance will not start to count towards the student’s grade until after the Add/Drop deadline of 9/7/23. After this, students will be allowed to miss 3 classes with no penalty.

Interruptions and inappropriate behavior will not be tolerated, as it is disrespectful to others and to the academic learning environment. Your professionalism, courtesy, and engagement in the class are critical components of your success.

**Lecture Tutorials:** Students will complete pdfs of Astronomy Workbook tutorials that will be turned into Canvas for points. These tutorials are designed to stimulate discussion and reinforce topics covered in the lectures. Ideally, these will be done in-class in small groups, though students may work individually if preferred. There will be 8 lecture tutorial assignments each worth 14 points. **Students must turn in their own copy of the assignment. These will be due at 11:59pm ONE week after the day they are assigned.** These due dates will be announced in class and reminders will be sent out using Canvas.

**Homework Assignments:** These assignments are designed to strengthen and assess your understanding of lecture materials and prepare for examinations. There will be 10 homework assignments and each will be worth 15 points. See the course schedule at the end of this

document for approximate due dates of these homework assignments. **Homework will be assigned and turned in on Canvas and you will have until 11:59pm on the day they are due to complete the assignment.**

**Examinations:** This course will consist of two non-cumulative mid-semester examinations and one cumulative final exam. **No make-up exams will be offered without prior approval from the professor.**

**Grading System**

The breakdown of how the final grade in the class will be calculated is given below, and any changes to the class scoring rubric will be discussed with the class prior to implementation and will only be made in the students' favor, never to their detriment.

Category	Point Distribution	Points	Notes
Homework	15 points each	150	1 Lowest Dropped
Lecture Tutorials	14 points each	98	1 Lowest Dropped
Midterm 1		40	
Midterm 2		40	
Final		60	
Attendance	1 point each class	32	Allowed 3 missed classes
Total		420	

**The lowest homework grade throughout the semester will be dropped as well as the lowest Lecture Tutorial grade.**

Grading Distribution:

Midsemester Total Points (Homework 1-5, Lecture Tutorials 1-3, Exam 1, 16 classes)	Midsemester Grade	Semester Total Points	Final Grade
155 to 173	A	378 to 420	A
138 to 154	B	336 to 377	B
121 to 137	C	294 to 335	C
103 to 120	D	252 to 293	D
0 to 102	F	0 to 251	F

**Grades will be kept up to date in Canvas. It is the student's responsibility to frequently check their scores in Canvas for accuracy. Any score in question must be discussed with me within two weeks of the due date. After two weeks, I will not entertain any challenges to the scores in Canvas.**

Sometimes instructors make mistakes, and I am no exception: exams end up being harder than expected, or assignments are just too ambitious for the time available. In these (hopefully rare) cases, I reserve the right to modify the final course grades upwards. This modification is subject to the following policies: (1) the same modification will be applied to the grades of all students, and (2) the modification may never result in a lower grade, but always a higher one.

### **Makeup and Late Work**

Students must obtain permission in advance of a regularly scheduled examination in order to take a make-up examination. An institutional excuse is required to get an extension from an online homework assignment. In addition, if unforeseen sickness occurs, please reach out to me and I will do my best to accommodate you in a reasonable manner. Points will be deducted from assignments at a rate of 10% for every day that they are late.

### **Extra Credit**

Students have a few chances throughout the semester to obtain extra credit points. The extra credit opportunity consists of going to the on-campus observatory during the hours it is open for students. Students can go and observe with the telescope operator. To obtain the extra credit points, the student must fill out an observation log. When a completed observation log is turned in to Canvas, the student will get 10 points of extra credit towards their final grade. The observatory schedule and the observation logs will be available on Canvas.

### **Administrative Drop**

As a professor, I am required to administratively drop students from the course who do not participate in the first week of classes. To determine if you have participated in the first week, I will be checking both your Top Hat attendance and your Canvas activity. In order to not be dropped from the course please participate in Top Hat questions and access this course through Canvas during the first week of classes.

### **Academic Honesty**

**Please read this section carefully as each student is required to understand and comply with all Academic Integrity rules and standards. Both NAU and this Department/Course have standards which are written and referenced below.**

Both myself and the science/engineering profession have absolutely no patience with cheating. Anyone cheating on an exam will receive a zero on that exam, and possibly a failing grade in the

course. If anyone is caught using another student's account in Top Hat, both the students may receive a zero for the entire "in class questions" portion of the grade.

Note that no student will be allowed to exit the classroom during any of the exams, unless there is an emergency. Therefore, make sure you get a drink and visit the facilities in advance. If you feel that you might need to leave the classroom during an exam, you must get advance permission from the professor, in writing (email), before the exam. The use of cell phones at and time during an exam will be considered an act of academic dishonesty. The same holds true for smart-watches and "Google Glasses", or other enhanced vision products. You must not use or look at or touch your phone or watch (even if not a smart watch) at any time. You will be asked to place all such products securely away, out of reach and view, before the exam begins. You are not allowed to use your phone as a calculator. The same holds true for any calculator that can communicate with any other device or user. You may not bring in any paper to any exam, including "cheat sheets", and you may not take any paper out of the classroom after any exam. You are not allowed to look at the exam of another student, nor are you allowed to send or receive any information and/or signals or other forms of communication during an exam. The violation of any of these Academic codes of conduct may result in your failing the course.

In general, it is not my responsibility to attempt to describe and prohibit any and all forms of

Academic Dishonesty. It is your responsibility to uphold the highest ethical standards. If you have any doubt or question about this policy, it is your responsibility to ask the professor in advance and to be clear about the answers and policies. Again, the text above and the attached NAU policies try to be very clear about what constitutes an act of Academic Dishonesty, but we cannot anticipate every possible form of cheating in advance. So the attachments and examples above are not meant to be comprehensive.

Academic Dishonesty information will be given to the Dean of Students and a written copy of any such incident may be attached to your official NAU file

**Any student that has been found to be cheating will receive a 0 for the assignment in question.**

## **University Policies**

### **ACADEMIC INTEGRITY**

NAU expects every student to firmly adhere to a strong ethical code of academic integrity in all their scholarly pursuits. The primary attributes of academic integrity are honesty, trustworthiness, fairness, and responsibility. As a student, you are expected to submit original work while giving proper credit to other people's ideas or contributions. Acting with academic integrity means completing your assignments independently while truthfully acknowledging all sources of information, or collaboration with others when appropriate. When you submit your work, you are implicitly declaring that the work is your own. Academic integrity is expected not only during formal coursework, but in all your relationships or interactions that are connected to the educational enterprise. All forms of academic deceit such as plagiarism, cheating, collusion, falsification or fabrication of results or records, permitting your work to be submitted by another, or inappropriately recycling your own work from one class to another, constitute academic misconduct that may result in serious disciplinary consequences. All students and faculty members are responsible for reporting suspected instances of academic misconduct. All students are encouraged to complete NAU's online academic integrity workshop available in the E-Learning Center and should review the full *Academic Integrity* policy available at <https://policy.nau.edu/policy/policy.aspx?num=100601>.

### **COPYRIGHT INFRINGEMENT**

All lectures and course materials, including but not limited to exams, quizzes, study outlines, and similar materials are protected by copyright. These materials may not be shared, uploaded, distributed, reproduced, or publicly displayed without the express written permission of NAU. Sharing materials on websites such as Course Hero, Chegg, or related websites is considered copyright infringement subject to United States Copyright Law and a violation of NAU Student Code of Conduct. For additional information on ABOR policies relating to course materials, please refer to [ABOR Policy 6-908 A\(2\)\(5\)](#).

### **COURSE TIME COMMITMENT**

Pursuant to Arizona Board of Regents guidance (ABOR Policy 2-224, *Academic Credit*), each unit of credit requires a minimum of 45 hours of work by students, including but not limited to, class time, preparation, homework, and studying. For example, for a 3-credit course a student should expect to work at least 8.5 hours each week in a 16-week session and a minimum of 33 hours per week for a 3-credit course in a 4-week session.

## **DISRUPTIVE BEHAVIOR**

Membership in NAU's academic community entails a special obligation to maintain class environments that are conducive to learning, whether instruction is taking place in the classroom, a laboratory or clinical setting, during course-related fieldwork, or online. Students have the obligation to engage in the educational process in a manner that does not interfere with normal class activities or violate the rights of others. Instructors have the authority and responsibility to address disruptive behavior that interferes with student learning, which can include the involuntary withdrawal of a student from a course with a grade of "W". For additional information, see NAU's *Disruptive Behavior in an Instructional Setting* policy at <https://nau.edu/university-policy-library/disruptive-behavior>.

## **NONDISCRIMINATION AND ANTI-HARASSMENT**

NAU prohibits discrimination and harassment based on sex, gender, gender identity, race, color, age, national origin, religion, sexual orientation, disability, veteran status and genetic information. Certain consensual amorous or sexual relationships between faculty and students are also prohibited as set forth in the *Consensual Romantic and Sexual Relationships* policy. The Equity and Access Office (EAO) responds to complaints regarding discrimination and harassment that fall under NAU's *Nondiscrimination and Anti-Harassment* policy. EAO also assists with religious accommodations. For additional information about nondiscrimination or anti-harassment or to file a complaint, contact EAO located in Old Main (building 10), Room 113, PO Box 4083, Flagstaff, AZ 86011, or by phone at 928-523-3312 (TTY: 928-523-1006), fax at 928-523-9977, email at [equityandaccess@nau.edu](mailto:equityandaccess@nau.edu), or visit the EAO website at <https://nau.edu/equity-and-access>.

## **TITLE IX**

Title IX of the Education Amendments of 1972, as amended, protects individuals from discrimination based on sex in any educational program or activity operated by recipients of federal financial assistance. In accordance with Title IX, Northern Arizona University prohibits discrimination based on sex or gender in all its programs or activities. Sex discrimination includes sexual harassment, sexual assault, relationship violence, and stalking. NAU does not discriminate on the basis of sex in the education programs or activities that it operates, including in admission and employment. NAU is committed to providing an environment free from discrimination based on sex or gender and provides a number of supportive measures that assist students, faculty, and staff.

One may direct inquiries concerning the application of Title IX to either or both the Title IX Coordinator or the U.S. Department of Education, Assistant Secretary, Office of Civil Rights. You may contact the Title IX Coordinator in the Office for the Resolution of Sexual Misconduct by phone at 928-523-5434, by fax at 928-523-0640, or by email at [titleix@nau.edu](mailto:titleix@nau.edu). In furtherance of its Title IX obligations, NAU promptly will investigate or equitably resolve all reports of sex or gender-based discrimination, harassment, or sexual misconduct and will eliminate any hostile environment as defined by law. The Office for the Resolution of Sexual Misconduct (ORSM): Title IX Institutional Compliance, Prevention & Response addresses

matters that fall under the university's Sexual Misconduct policy. Additional important information and related resources, including how to request immediate help or confidential support following an act of sexual violence, is available at <https://in.nau.edu/title-ix>.

## **ACCESSIBILITY**

Professional disability specialists are available at Disability Resources to facilitate a range of academic support services and accommodations for students with disabilities. If you have a documented disability, you can request assistance by contacting Disability Resources at 928-523-8773 (voice), 928-523-8747 (fax), or [dr@nau.edu](mailto:dr@nau.edu) (e-mail). Once eligibility has been determined, students register with Disability Resources every semester to activate their approved accommodations. Although a student may request an accommodation at any time, it is best to initiate the application process at least four weeks before a student wishes to receive an accommodation. Students may begin the accommodation process by submitting a self-identification form online at <https://nau.edu/disability-resources/student-eligibility-process> or by contacting Disability Resources. The Director of Disability Resources, Jamie Axelrod, serves as NAU's Americans with Disabilities Act Coordinator and Section 504 Compliance Officer. He can be reached at [jamie.axelrod@nau.edu](mailto:jamie.axelrod@nau.edu).

## **RESPONSIBLE CONDUCT OF RESEARCH**

Students who engage in research at NAU must receive appropriate Responsible Conduct of Research (RCR) training. This instruction is designed to help ensure proper awareness and application of well-established professional norms and ethical principles related to the performance of all scientific research activities. More information regarding RCR training is available at <https://nau.edu/research/compliance/research-integrity>.

## **MISCONDUCT IN RESEARCH**

As noted, NAU expects every student to firmly adhere to a strong code of academic integrity in all their scholarly pursuits. This includes avoiding fabrication, falsification, or plagiarism when conducting research or reporting research results. Engaging in research misconduct may result in serious disciplinary consequences. Students must also report any suspected or actual instances of research misconduct of which they become aware. Allegations of research misconduct should be reported to your instructor or the University's Research Integrity Officer, Dr. David Faguy, who can be reached at [david.faguy@nau.edu](mailto:david.faguy@nau.edu) or 928-523-6117. More information about misconduct in research is available at <https://nau.edu/university-policy-library/misconduct-in-research>.

## **SENSITIVE COURSE MATERIALS**

University education aims to expand student understanding and awareness. Thus, it necessarily involves engagement with a wide range of information, ideas, and creative representations. In their college studies, students can expect to encounter and to critically appraise materials that may differ from and perhaps challenge familiar understandings, ideas, and beliefs. Students are encouraged to discuss these matters with faculty.

Tentative course schedule. Any changes made during the semester will be with the consultation of the class and only to the students' benefit and not to their detriment.

Week	Date	Topic	Homework Due
1	M, 8/28	Class Introduction	
	W, 8/30	Ch 1: A Brief Tour	
	F, 9/1	Ch 2: The Birth of Astronomy	
2	M, 9/4	Labor Day, No Class	
	W, 9/6	Ch 2: The Birth of Astronomy (cont.)	
	F, 9/8	Ch. 2: The Birth of Astronomy (cont.)	Homework 1
3	M, 9/11	Ch. 4: Earth, Moon and Sky	
	W, 9/13	Ch. 4: Earth, Moon, and Sky (cont.)	
	F, 9/15	Ch. 4: Earth, Moon, and Sky (cont.)	Homework 2
4	M, 9/18	Ch. 3: Orbits and Gravity	
	W, 9/20	Ch. 3: Orbits and Gravity (cont.)	
	F, 9/22	Ch. 3: Orbits and Gravity (cont.)	Homework 3
5	M, 9/25	Ch. 5: Radiation and Spectra	
	W, 9/27	Ch. 5: Radiation and Spectra (cont.)	
	F, 9/29	Ch. 5: Radiation and Spectra (cont.)	Homework 4
6	M, 10/2	Ch. 6: Astronomical Instruments	
	W, 10/4	Exam Review	
	F, 10/6	<b>Exam #1 (Ch. 1-6)</b>	
7	M, 10/9	Ch. 6: Astronomical Instruments (cont.)	
	W, 10/11	Ch. 6: Astronomical Instruments (cont.)	
	F, 10/13	Solar System Overview	Homework 5
8	M, 10/16	Solar System Overview (cont.)	
	W, 10/18	Ch. 15-17: The Sun and Analyzing Starlight	
	F, 10/20	Ch. 15-17: The Sun and Analyzing Starlight (cont.)	Homework 6
9	M, 10/23	Ch. 15-17: The Sun and Analyzing Starlight (cont.)	
	W, 10/25	Ch. 18-19: A Celestial Census and Celestial Distances	
	F, 10/27	Ch. 18-19: A Celestial Census and Celestial Distances (cont.)	Homework 7
10	M, 10/30	Ch. 18-19: A Celestial Census and Celestial Distances (cont.)	
	W, 11/1	Ch. 21: The Birth of Stars	
	F, 11/3	Ch. 22: Stellar Evolution	Homework 8
11	M, 11/6	Exam Review	
	W, 11/8	<b>Exam #2 (Ch. 6, solar system overview, Ch. 15-19)</b>	
	F, 11/10	Veterans Day, No Class	
12	M, 11/13	Ch. 22: Stellar Evolution (cont.)	
	W, 11/15	Ch. 23-24: Death of Stars and General Relativity	
	F, 11/17	Ch. 23-24: Death of Stars and General Relativity (cont.)	Homework 9
13	M, 11/20	Ch. 23-24: Death of Stars and General Relativity (cont.)	
	W, 11/22	Thanksgiving Break, No Class	
	F, 11/24	Thanksgiving Break, No Class	
14	M, 11/27	Ch. 25-29: Galaxies and Cosmology	



	W, 11/29	Ch. 25-29: Galaxies and Cosmology (cont.)	
	F, 12/1	Ch. 25-29: Galaxies and Cosmology (cont.)	Homework 10
	M, 12/4	Astronomy News	
	W, 12/6	Astronomy News/Final Exam Review	
15	F, 12/8	Final Exam Review	Homework 11
16	W, 12/13	<b>Final Exam (Open 6am - 11:59pm)</b>	