

Department of Astronomy and Planetary Science

Introduction to Astrophysics

General Information

- Department: Astronomy and Planetary Science
- Course: AST 280 (Introduction to Astrophysics) – Class Number 2439 Section 001
- Term: Fall 2021
- Total Units Of Course Credit: 3
- Pre- and Co-Requisite(s): (MAT 136) and (PHY 161 or PHY 171)
- Mode of Instruction: Remote and Synchronous All Semester
- Meeting Time: T, TH 12:45 – 2:00 p.m.
- Location: Remote
- Instructor: Stephen Tegler
- Phone: 928-523-9382; Email: Stephen.Tegler@nau.edu
- Tegler's Office Location: Remote via Zoom
- Tegler's Office hours: T, TH 2:15 – 3:15 p.m. via Zoom or email me or phone me to make an appointment.

Course Overview:

We will study the tools of astrophysics, stars and stellar evolution, galaxies and galactic evolution, and cosmology. There are no pre-requisite astronomy classes; however, you must have completed MAT 136 and PHY 161 or PHY 171. If you do not have the required pre-requisites, you may be administratively dropped from the class.

Student Learning Outcomes:

- You will develop expertise in physics and astronomy
- You will develop skills in solving physics problems in an astrophysical context
- You will be able to look at the solution to a problem and judge whether the solution is “sensible”

Assignments/Course Structure/Approach

You are expected to come to all T, TH class meetings.

You are expected to complete a reading assignment and answer questions about the reading assignment before each class. Solutions to these questions must be submitted before the start of each class. During class, I will emphasize important material, and in-class activities will assess your comprehension of important material. Homework assignments must be submitted by 11:59 p.m. each Thursday.

Assessment Methods for Student Learning Outcomes

Lower-Stakes Assessments:

- Questions on Pre-Class Readings
- In-Class Activities
- Homework

Higher-Stakes Assignments:

- Two Examinations
- Comprehensive Final Examination

Grading

Percentages Toward Final Grade:

- Pre-Class Reading Questions: ~20%
- In-Class Questions ~20%
- Homework: ~20%
- Two Examinations: ~20%
- Final Examination: ~20%

Examination Dates:

- Examination 1: Thursday, September 23, 2021
- Examination 2: Thursday, October 28, 2021
- Final Examination: Tuesday, December 7, 2021.

Approximate Grading Scale:

- >90% A
- >80% B
- >70% C
- >60% D

It's your responsibility to frequently check your scores for accuracy. Any score in question must be discussed with me within one week of posting of the solutions. After one week, I will not entertain any challenges to a score.

Makeup Work:

You must obtain permission in advance of a regularly scheduled examination in order to take a make-up examination. All make-up examinations will be given near the end of the semester.

If you miss a class, lectures will be recorded and available for review.

There will be no makeup for questions on pre-class readings, in-class activities, or homework assignments. An institutional excuse is required to be excused from any of these assignments.

To take into account situations where you cannot complete an assignment because of reasons beyond your control and are not eligible for an institutional excuse, I will offer several extra-credit assignments throughout the semester.

Required Materials:

Be sure to bring pencil/pen, paper, and a calculator to our class meetings. You will need access to a computer with good an internet connection, a webcam, and a microphone. Please contact me if you have a problem accessing any of these computer resources. There is no textbook to buy, I will supply readings each week.

TopHatPro (www.tophat.com) is required for the class. TopHatPro is the platform we will use to (1) access questions on pre-class readings, (2) access in-class activities, (3) access homework, and (4) access examinations. A subscription to TopHatPro with the Remote Proctoring Add-On costs \$30. For information on how to purchase TopHatPro, setup your account, and a tutorial on using TopHat go to the link

<https://success.tophat.com/s/article/Student-Getting-Started-with-Top-Hat>

Tutorial Assistance

Help will be available through office hours held by the professor.

Academic Dishonesty:

A finding of academic dishonesty will result in a zero for the assignment and a record of your offense in NAU Academic Dishonesty Database. A repeat of a finding of academic dishonesty will result in a failing grade for the class.

Course Outline:

Celestial Mechanics
The Continuous Spectrum of Light
The Interaction of Light and Matter
Telescopes
Classification of Stellar Spectra

Examination # 1, Thursday, September 23, 2021

Interiors of Stars
Interstellar Medium and Star Formation
Main Sequence and Post-Main Sequence Stellar Evolution
The Fate of Massive Stars
Degenerate Remnants of Stars
Black Holes

Examination # 2, Thursday, October 28, 2021

Milky Way
Nature of Galaxies, Galactic Evolution
Active Galaxies
Cosmology

Comprehensive Final Examination, Tuesday, December 7, 2021

UNIVERSITY POLICIES

COVID-19 REQUIREMENTS AND INFORMATION

Additional information about the University's response to COVID-19 is available from the **Jacks are Back!** web page located at <https://nau.edu/jacks-are-back>.

SYLLABUS POLICY STATEMENTS

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>.

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, or veteran status. Due to potentially unethical consequences, 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, or visit the EAO website at <https://nau.edu/equity-and-access>.

TITLE IX

Title IX is the primary federal law that prohibits discrimination on the basis of sex or gender in educational programs or activities. Sex discrimination for this purpose includes sexual harassment, sexual assault or relationship violence, and stalking (including cyber-stalking). Title IX requires that universities appoint a “Title IX Coordinator” to monitor the institution’s compliance with this important civil rights law. NAU’s Title IX Coordinator is Elyce C. Morris. The Title IX Coordinator is available to meet with any student to discuss any Title IX issue or concern. You may contact the Title IX Coordinator by phone at 928-523-3515, by fax at 928-523-0640, or by email at elyce.morris@nau.edu. In furtherance of its Title IX obligations, NAU will promptly investigate and equitably resolve all reports of sex or gender-based discrimination, harassment, or sexual misconduct and will eliminate any hostile environment as defined by law. Additional important information about Title IX and related student 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), 928-523-6906 (TTY), 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, Dr. David Faguy, who can be reached at 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.

Last revised August 1, 2021