NORTHERN ARIZONA UNIVERSITY

Department of Astronomy and Planetary Science

Introduction to Astrophysics

General Information

- Department: Astronomy and Planetary Science
- Course: AST 280 (Introduction to Astrophysics) – Class Number 3552 Section 001
- Term: Fall 2024
- Total Units Of Course Credit: 3
- Pre- and Co-Requisite(s): (MAT 136) and (PHY 161 or PHY 171)
- Mode of Instruction: In-Person
- Meeting Time: T, TH 12:45 – 2:00 p.m.
- Location: Science Annex Room 113
- Instructor: Stephen Tegler
- Phone: 928-523-9382; Email: Stephen.Tegler@nau.edu
- Tegler's Office Location: Physical Sciences Building Room 225D
- Tegler's Office hours: T, TH 2:15 – 3:15 p.m. or email or phone me to make an appointment.
- Teaching Assistant: Emily Clark
- Clark's Email: erc328@nau.edu
- Clark's Office Hours: W 10:00 – 11:00 in Physical Sciences Building Room 225

Course Overview:

We will study the tools of astrophysics, stars and stellar evolution, galaxies and galactic evolution, and cosmology. You must have completed MAT 136 and PHY 161 or PHY 171. You may be administratively dropped from the class if you do not have the required prerequisites.

Student Learning Outcomes:

- You will develop expertise in physics and astronomy
- You will develop skills in solving physics problems in an astrophysical context
- You can look at the solution to a problem and judge whether the solution is reasonable.

Assignments/Course Structure/Approach

You are expected to come to all T and 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. I will emphasize important material during class; in-class activities will assess your comprehension. Homework assignments must be submitted by 11:59 p.m. each Thursday.

Assessment Methods for Student Learning Outcomes

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

Grading

Percentages Toward Final Grade:

- Questions on Pre-Class Readings: ~33%
- In-Class Activities ~33%
- Homework: ~33%

Approximate Grading Scale:

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

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

Makeup Work:

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

I will offer several extra-credit assignments throughout the semester to consider situations where you cannot complete an assignment because of reasons beyond your control and are not eligible for an intuitional excuse.

Required Materials:

Please bring a pencil/pen, paper, and a calculator to our class meetings. **You will also need access to a phone, tablet, or computer with a good internet connection during class**. Please contact me if you have a problem accessing any of these resources. There is no textbook to buy; I will supply readings each week.

TopHat is required for the class. TopHat is the platform we will use to access (1) readings, (2) questions on pre-class readings, (3) in-class activities, and (3) homework. TopHat is free.

Tutorial Assistance

Help will be available during office hours held by the professor and a teaching assistant.

Academic Dishonesty:

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

You may work with other students on assignments; however, students turning in identical solutions to assignments will receive grades of zero on the assignment.

Course Outline:

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

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

Milky Way
Nature of Galaxies, Galactic Evolution
Active Galaxies
Cosmology

NAU Career-Ready Agenda

100% Career Ready:

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

1. 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.

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

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

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

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

6. Professionalism: Understanding that work environments differ greatly, demonstrating effective work habits, and acting in the interest of the larger community and workplace.

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

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

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://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 conductive 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.

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