

AST 180 – Introduction to Astronomy (Section 1)

Fall 2024

Course Information

- Location: Cline Library Rm 102
- Meeting time: M/W/F 11:30am-12:20pm
- Total Units of Course Credit: 3
- Prerequisites: None!

Instructor Information

- Instructor: Prof. Jonathan Jackson
- Email: jonathan.jackson@nau.edu
- Office: Physical Sciences Rm 225A
- Student Hours: W/Th 4-5pm
- TA Office Hours: M/F 2-3 pm Rm 111
- TA: Kai Bowen (klb826@nau.edu)

Course Description

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 discovery and characterization of exoplanets, the Milky Way and evolution of galaxies, and the origin of the universe.

This course satisfies the Science and Applied Science Liberal Studies requirement and is a course requirement for the B.S. of Astronomy.

Student Learning Objectives

At the end of this course, students should be able to:

SLO1. Demonstrate understanding of physics concepts including velocity, momentum, angular momentum, gravity, and energy;

SLO2. Explain and have a sense for the scales of the Solar System, galaxies, and the universe;

SLO3. Explain the basic structure of the Solar System, stars, planetary systems, and galaxies with an understanding of the different types of stars and galaxies as well as techniques used to observe these objects;

SLO4. Apply appropriate physics concepts to simple quantitative calculations related to the Solar System, stars, planetary systems, and galaxies and evaluate the answers for physical viability;

SLO5. Perform estimation and unit conversion type calculations quickly to evaluate a problem;

SLO6. Demonstrate an understanding of the scientific method and how scientific research is conducted.

100% Career Ready

One of the primary goals of this course is to provide skills that are in-demand from STEM employees to help NAU CEFNS students pursue careers of confidence and lives or purpose. Below is a list of in-demand career-ready competencies (CRC) from the National Association of Colleges and Employers (NACE) that students may be able to practice in this course:

CRC1. Career & Self-Development: Proactively develop oneself and one's career through continual personal and professional learning, awareness of one's strengths and weaknesses, navigation of career opportunities, and networking to build relationships within and without one's organization.

CRC2. Communication: Clearly and effectively exchange information, ideas, facts, and perspectives with persons inside and outside of an organization.

CRC3. Critical Thinking: Identify and respond to needs based upon an understanding of situational context and logical analysis of relevant information.

CRC4. Equity & Inclusion: Demonstrate the awareness, attitude, knowledge, and skills required to equitably engage and include people from different local and global cultures. Engage in anti-racist practices that actively challenge the systems, structures, and policies of racism.

CRC5. Leadership: Recognize and capitalize on personal and team strengths to achieve organizational goals.

CRC6. Professionalism: Knowing work environments differ greatly, understand and demonstrate effective work habits, and act in the interest of the larger community and workplace.

CRC7. Teamwork: Build and maintain collaborative relationships to work effectively toward common goals, while appreciating diverse viewpoints and shared responsibilities.

CRC8. Technology: Understand and leverage technologies ethically to enhance efficiencies, complete tasks, and accomplish goals.

Career Ready Resources

- LinkedIn:
 - CEFNS Career Development: www.linkedin.com/in/cefns-career-development-072715233
 - NAU Career Development: <https://www.linkedin.com/company/nau-career-development/>
- Handshake: <https://nau.joinhandshake.com/login>
- Udemy: Online courses and career searching advice
 - <https://in.nau.edu/its/udemy/>
 - Log in with your NAU email account and search 'NAU Career Steps'
- O*net Online: Occupation exploration reports - <https://www.onetonline.org/>

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 902671. Top Hat is 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), 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 9/5/24. After this, students will be allowed to miss 3 classes with no penalty.
- **Lecture Tutorials:** Students will complete pdfs of Astronomy Workbook tutorials that will be turned in on 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 11:59 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 11 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.

Homeworks will be assigned and turned in on Canvas and you will have until 11:59 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 and an official university-recognized excuse.**

Grading System

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 points each class	33	Allow 3 missed classes
Total		421	

Grading Distribution:

Midsemester Total Points (Homework 1-5, Lecture Tutorials 1-3, Exam 1, 15 classes)	Midsemester Grade	Semester Total Points	Final Grade
155 to 172	A	379 to 421	A
138 to 154	B	337 to 378	B
121 to 137	C	295 to 336	C
104 to 120	D	253 to 294	D
0 to 103	F	0 to 252	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 sometimes 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 lower grades, only ever raise them.

Makeup and Late Work

Students must obtain permission in advance of a regularly scheduled examination in order to take a make-up exam. 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 late 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 the 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://www9.nau.edu/policies/Client/Details/1443?whoIsLooking=Students&pertainsTo=All>
- **ARTIFICIAL INTELLIGENCE:** Artificial intelligence (AI) technologies bring both opportunities and challenges. Ensuring honesty in academic work creates a culture of integrity and expectations of ethical behavior. The use of these technologies can depend on the instructional setting, varying by faculty member, program, course,

and assignment. Please refer to course policies, any additional course-specific guidelines in the syllabus, or communicate with the instructor to understand expectations. NAU recognizes the role that these technologies will play in the current and future careers of our graduates and expects students to practice responsible and ethical use of AI technologies to assist with learning within the confines of course policies.

- **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. To report a concern related to possible unlawful discrimination or harassment or to request a time to meet, please use the [Report an Issue Form](#). To file a complaint, please submit the online [Complaint Form](#). EAO also assists with religious accommodations. To request a religious accommodation, please use the [Religious Accommodation Request Intake Form](#). EAO additionally provides access to

lactation spaces, and please use to the [Lactation Space Request Form](#) to request use of a location. For additional information about nondiscrimination or anti-harassment, contact EAO at EquityandAccess@nau.edu, or visit the EAO website at <https://nau.edu/equity-and-access>. The EAO is located in Old Main on the first floor.

- **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 employees, and covered guests. One may direct inquiries concerning the application of Title IX to either or both the university Title IX Coordinator or the U.S. Department of Education, Assistant Secretary, Office of Civil Rights. You may contact NAU's Title IX Coordinator at titleix@nau.edu or by phone at 928-523-5434 . In furtherance of its Title IX obligations, NAU promptly will investigate or equitably resolve all reports of sex/gender-based discrimination, harassment, or sexual misconduct and will eliminate any hostile environment as defined by law. To submit a report, please use the [File a Report Form](#). 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](#). ORSM also facilitates reasonable modifications for pregnant or parenting individuals. Additional important information and related resources, including how to request help or confidential support following conduct covered by the Sexual Misconduct Policy, is available on the [ORSM web site](#), and you also may contact the office at titleix@nau.edu. The ORSM is located in Gammage on the third floor.
- **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 (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.
- **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, Scott Pryor, who can be reached at scott.pryor@nau.edu or 928-523-5927. 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

Week	Date	Topic	Homework Due
1	8/26	Class Introduction	
	8/28	Ch 1: A Brief Tour	
	8/30	Ch 1: A Brief Tour (cont.)	
2	9/2	<i>LABOR DAY – NO CLASS</i>	
	9/4	Ch 2: The Birth of Astronomy	
	9/6	Ch 2: The Birth of Astronomy (cont.)	Homework 1
3	9/9	Ch 4: Earth, Moon, and Sky	
	9/11	Ch 4: Earth, Moon, and Sky (cont.)	
	9/13	Ch 4: Earth, Moon, and Sky (cont.)	Homework 2
4	9/16	Ch 3: Orbits and Gravity	
	9/18	Ch 3: Orbits and Gravity (cont.)	
	9/20	Ch 3: Orbits and Gravity (cont.)	Homework 3
5	9/23	Ch 5: Radiation and Spectra	
	9/25	Ch 5: Radiation and Spectra (cont.)	
	9/27	Ch 5: Radiation and Spectra (cont.)	Homework 4
6	9/30	Ch 6: Astronomical Instruments	
	10/2	Exam Review	
	10/4	Exam #1 (Ch 1-6)	
7	10/7	Solar System Overview	
	10/9	Solar System Overview (cont.)	
	10/11	Exoplanets	Homework 5
8	10/14	Exoplanets (cont.)	
	10/16	Exoplanets (cont.)	
	10/18	Ch 15-17: The Sun and Analyzing Starlight	Homework 6
9	10/21	Ch 15-17: The Sun and Analyzing Starlight (cont.)	
	10/23	Ch 15-17: The Sun and Analyzing Starlight (cont.)	
	10/25	Ch 18-19: A Celestial Census and Celestial Distances	Homework 7
10	10/28	Ch 18-19: A Celestial Census and Celestial Distances (cont.)	
	10/30	Ch 18-19: A Celestial Census and Celestial Distances (cont.)	
	11/1	Ch 21: The Birth of Stars	Homework 8
11	11/4	Ch 22: Stellar Evolution	
	11/6	Exam Review	
	11/8	Exam #2 (The Solar System, Exoplanets, Ch 15-19)	
12	11/11	<i>VETERANS DAY – NO CLASS</i>	
	11/13	Ch 23-24 Death of Stars and General Relativity	
	11/15	Ch 23-24 Death of Stars and General Relativity (cont.)	Homework 9
13	11/18	Ch 23-24 Death of Stars and General Relativity (cont.)	
	11/20	Ch 25-29: Galaxies and Cosmology	
	11/22	Ch 25-29: Galaxies and Cosmology (cont.)	Homework 10
	11/25	Ch 25-29: Galaxies and Cosmology (cont.)	
	11/27	Astronomy News	

14	11/29	<i>THANKSGIVING BREAK – NO CLASS</i>	
15	12/2	Final Exam Review	
	12/4	Final Exam Review	
	12/6	Final Exam Review	Homework 11
16	12/11	FINAL EXAM (Open 6 am – 11:59 pm)	